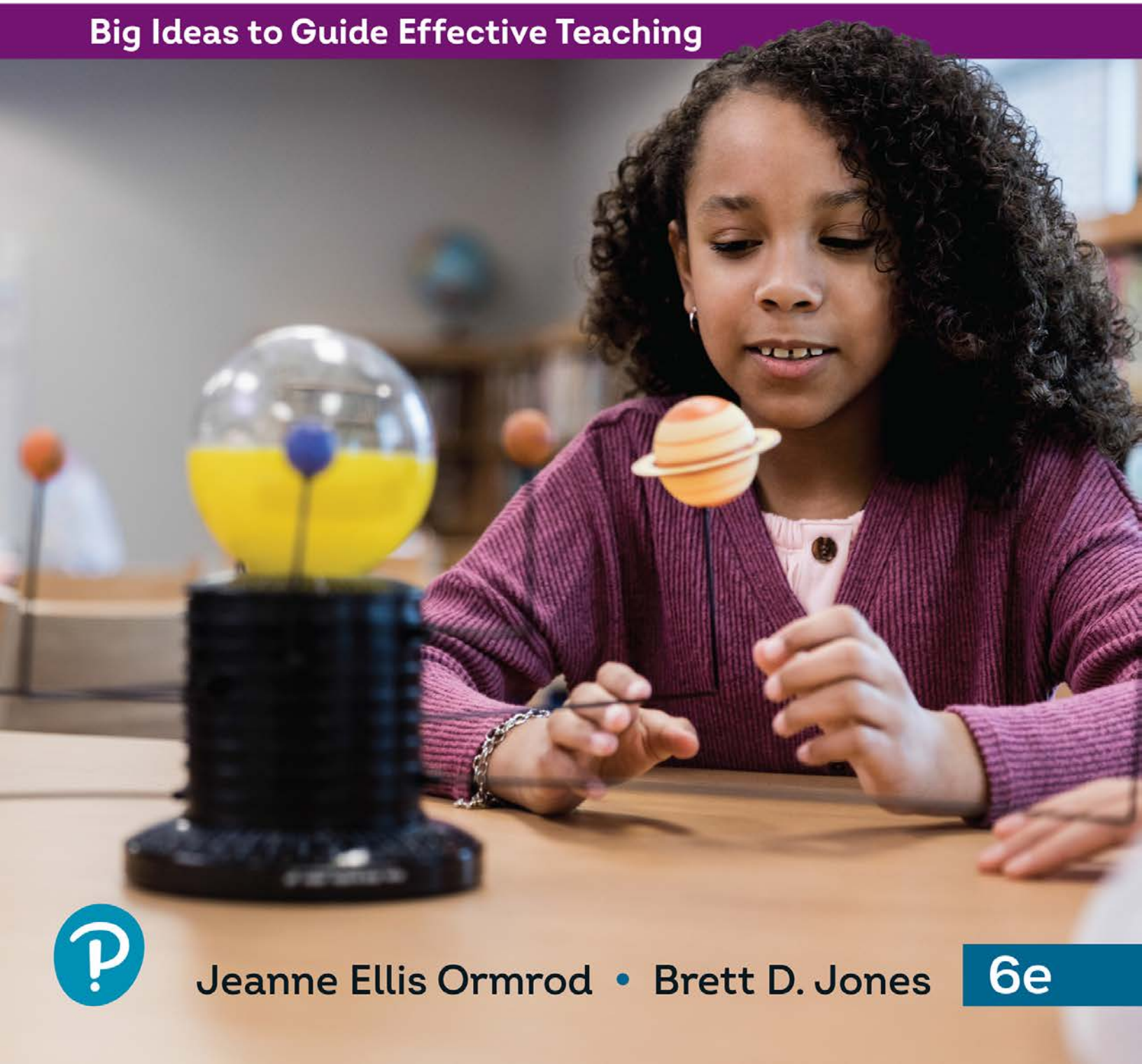
ESSENTIALS OF EDUCATIONAL PSYCHOLOGY

Big Ideas to Guide Effective Teaching



Jeanne Ellis Ormrod • Brett D. Jones

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SIXTH EDITION

Essentials of Educational Psychology

Big Ideas to Guide Effective Teaching

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To Olivia, Miles, and Jack Fox (from Jeanne)

and

To Mia and Jack Jones (from Brett)

About the Authors

Jeanne Ellis Ormrod received her A.B. in psychology from Brown University and her M.S. and Ph.D. in educational psychology from The Pennsylvania State University. She earned licensure in school psychology through postdoctoral work at Temple University and the University of Colorado at Boulder and has worked as a middle school geography teacher and school psychologist. Dr. Ormrod was Professor of Educational Psychology at the University of Northern Colorado (UNC) until 1998 and is currently Professor Emerita in UNC's School of Psychological Sciences. She has published and presented extensively on cognition and memory, cognitive development, instruction, and related topics but is probably best known for this book and four others: *Human Learning* (currently in its 8th edition); *Educational Psychology: Developing Learners* (10th edition, coauthored with Eric Anderman and Lynley Anderman); *Child Development and Education* (coauthored with Teresa McDevitt, currently in its 7th edition); and *Practical Research* (coauthored with Paul Leedy, currently in its 12th edition). After raising three children (two of whom have become teachers themselves), she now lives in New Hampshire with her husband, Richard. Within the past few years, she has had the good fortune to visit schools in diverse cultural settings, including Rwanda, Tanzania, Thailand, Malaysia, and Peru's Amazon region.

Brett D. Jones is Professor of Educational Psychology in the School of Education at Virginia Tech (Virginia Polytechnic Institute and State University). He received his B.A.E. in architectural engineering from The Pennsylvania State University and his M.A. and Ph.D. in educational psychology from the University of North Carolina at Chapel Hill. Dr. Jones has held faculty positions as an educational psychologist at Duke University, the University of South Florida St. Petersburg, and Virginia Tech. He has taught over 20 different types of university courses related to motivation, cognition, and teaching strategies. Dr. Jones has also conducted workshops and invited presentations at many universities and has presented more than 150 research papers at conferences. His research, which includes examining instructional methods that support students' motivation and learning, has led to more than 100 research articles, several book chapters, and two other books (*Motivating Students by Design: Practical Strategies for Professors* and *The Unintended Consequences of High-Stakes Testing*, the latter of which was coauthored with M. Gail Jones and Tracy Hargrove). He and his wife stay busy with their two children, who enjoy school, athletics, and cheering for the Hokies, Nittany Lions, and Tar Heels.

Preface

About This Book

Welcome to the interesting field of educational psychology! We're excited to share with you the many psychological concepts and principles that are related to teaching and learning. Our goal in writing this book was not only to make these concepts and principles easy to understand but also to provide readers with research-based teaching strategies that they could use to help their students learn in a developmentally appropriate manner.

Two primary characteristics distinguish this book from most other educational psychology textbooks: its shorter length and its organization into "Big Ideas." We used the word *Essentials* in the title of the book because we've distilled the many ideas in educational psychology down to the essential, big ideas. As a result, this book has only 10 chapters instead of the 15 chapters or so that are typical in many educational psychology textbooks. This shorter book allows students to spend more time understanding concepts in-depth instead of covering more topics in less depth. For example, in a 15-week course, instructors could spend two weeks on some chapters instead of just one. Or, they could provide supplementary readings or case studies to delve deeper into some of the chapter topics.

With respect to the book's organization, each chapter is divided into about four *Big Ideas* that are further divided into important principles and teaching strategies. Organizing the book's chapters by *Big Ideas* focuses students on the most important educational psychology ideas and teaching strategies. The traditional approach to teaching and writing about educational psychology is to cover one theory at a time, explaining its assumptions and principles and then identifying implications for educational practice. But in our extensive experience in teaching educational psychology to college students, we've had success in teaching our courses differently, focusing more on commonalities than differences among theories. In fact, although researchers from different traditions have approached human cognition and behavior from many different angles, they sometimes arrive at more or less the same conclusions. The language they use to describe their observations is often different, to be sure, but beneath all the terminology are certain nuggets of truth that can be remarkably similar. We've tried to integrate these ideas from many theoretical perspectives into what is, for us, a general set of principles and strategies that educational psychology *as a whole* can offer teachers.

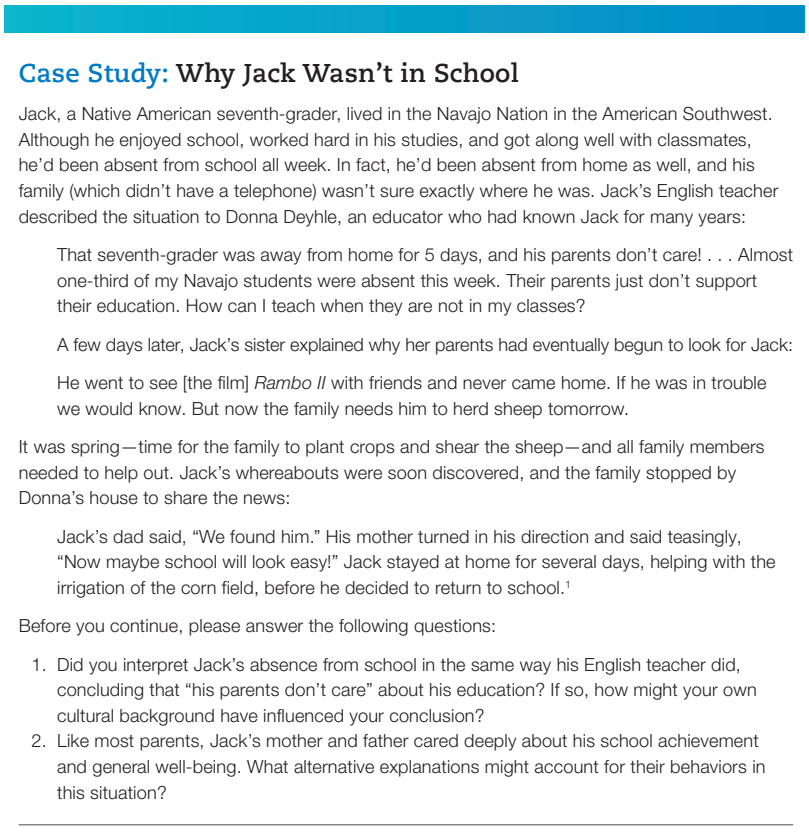
Chapter 1 introduces readers to how teachers can develop expertise, how they can use research findings, and how readers can implement strategies to learn and study more effectively. Chapters 2, 3, and 4 focus on many different factors that can affect learning, including the brain, cognition, memory, complex cognitive processes (e.g., self-regulation, transfer, problem solving), and the social and cultural environments in which the learning takes place. We then consider the effects of motivation (Chapter 5) and development (Chapters 6 and 7) on students' learning and achievement. The last three chapters of the book build on the earlier ones to offer recommendations for instruction (Chapter 8), classroom management (Chapter 9), and assessment (Chapter 10).

Pedagogical Features

The book includes a variety of features that can help readers better understand, remember, and apply what they're reading. These features are provided here in a bulleted list along with an example of each.

- **Big Ideas:** Each chapter begins with about four *Big Ideas*—overarching principles that provide a general organizational scheme for the chapter's content.

- **Case Studies:** Immediately following the list of Big Ideas presented at the beginning of each chapter is a *Case Study* that introduces some of the ideas and issues that we address in the chapter. Throughout each chapter, we periodically revisit the case to offer new insights and interpretations.



Case Study: Why Jack Wasn't in School

Jack, a Native American seventh-grader, lived in the Navajo Nation in the American Southwest. Although he enjoyed school, worked hard in his studies, and got along well with classmates, he'd been absent from school all week. In fact, he'd been absent from home as well, and his family (which didn't have a telephone) wasn't sure exactly where he was. Jack's English teacher described the situation to Donna Deyhle, an educator who had known Jack for many years:

> That seventh-grader was away from home for 5 days, and his parents don't care! . . . Almost one-third of my Navajo students were absent this week. Their parents just don't support their education. How can I teach when they are not in my classes?
>
> A few days later, Jack's sister explained why her parents had eventually begun to look for Jack:
>
> He went to see [the film] *Rambo II* with friends and never came home. If he was in trouble we would know. But now the family needs him to herd sheep tomorrow.

It was spring—time for the family to plant crops and shear the sheep—and all family members needed to help out. Jack's whereabouts were soon discovered, and the family stopped by Donna's house to share the news:

> Jack's dad said, "We found him." His mother turned in his direction and said teasingly, "Now maybe school will look easy!" Jack stayed at home for several days, helping with the irrigation of the corn field, before he decided to return to school.[1]

Before you continue, please answer the following questions:

1. Did you interpret Jack's absence from school in the same way his English teacher did, concluding that "his parents don't care" about his education? If so, how might your own cultural background have influenced your conclusion?
2. Like most parents, Jack's mother and father cared deeply about his school achievement and general well-being. What alternative explanations might account for their behaviors in this situation?

- **Guiding Principles and Key Strategies:** Boldfaced *Guiding Principles* and *Key Strategies* are provided throughout the chapter to highlight key principles and concrete recommendations that can guide teachers in their decision making and classroom practices.

> **Help students avoid mental sets when engaging in creative problem solving.**
>
> To avoid *mental sets* that exclude potentially effective approaches and solutions, it's helpful to encourage students to encode situations and problems in multiple ways, as demonstrated by these examples:

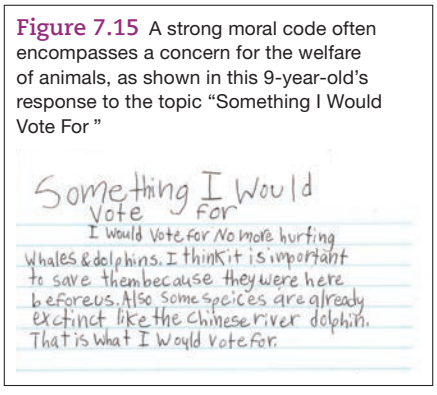
- **See for Yourself exercises:** We often put readers themselves in the position of a "learner" and ask them to engage in a short learning or thinking activity. Many of these *See For Yourself* exercises are similar to ones we've used in our own educational psychology classes. Our students have found them to be quite helpful in making concepts and principles more "real" for them—and hence more vivid, understandable, and memorable. An example of such an exercise follows.

> **See For Yourself**
>
> Carberry and Seville
>
> 1. Professor Josiah S. Carberry has just returned the first exam, scored and graded, in your advanced psychoceramics class. You discover that you've received one of the few high test grades in the class, an A–. Why did you do so well when most of your classmates did poorly? Jot down several possible explanations for why you might have received a high grade in Dr. Carberry's class.
> 2. An hour later, you get the results of the first test in Professor Barbara F. Seville's sociocosmetology class, and you learn that you *failed* it! Why did you do so poorly? Jot down several possible reasons for your F on this test.

- **Think About It questions:** An additional feature comes in the form of *Think About It* questions in the margin that encourage readers to connect chapter content to their past experiences or current beliefs.

> **think about it**
>
> Can you think of a recent situation in which you exhibited positive transfer? Can you think of one in which you exhibited negative transfer?

- **Example artifacts from students and teachers:** If you quickly flip through the book, you'll see many classroom artifacts—that is, examples of work created by actual students and teachers. We use artifacts throughout the book to help readers connect concepts, principles, and strategies to students' behavior and to classroom practices.


Something I Would Vote For

I would vote for No more hurting whales & dolphins. I think it is important to save them because they were here beforeus. Also some speices are already extinct like the chinese river dolphin. That is what I would vote for.

Figure 7.15 A strong moral code often encompasses a concern for the welfare of animals, as shown in this 9-year-old's response to the topic "Something I Would Vote For"

- **Developmental Trends:** To a considerable degree, we talk about concepts and principles that apply to children and adolescents at all grade levels. Yet 1st graders often think and act very differently than 6th graders, and 6th graders can, in turn, be quite different from 11th graders. Most chapters have one or more *Developmental Trends* tables that highlight and illustrate developmental differences that teachers are apt to see in grades K–2, 3–5, 6–8, and 9–12. Here is an example from part of a Developmental Trends table.

Table 3.2 Metacognition at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **Grades K–2**	• Awareness of thought in oneself and others, albeit in a simplistic form; limited ability to reflect on the specific nature of one's own thought processes • Considerable overestimation of what has been learned and how much can be remembered • Belief that learning is a relatively passive activity • Belief that the absolute truth about any topic is "out there" somewhere, waiting to be discovered	An adult tells 6-year-old Brent that she will read him a list of 12 words; she then asks him to predict how many he'll be able to remember. Brent predicts "about 8 or 9 . . . maybe all of them," but in fact he recalls only 6. Later, when the adult asks him what he did to try to remember the words, he says only, "Think" and "Holded it, hold it in my brain."	• Talk often about thinking processes (e.g., "I *wonder* if . . . " "How might you *remember* to . . . ?"). • Provide opportunities for students to "experiment" with their memories (e.g., playing "I'm going on a trip and am going to pack _____," in which each student repeats items previously mentioned and then adds another item to the list). • Introduce simple learning strategies (e.g., rehearsal of spelling words, repeated practice of motor skills).

- **Classroom Strategies boxes:** Most chapters have two or more *Classroom Strategies* boxes that offer concrete suggestions and examples of how teachers might apply a particular concept or principle. These features should provide yet another mechanism to help our readers apply educational psychology to actual classroom practices. Part of one of these Classroom Strategies boxes is shown here.

Classroom Strategies

Working with Students Who Have Significant Delays in Cognitive Development

- **Introduce new material at a slower pace, and provide many opportunities for practice.**
  An elementary teacher gives a student only two new addition facts a week because any more than two seem to be overwhelming. Every day, the teacher has the student practice writing the new facts and review the facts learned in preceding weeks.
- **Explain tasks and expected behaviors concretely and in very specific language.**
  An art teacher gives a student explicit training in the steps needed at the end of each painting session: (1) Rinse the paintbrush out at the sink, (2) put the brush and watercolor paints on the shelf in the back room, and (3) put the painting on the counter by the window to dry. Initially, the teacher needs to remind the student of every step in the process. But with time and practice, the student eventually carries out the process independently.
- **Give students explicit guidance about how to study.**
  An elementary teacher tells a student, "When you study a new spelling word, it helps if you repeat the letters out loud while you practice writing the word. Let's try it with the word *house*. Watch how I repeat the letters—H . . . O . . . U . . . S . . . E—as I write the word. Now you try doing what I just did."
- **Encourage independence.**
  A middle school teacher teaches a student how to use her calculator to figure out what she needs to pay for lunch every day. The teacher also gives the student considerable practice in identifying the correct bills and coins to use when paying various amounts.
- **Provide technology that can enhance students' self-reliance.**
  Using a task organizer app on a smartphone (e.g., Visules, Picture Scheduler), a high school life skills teacher creates a sequence of step-by-step pictures that can help a student learn and remember how to cook a hard-boiled egg.

Sources: Feuerstein, Feuerstein, & Falik, 2010; K. L. Fletcher & Bray, 1995; Heward, 2009; Patton, Blackbourn, & Fad, 1996; Prout, 2009; Turnbull et al., 2010.

- **Use of footnotes:** Some of our colleagues in the field may be surprised to see our use of footnotes rather than APA (American Psychological Association) citation style throughout the book. Our decision has been strictly a pedagogical one. Yes, students need to know that the principles and recommendations in this book are research-based. But we've found that APA style can be quite distracting for someone who is reading about psychology for the first time and trying to sort out what things are and are not important to learn and remember. Novice psychologists should be concerned more with the *ideas themselves* than with the people behind the ideas. By putting most of the research authors' names in small print at the bottom of the page, we can help novices better focus their attention on what things truly are most important to know and understand.

Learning Management System (LMS)–Compatible Assessment Bank, and Other Instructor Resources

LMS-Compatible Assessment Bank

With this new edition, assessments are included in LMS-compatible banks for the following learning management systems: Blackboard (ISBN 9780136817758), Canvas (ISBN 9780136817703), D2L (ISBN 9780136817918), and Moodle (ISBN 9780136817871). These packaged files allow maximum flexibility to instructors when it comes to importing, assigning, and grading. Assessment types include:

- **Learning Outcome Quizzes:** Each chapter *Big Idea* is the focus of a *Learning Outcome Quiz* that is available for instructors to assign through their Learning Management System. The *Big Ideas* identify chapter content that is most important for learners and serve as the organizational framework for each chapter. The quiz questions focus almost exclusively on meaningful learning and, often, on application of key concepts and principles related to scenarios and problems. In general, the quizzes have been written with a particular principle in mind: When used in the LMS

environment, these multiple-choice questions are automatically graded and include feedback for the correct answer and for each distractor to help guide students' learning. As we say in Chapter 10, *Assessment activities can be learning experiences in and of themselves.*

- **Application Exercises:** Each chapter provides opportunities for students to apply what they have learned through *Application Exercises*. One *Application Exercise* is available for each Big Idea within the chapter. The exercises require students to watch short videos, read scenarios, or think about situations and then answer open-ended questions. When used in the LMS environment, a model response written by experts is provided after students submit the exercise. This feedback helps guide students' learning and can assist the instructor in grading.
- **Chapter Tests:** Suggested test items for each chapter in the following formats: multiple choice and short answer/essay. Some items (lower-level questions) simply ask students to identify or explain concepts and principles they have learned. But many others (higher-level questions) ask students to apply those same concepts and principles to specific classroom situations—that is, to actual student behaviors and teaching strategies. The lower-level questions assess basic knowledge of educational psychology. But ultimately, it is the higher-level questions that can best assess students' ability to use principles of educational psychology in their own teaching practice.

Instructor's Manual (ISBN 9780136817611)

The Instructor's Manual is provided as a Word document and includes resources to assist professors in planning their course. These resources consist of suggestions for learning activities, supplementary lectures, group activities, and additional media resources. These have been carefully selected to provide opportunities to support, enrich, and expand on what students read in the textbook.

PowerPoint® Slides (ISBN 9780136817574)

PowerPoint slides are provided for each chapter and highlight key concepts and summarize the content of the text to make it more meaningful for students. Oftentimes, these slides also include questions and problems designed to stimulate discussion and to encourage students to elaborate and deepen their understanding of chapter topics.

Note: All instructor resources—LMS-compatible assessment bank, instructor's manual, and PowerPoint slides—are available for download at www.pearsonhighered.com. Use one of the following methods:

- From the main page, use the search function to look up the lead author (i.e., Ormrod) or the title (i.e., Essentials of Educational Psychology). Select the desired search result, then access the "Resources" tab to view and download all available resources.
- From the main page, use the search function to look up the ISBN (provided above) of the specific instructor resource you would like to download. When the product page loads, access the "Downloadable Resources" tab.

New to This Edition

Our knowledge about how children and adolescents learn and develop—and also about how best to *help* them learn and develop—grows every year. Throughout this sixth edition, we've made many changes to reflect new research findings and evidence-based classroom strategies. General changes include the following:

- **More explicit connections between principles and teaching strategies:** For several chapters in the prior edition, we provided most of the teaching strategies in separate

sections near the end of the chapter. In this edition, we integrated those teaching strategies throughout the chapters. As a result, the *Big Idea* sections in many chapters now include a subsection titled *Teaching Strategies* to make the connections between the principles and the teaching strategies more explicit.

- **More explicit connections between theories and principles:** Although our approach in this book is to integrate the concepts, principles, and educational strategies that diverse theoretical perspectives offer, it's also important for teachers to have some familiarity with specific psychological theories and with prominent theorists who have had a significant influence on psychological thinking (e.g., Jean Piaget, Lev Vygotsky, B. F. Skinner). To better connect these theories to the *Big Ideas* and principles presented in the text, we moved the theories from the *Theoretical Perspectives* tables in the prior edition to within the body of the text.
- **New figures to facilitate comprehension:** We added over 90 new figures to summarize or present the concepts explained in the text.
- **Updated references and explanations:** We have included over 500 new references to provide readers with the most current and relevant research.
- **New keywords and definitions:** We added new keywords and definitions that are consistent with current research.

Key Content Updates by Chapter

More specific, chapter-by-chapter changes include the following additions and modifications:

- **Chapter 1:** Added a second reflection question and explanation related to motivation for the opening "Case Study: The 'No D' Policy"; switched the order of the first and second big ideas (Sections 1.1 and 1.2); added an explanation and figure related to the organization of the educational psychology topics within the book; added a brief history of the field of educational psychology; added examples of the types of questions addressed in each chapter in the book; added a definition of *variable* with examples; added a figure to show the relationships between variables, principles, theories, and ideas; added several study strategies, with figures and examples, including spacing study sessions, reviewing previously learned material, previewing material, taking notes during reading, finding examples and nonexamples of concepts, checking and practicing what you have learned, and evaluating your study schedule; and added a principle about being an active participant and putting forth effort in learning and studying.
- **Chapter 2:** Replaced the Case Study at the beginning of the chapter with a new Case Study titled "Studying for a Test"; moved all of the teaching implications in Section 2.5 to within the chapter at the appropriate locations; edited the wording and order of a few of the Big Ideas; deleted Table 2.1 and distributed the text from the table to within the chapter or within other chapters; added a definition of *cognition* at the beginning of the chapter; added more specific information about the brain in Section 2.1 including two new figures (Figures 2.4 and 2.5); added a new Figure 2.6; revised the model of memory in Figure 2.7; added a new Figure 2.8; added the terms and definitions for *mind wandering*, *selective attention*, and *divided attention* in Section 2.2; added an explanation of cognitive load theory; added a new subsection in Section 2.3 with three new theories of concepts (classical theory of concepts, prototype theory, and exemplar theory) along with a new table that includes examples of different concepts; added a new subsection in Section 2.3 with teaching strategies for teaching concepts, including a new Classroom Strategies box; added a new example

for organization along with a new Figure 2.16; added a new example for encouraging elaboration along with a new Figure 2.18; added a new Figure 2.22 to show several different types of constructivism; added a new Figure 2.26 to provide an example of one of the teaching strategies; added an example in Section 2.5 about how memories are retrieved by following pathways; added information in Section 2.5 about the role of forgetting and new findings from neuroscience with updated citations; added a new subsection in Section 2.5 about providing opportunities to practice retrieval, including a new Figure 2.28; added a new subsection in Section 2.5 about intermixing practice problems, including a new See For Yourself exercise and a new Figure 2.29; added a new sub-section in Section 2.5 about spacing review sessions that includes a definition for *spacing effect*; and made minor edits throughout the chapter.

- **Chapter 3:** Deleted Big Ideas 3.5 and 3.6 and moved the principles and practices within them into other sections of the chapter; edited the wording of Big Idea 3.4; added a figure to list many different types of complex cognitive processes; added a new figure illustrating self-regulation, metacognition, and motivation; explained the differences between self-regulation and metacognition in Section 3.1; provided more explanation about metacognition and a figure showing the three categories of metacognitive knowledge; added four new strategies and examples in the Classroom Strategies section titled "Fostering Self-Regulation"; added a new figure related to specific transfer; added a new paragraph using an example about computer programming for general transfer in Section 3.2; revised the definition of *service learning* and provided a new example of it in Section 3.2; added an explanation of critical service learning along with an associated figure; added a new figure showing the components of well-defined and ill-defined problems; expanded the explanation of creativity in Section 3.3; added text and an associated figure related to the creative problem-solving process; added the key term *engineering design* and explained the processes involved in it; added three examples of how teachers can help students avoid mental sets (Section 3.3); added a new section about thinking at the beginning of Section 3.4 along with a figure of the categories of cognitive processes; added the terms *design thinking* and *computational thinking* along with explanations of each; moved the ideas in the Cultural Considerations box (Section 3.4) to within the text in the appropriate section; and added a new figure related to students being critical thinkers.
- **Chapter 4:** Deleted Big Ideas 4.5 and 4.6 and moved the principles and practices within them into other sections of the chapter; edited the wording of Big Idea 4.3; added a definition and explanation of *ecological systems theory* in the introduction; added a definition of *Behaviorism* in Section 4.1; edited Figures 4.3 and 4.6; added a definition and examples of the *Premack Principle* in Section 4.1; added a definition of *social cognitive theory* in Section 4.1; added a definition of *cognitive modeling* in Section 4.1; added new Figures 4.7, 4.8, and 4.12; provided more examples of using verbal praise and a token economy in Section 4.1; added definitions of *social constructivism* and *sociocultural theory* in Section 4.2.; the ideas in the Cultural Considerations box (Section 4.3) were moved to within the text in the appropriate section; added an example of how cultural lenses can affect students' views in Section 4.3; added a new section in subsection 4.3 related to race and included definitions and examples of *racial ideology, color-blind racial ideology, racial microaggressions, and racial battle fatigue*; added a new Figure 4.16; added another example of stereotypes in Section 4.3; and added two new sections for teaching strategies in Section 4.4.
- **Chapter 5:** The title of the chapter was changed to "Motivation and Emotions"; Big Ideas 5.2 and 5.4 were combined; deleted Table 5.1 and distributed the text from the

table to within the chapter or within other chapters; added a new figure in Section 5.1 about theoretical approaches; added a new section in Section 5.1 titled "Teacher Beliefs About and Assessment of Students' Motivation" along with an accompanying section with teaching strategies that include a new figure; included new figures in Section 5.2 related to arousal, self-worth, and interest; added two new See For Yourself activities in Section 5.2 ("Enjoyable Activity" along with an accompanying figure and "Self-Efficacy for Different Activities"); added more explanation about *cost* in Section 5.2; revised a figure related to self-efficacy and added a complementary paragraph to explain it; added a new figure related to appropriate attributions; added a new teaching strategy related to usefulness in Section 5.3; moved the ideas in the Cultural Considerations boxes (previously in Sections 5.3 and 5.4) to within the text in the appropriate section; edited a couple examples in the Classroom Strategies box titled "Enhancing Self-Efficacy and Self-Worth"; added a new figure related to SMART goals; edited some examples and added two new examples (with an accompanying figure) in the Classroom Strategies box titled "Forming Productive Expectations and Attributions;" added a new figure about situational interest in Section 5.3; added more strategies related to caring in Section 5.3; and added definitions of *emotions, social and emotional learning, and emotion regulation* (along with accompanying explanations) in Section 5.4.

- **Chapter 6:** Deleted Big Idea 6.5 and moved the principles and practices within it into other sections of the chapter; deleted Table 6.1 and distributed the text from the table to within the chapter or within other chapters; updated several figures throughout the chapter; added a figure that shows synaptic connections in Section 6.1; added a paragraph about children's use of different brain areas in Section 6.1; in Section 6.2, added a figure that shows an example of mental schemes, a figure related to language development, a figure explaining reciprocal teaching, and a figure about apprenticeships; added to the definition and explanation of *scheme* in Section 6.2; edited the examples for assimilation and accommodation in Section 6.2; in Section 6.4, added a figure related to dispositions and a figure about multiple intelligences; and moved the ideas in the Cultural Considerations box (Section 6.4) to within the text in the appropriate section.
- **Chapter 7:** Edited the wording of Big Ideas 7.1 and 7.2; deleted Big Idea 7.4 and moved the principles and practices within it into other sections of the chapter; in Section 7.1, edited the principles and the order in which some of them appear; added a table for personality traits along with text to accompany it; created several new figures in Section 7.1; in Section 7.1, added definitions and accompanying explanations for *traits, sociability, activity level, environmental sensitivity, permissive and uninvolved parenting, self-concept, self-esteem, reciprocal effects model, gender identity, and sexual orientation identity*; added a new See For Yourself exercise titled "Your Sense of Self" along with an explanation of it; added a new principle related to sexual orientation; added a principle about creating positive environments for all gender identities and sexual orientation identities; added a new definition for *social and emotional learning*; added a new figure for steps in social problem solving; moved the ideas in the Cultural Considerations box (Section 7.3) to within the text in the appropriate section; and reorganized the principles and text in Section 7.4.
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J. E. O.
B. D. J.

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In forming their identity, it's important for adolescents to explore alternative beliefs, values, and career goals. 303

Teaching Strategies: Fostering Personal Development 305

Accommodate students' diverse personality traits. 305

Create a warm, supportive environment with clear standards for behavior and explanations of why some behaviors are unacceptable. 305

Help students get a handle on who they are and who they want to become. 306

Channel adolescents' risk-taking tendencies into safe activities. 307

Create a positive learning environment in which students of all gender identities and sexual orientation identities feel welcome. 308

7.2 Social Development 308

Peer Relationships 309

Peer relationships promote personal, social, and academic development in ways that adult–child relationships often cannot. 309

Peers help define "appropriate" ways of behaving. 310

On average, boys and girls interact with their peers in distinctly different ways. 311

Social groups become increasingly important in adolescence. 311

Romantic relationships in adolescence can provide valuable practice for the intimate relationships of adulthood. 312

Truly popular children have good social skills. 313

Social Cognition 314

As children get older, they become increasingly aware of other people's thoughts and feelings. 315

Children's cognitive processes in social situations influence their behaviors toward others. 316

Aggressive behavior is often the result of counterproductive cognitive processes. 316

Teaching Strategies: Encouraging Effective Social Cognition and Interpersonal Skills 318

Foster perspective taking and empathy. 318

Talk with students about what it really *means to be popular. 319*

Provide frequent opportunities for social interaction and cooperation. 320

Explicitly teach social skills to students who have trouble interacting effectively with others. 320

Explain what bullying is and why it cannot be tolerated. 321

Be alert for incidents of bullying and other forms of aggression, and take appropriate actions with both the victims and the perpetrators. 322

Explicitly discourage inappropriate electronic communications and postings. 323

Promote understanding, communication, and interaction among diverse groups. 323

7.3 Moral and Prosocial Development 325

The Nature of Moral and Prosocial Development 325

Children begin applying internal standards for behavior at a very early age. 325

Children increasingly distinguish between moral and conventional transgressions. 325

Children's capacity to respond emotionally to other people's misfortunes and distress increases throughout the school years. 326

With age, reasoning about moral issues becomes increasingly abstract and flexible. 327

Challenges to current moral perspectives can promote advancement toward more sophisticated reasoning. 329

Cognition, affect, and motivation all influence moral and prosocial behavior. 329

Moral values become an important part of some young people's identity. 331

Teaching Strategies: Promoting Moral Reasoning and Prosocial Behavior 331

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Engage students in discussions of social and moral issues. 332

Discourage all forms of cheating. 332

Get students actively involved in community service or service-learning experiences. 333

7.4 Students Who Face Exceptional Personal or Social Challenges 333

Students At Risk for Academic Failure 333

Some students face, or have faced, exceptional challenges outside of school. 334

Some students do well in school despite hardships. 334

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Intervene early and often with students who are at risk for dropping out of school. 335

Connect students and families to resources. 336

Identify additional supportive strategies and services for students who are homeless. 336

Watch for signs of abuse. 338

Be on the lookout for students who appear to be social outcasts. 338

Provide extra support and guidance for students who have disabilities that affect their personal or social functioning. 338

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Begin by identifying what students should ultimately know and be able to do. 346

Align long-term instructional goals with appropriate standards for various content domains. 348

Include goals and objectives at varying levels of complexity and sophistication. 350

Ask students to identify some of their own goals for instruction. 351

Break complex tasks and topics into smaller pieces, identify a logical sequence for the pieces, and decide how best to teach each one. 352

Consider how you might motivate students to actively engage in instructional activities. 354

Develop step-by-step lesson plans. 354

Use class websites to share information and scaffold students' learning. 355

8.2 Conducting Teacher-Directed Instruction 355

Encourage and support students' cognitive processes and motivation. 356

Ask a lot of good questions to promote and assess learning. 358

Intermingle explanations with examples and opportunities for practice. 361

Help all students achieve mastery of basic knowledge and skills. 362

Take advantage of well-designed instructional software and websites. 363

Extend the school day with age-appropriate homework assignments. 365

8.3 Conducting Student-Directed Instruction 366

Have students discuss issues that lend themselves to multiple perspectives, explanations, or approaches. 368

Create a classroom atmosphere conducive to open debate and the constructive evaluation of ideas. 370

Conduct activities in which students must depend on one another for their learning. 371

Have students answer questions through their own research or investigations. 374

Have students work on complex, real-world problems, projects, and designs. 374

When real-world tasks are impractical or impossible, consider using simulations and games. 377

Have students work one-on-one with another student or a teacher. 378

Use computer technology to enhance communication and collaboration. 381

8.4 General Instructional Strategies 382

Take group differences into account. 382

Consider how you might productively modify or supplement instructional strategies for the benefit of English learners in your classroom. 383

Also take developmental levels, individual differences, and special educational needs into account. 383

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Communicate caring and respect for every student. 393

Work hard to improve relationships that have gotten off to a bad start. 395

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Create a goal-oriented and business-like (but nonthreatening) atmosphere. 396

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Collaborate with colleagues to create an overall sense of school community. 404

Work cooperatively with other agencies that play key roles in students' lives. 405

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Invite families and community members to participate in the academic and social life of the school. 407

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9.3 Reducing Unproductive Behaviors 409

Consider whether instructional strategies or classroom assignments might be partly to blame for off-task behaviors. 409

Consider whether cultural background might influence students' classroom behaviors. 410

Ignore misbehaviors that are temporary, minor, and unlikely to be repeated or copied. 411

Give signals and reminders about what is and is not appropriate. 412

Get students' perspectives about their behaviors. 413

Teach self-regulation techniques. 415

When administering punishment, use only those consequences that have been shown to be effective in reducing problem behaviors. 416

Confer with parents. 418

To address a chronic problem, plan and carry out a systematic intervention. 422

Determine whether certain undesirable behaviors might serve particular purposes for students. 424

Use the simplest and least intrusive strategy possible to address student misbehaviors. 426

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Assessment activities can be learning experiences in and of themselves. 443
Assessments can provide feedback about learning progress. 443
Assessments can motivate students to study and learn. 443
Assessments can encourage engagement and self-regulation if *students play an active role in the assessment process. 444*
*Through both words and deeds, communicate that promoting learning and mastery—*not *passing judgment—is the ultimate goal. 444*
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When determining overall scores, don't compare students to one another unless there is a compelling reason to do so. 473
Accompany any test scores with specific, constructive feedback. 474
Make allowances for risk taking and the occasional "bad day." 475
Respect students' right to privacy. 476

10.5 Summarizing Students' Achievement with Grades and Portfolios 477
Base final grades largely on final achievement levels and hard data. 477
Use many assessments to determine final grades, but don't count everything. 477
Share grading criteria with students, and keep students continually apprised of their progress. 477
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Teach to the test if—but only if—it reflects important instructional goals. 486
When preparing students for an upcoming standardized test, tell them what the test will be like and teach them good test-taking skills. 486

When administering the test, follow the directions closely and report any unusual circumstances. 487

Make appropriate accommodations for English learners. 487

When interpreting test results, take students' ages and developmental levels into account. 488

If tests are being used to measure teacher or school effectiveness, advocate for a focus on students' improvement over time rather than on age-group averages. 488

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Essentials of Educational Psychology

Big Ideas to Guide Effective Teaching

Chapter 1

Introduction to Educational Psychology

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Big Ideas to Master in this Chapter

1.1 Effective teachers continually work to enhance their professional knowledge and skills.

1.2 Effective teachers use research findings and research-based theories to make decisions about instructional strategies, classroom management, and assessment practices.

1.3 Students read, study, and learn more efficiently when they plan appropriately and use effective strategies.

Case Study: The "No D" Policy

Anne Smith is a ninth-grade English teacher with 10 years of teaching experience, and by all accounts she's an excellent teacher. Even so, in previous years many of her students haven't invested much time or energy into their writing assignments and seemingly haven't been bothered by the low grades they've earned in her classes. In an effort to engage this year's students more fully in their schoolwork, Ms. Smith begins the school year by initiating two new policies.

- First, to pass her course, students must earn at least a C. She won't give anyone a final grade of D because she knows that everyone can earn a high grade if they put forth effort.
- Second, students will have multiple opportunities to revise and resubmit assignments. She'll give whatever feedback students need on the assignments to help them improve their work. And if needed, she'll even give them one-on-one instruction to help them.

She solicits students' questions and concerns about the new policies, gains their agreement to "try something new," and engages them in a discussion of specific, concrete characteristics of A-quality, B-quality, and C-quality work.

As the school year progresses, she regularly administers brief surveys to get students' feedback about her innovations, asking such questions as "How is the 'no D' policy working for you?" "Do you think your grade is an accurate reflection of your learning?" and "Any suggestions?" Students' responses on the surveys are overwhelmingly positive. Students mention noticeable improvements in the quality of their writing and increasingly report that they believe themselves to be in control of both their learning and their grades. Furthermore, they begin to see their teacher in a new light, "as one who will help them achieve their best work, not as one who just gives out grades . . . as a coach encouraging them along the long race of learning." Final course grades also confirm the value of the new policies: A much higher percentage of students earn grades of C or better than has been true in past years.[1]

Please answer these two questions before you read further:

1. What strategies does Ms. Smith use to develop her students' writing skills?
2. How might Ms. Smith's policies and behaviors motivate her students?

Effective teachers don't simply transmit new information and skills to students, they also help students *master* the information and skills. Ms. Smith develops her students' writing skills by giving them feedback and individualizing instruction when needed to help them improve their skills. By allowing students to revise and resubmit assignments, Ms. Smith gives all students the chance to improve and demonstrates her commitment to helping them learn and develop their writing abilities.

Effective teachers also motivate students to engage in learning activities. Ms. Smith's policies and behaviors likely motivate her students in many ways. Ms. Smith's first policy sets high expectations and demonstrates her belief that all students can succeed with effort, which is supported by the second policy: students can revise and resubmit assignments multiple times. These policies can motivate students, especially those who might not have been as engaged otherwise because they perceived themselves to be poor writers. Students' successes, even minor ones, can motivate them to continue to succeed and improve their writing. In addition, by surveying students and listening to their feedback, Ms. Smith demonstrates that she respects and cares about students' opinions and their development as writers. If students trust Ms. Smith and feel a connection with her, they're more likely to listen to her and be motivated to participate in class activities.

Ms. Smith's case study is an example of how teachers' decisions to implement classroom strategies and policies can affect what students know, think, do, and feel. However,

[1] Based on a description in A. K. Smith, 2009.

Chapter Outline

Case Study: The "No D" Policy

1.1 Developing Expertise as a Teacher

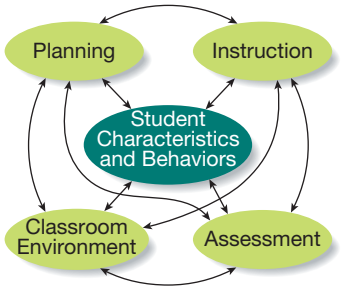
1.2 Using Research Findings to Make Instructional Decisions

1.3 Strategies for Learning and Studying Effectively

Summary

Case Study Practice Exercises: New Instructional App

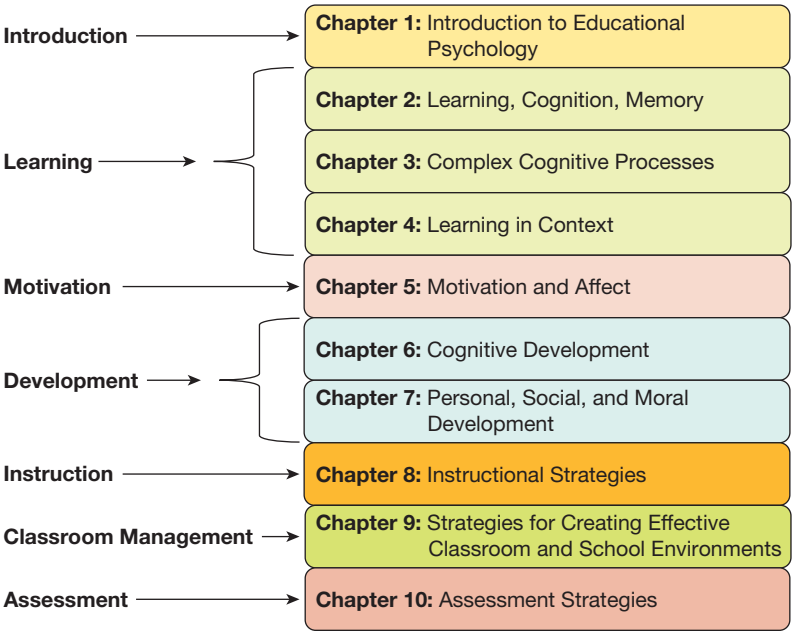
Figure 1.1 A learner-centered model of instruction.



students' characteristics and behaviors must also influence the decisions teachers make, such as decisions about what topics and skills to teach (*planning*), how to teach those topics and skills (*instruction*), how to keep students on task and supportive of one another's learning efforts (creating an effective *classroom environment*), and how best to determine what students have learned (*assessment*). The relationships among these factors is depicted in Figure 1.1. Notice how *student characteristics and behaviors* are at the center of the figure because these must drive almost everything that teachers do in the classroom. Such an approach to teaching is sometimes known as **learner-centered instruction**.[2]

The purpose of this text is to help you understand children and adolescents: how they learn and develop, how they're likely to be similar to but also different from one another, what activities and assignments are apt to engage them in the classroom, and so on. It will also give you a toolbox of strategies for planning and implementing instruction, creating an environment that keeps students motivated and on task, and assessing students' progress and achievement. These topics are within the field of **educational psychology**, which is an academic discipline that (1) systematically studies the nature of human learning, development, motivation, and related topics and (2) applies its research findings to the identification and development of effective instructional practices, including classroom management and assessment. These topics are presented in this text in the order shown in Figure 1.2. These topics don't always fit neatly into just one chapter; they often overlap and are related to one another. For example, classroom management strategies are built upon theories of learning, development, and motivation. Throughout the text, we've tried to make connections between topics to help you understand the interrelationships among concepts as you further your knowledge of this fascinating field.

Figure 1.2 Chapter(s) in which each educational psychology topic appears most frequently.



[2] For good general discussions of learner-centered instructional practices, see McCombs, 2005; National Research Council, 2000. You may also want to look at the American Psychological Association's 14 *Learner-Centered Psychological Principles* (www.apa.org/ed/governance/bea/learner-centered.pdf).

Whether you're preparing to become a teacher or you already have teaching experience, the topics in this text help you on your road to becoming a more skillful teacher.[3] We begin the next section by examining some of the ways in which teachers can develop their professional expertise and the important role that educational psychology plays in developing that expertise. Then, we explain the role of research and the scientific study of psychological principles applied to education because effective teachers use research findings to help them make decisions about their instruction. We conclude this chapter by presenting research-based strategies that you can use to study most effectively. Students in our undergraduate and graduate courses have told us that these strategies are very useful in learning the concepts in this text and in other courses or educational settings. You can also teach these study strategies to *your* students to help them become better at studying and learning.

1.1 Developing Expertise as a Teacher

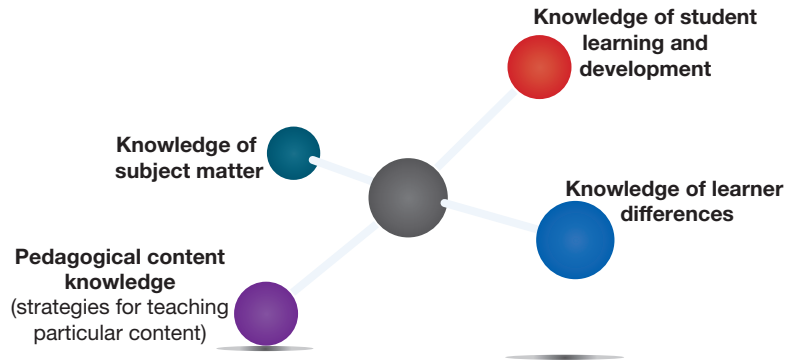
Big Idea 1.1 **Effective teachers continually work to enhance their professional knowledge and skills.**

You will become a better teacher by learning to apply the concepts in this text; however, true expertise in teaching takes many years to acquire.[4] In this section, we offer several strategies that you can use over time to develop your knowledge and skills as a teacher—all of them based on research on teacher effectiveness.

Learn as much as you can about the subject matter you teach, about teaching strategies, and about learners and their development.

Effective teachers typically know their subject matter extremely well and can usually anticipate and address the difficulties students will have and the kinds of errors students will make in the process of mastering a certain skill or body of knowledge.[5] Effective teachers also know a variety of teaching strategies, including strategies for teaching particular topics and skills, strategies collectively known as **pedagogical content knowledge**.[6] In addition, effective teachers have knowledge of how their students learn and develop in social contexts and how students can differ individually and culturally (see Figure 1.3).[7]

Figure 1.3 Effective teachers draw on many types of knowledge when making decisions in the classroom.



[3] Bransford et al., 2005; Brouwer & Korthagen, 2005.
[4] Alexander, 2003; Berliner, 2001.
[5] Borko & Putnam, 1996; Cochran & Jones, 1998; H. C. Hill et al., 2008; D. C. Smith & Neale, 1991; Windschitl, 2002.
[6] Baumert et al., 2010; Cochran & Jones, 1998; Krauss et al., 2008; Shulman, 1986.
[7] Bransford et al., 2005; Council of Chief State School Officers, 2013; Russ et al., 2016.

Much of this knowledge—especially knowledge of learning, development, and learner differences—is included in this text because it's within the field of educational psychology.

To meet the needs of *all* their students, teachers must be prepared to teach students with unique educational needs, including students with disabilities. **Students with disabilities** are different enough from their peers that they may require modifications to their learning goals (e.g., alternative texts or assignments) or accommodations that allow them to access class content (e.g., Braille, recorded texts, assistive technologies). Many of these students are included in general education classrooms, a practice called **inclusion**. At several points in the text we consider students with particular kinds of needs and identify strategies that may be especially useful in working with them.

Believe that you can make a difference in students' lives.

In Chapter 5 you'll discover the importance of having high **self-efficacy**—believing that you're capable of executing certain behaviors or reaching certain goals. Students are more likely to try to learn something if they believe they *can* learn it; in other words, if they have high self-efficacy. But teachers, too, must have high self-efficacy about what they can accomplish. Students who achieve at high levels are apt to be those whose teachers have confidence in what they, *as teachers*, can do—both individually and collectively—for their students.[8] Ultimately, what teachers do in the classroom *matters* for students, not only in the short term but for years to come.[9]

Continually reflect on and critically examine your assumptions, inferences, and teaching practices.

In the opening case study, Anne Smith reflects on her students' performance in previous years and then institutes new assessment policies that might be more motivating and productive. Like Ms. Smith, effective teachers engage in **reflective teaching**: They continually examine and critique their assumptions, inferences, and instructional practices, and they regularly adjust their beliefs and strategies in light of new evidence.[10]

Communicate and collaborate with colleagues.

Good teachers rarely work in isolation. Instead, they frequently communicate with colleagues in their own school district and across the nation—perhaps with colleagues in other countries as well—through face-to-face meetings, e-mail, regional or national conferences, and professional websites (e.g., www.oercommons.org). Ideally, teachers and administrators at a single school create a **professional learning community**, in which they share a common vision for students' learning and achievement, work collaboratively to achieve desired outcomes for all students, and regularly communicate with one another about their strategies and progress.[11] Most experienced teachers are happy to offer beginning teachers advice and support during challenging times. In fact, they're apt to be flattered to be asked!

Learn as much as you can about the culture(s) of the community in which you are working.

Throughout the text, you'll see numerous ways in which children from diverse cultural groups may think and behave differently from one another. But a textbook can offer only a sampling of the many cultural differences you might encounter. You can

[8] Holzberger et al., 2013; J. A. Langer, 2000; Skaalvik & Skaalvik, 2008.
[9] Hattie, 2009; Konstantopoulos & Chung, 2011.
[10] Hammerness et al., 2005; T. Hogan et al., 2003; Larrivee, 2006.
[11] DuFour et al., 2008; P. Graham & Ferriter, 2009; Raudenbush, 2009.

become more informed about students' cultural beliefs and practices if you participate in local community activities and converse frequently with parents and other community members.[12]

Keep up to date on research findings and innovative evidence-based practices in education.

Occasional university coursework and in-service training sessions are good ways to enhance teaching effectiveness.[13] Also, effective teachers typically subscribe to one or more professional journals and, as time allows, they attend professional conferences in their region. Many websites provide teachers with information and ideas about effective classroom practices, including the websites of professional organizations such as the National Council of Teachers of Mathematics (www.nctm.org), the National Council for the Social Studies (www.socialstudies.org), the National Association for Music Education (www.nafme.org), the National Science Teachers Association (www.nsta.org), and the International Literacy Association (www.literacyworldwide.org).

Integrate action research into your ongoing classroom practices.

Like Anne Smith in the opening case study, practicing teachers sometimes have questions that existing research findings don't fully answer. In **action research**, teachers conduct systematic studies of issues and problems in their own schools, with the goal of seeking more effective strategies for working with students.[14] For example, an action research project might involve examining the effectiveness of a new teaching technique, seeking students' opinions on a new classroom policy (as Ms. Smith does), or ascertaining reasons why many students rarely complete homework assignments.

Action research studies typically involve the following steps:[15]

1. *Identify an area of focus.* The teacher-researcher begins with a problem and gathers preliminary information that might shed light on the problem, perhaps by reading relevant books or journal articles, searching the Internet, or discussing the issue with colleagues or students. The teacher-researcher then identifies one or more specific questions to address and develops a research plan for answering those questions (data-collection techniques, necessary resources, schedule, etc.). At this point, the teacher also seeks permission to conduct the study from school administrators and any other appropriate authorities. Depending on the nature of the study, parents' permission may be necessary.
2. *Collect data.* The teacher-researcher collects data relevant to the research questions. Such data might, for example, be obtained from questionnaires, interviews, achievement tests, students' journals or portfolios, existing school records (e.g., attendance patterns, school suspension rates), observations, or any combination of these.
3. *Analyze and interpret the data.* The teacher-researcher looks for patterns in the data. Sometimes the analysis involves computing numerical statistics (e.g., frequencies, percentages, averages, correlation coefficients). At other times, the analysis involves an in-depth inspection of the data without numbers, such as reading students' responses to identify themes and to interpret the meaning of the responses. Or, it could be a combination that includes both statistical analyses and qualitative interpretations of the meaning of the data. The teacher-researcher then relates the findings to the original research questions.

[12] Castagno & Brayboy, 2008; McIntyre, 2010; Rogoff, 2003.
[13] Desimone, 2009; Guskey & Sparks, 2002; Hamre et al., 2012; Hattie, 2009.
[14] Mertler, 2019.
[15] Steps based on those recommended by Mills, 2014.

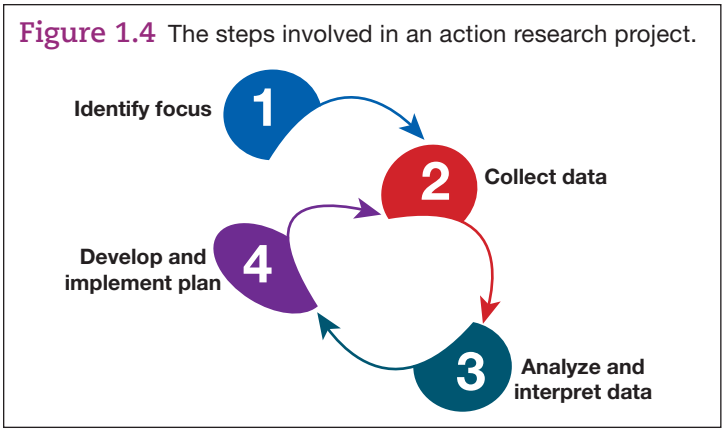


Figure 1.4 The steps involved in an action research project.

4. *Develop and implement an action plan.* The teacher-researcher uses the information collected to *take action*; for instance, to change instructional strategies, school policies, or the classroom environment.

After the final step, a teacher-researcher may have all the information needed to work more effectively with students. Or, it may be necessary to go through the process again by collecting more data, analyzing and interpreting the data, and developing and implementing another action plan. This cyclical process is shown in Figure 1.4 and could continue over and over.

1.2 Using Research Findings to Make Instructional Decisions

Big Idea 1.2 **Effective teachers use research findings and research-based theories to make decisions about instructional strategies, classroom management, and assessment practices.**

Teachers make instructional decisions based on their prior experiences, advice from others, knowledge and skills they learned in their formal schooling, and so on. Although many of these sources of information are potentially useful to teachers' instructional decisions, effective teachers rely on research findings and research-based theories to inform their practices. In the principles that follow, we explain why teachers need to understand research, we examine the different types of research conducted by educational psychologists, and we describe how this research can be synthesized and organized into principles and theories that can be helpful to teachers.

The effectiveness of various classroom practices can best be determined through systematic research.

You have been a student for many years now, and you've undoubtedly learned a great deal about how individuals learn and develop and about how teachers can foster their learning and development. But exactly how much *do* you know? To help you find out, please complete the following short pretest that was developed by one of us authors.

See For Yourself

Ormrod's Own Psychological Survey (OOPS)

True/False

Decide whether each of the following statements is *true* or *false*.

_____ 1. Some children are predominantly left-brain thinkers, whereas others are predominantly right-brain thinkers.
_____ 2. Students are good judges of how much they know about a topic.
_____ 3. Anxiety sometimes helps students learn and perform more successfully in the classroom.
_____ 4. Playing video games can enhance children's cognitive development.
_____ 5. The ways in which teachers assess students' learning influence what and how students actually learn.

Now let's see how well you did on the OOPS. The answers, along with an explanation for each one, are as follows:

1. **Some children are predominantly left-brain thinkers, whereas others are predominantly right-brain thinkers.** False—With the development of new medical technologies in recent years, researchers have learned a great deal about how the human brain works and which parts of it specialize in which aspects of human thinking. As you'll discover in Chapter 2, the two halves, or *hemispheres*, of the brain do have somewhat different specialties, but they continually communicate and collaborate in tackling even the simplest of daily tasks. Thinking and learning about almost anything is distributed across many parts of the brain. Therefore, practically speaking, there's no such thing as left-brain or right-brain thinking.[16]
2. **Students are good judges of how much they know about a topic.** False—Contrary to popular opinion, students are usually *not* the best judges of what they do and don't know. For example, many students think that if they've spent a long time studying a textbook chapter, they must know its contents very well. Yet if they've spent most of their study time inefficiently—perhaps by "reading" while thinking about something else altogether or by mindlessly copying definitions—they may know far less than they think they do. We consider this *illusion of learning* further in Chapter 3.[17]
3. **Anxiety sometimes helps students learn and perform more successfully in the classroom.** True—Many people think that anxiety is always a bad thing. But actually, a little bit of anxiety can *improve* learning and performance, especially when students perceive a task to be something they can accomplish with reasonable effort.[18] For instance, a small, manageable amount of anxiety can spur students to complete their work carefully and to study for tests. We explore the effects of anxiety and other emotions in Chapter 5.
4. **Playing video games can enhance children's cognitive development.** Sometimes True—A great deal of time spent playing video games *instead of* reading, doing homework, and engaging in other school-related activities can definitely interfere with children's long-term academic success. But some video games can be powerful tools for promoting important cognitive abilities, such as spatial abilities and the flexible use of attention.[19] And educational technologists have increasingly been designing highly motivating video games that simulate real-world problems and foster complex problem-solving skills.[20] In upcoming chapters (especially Chapter 4 and Chapter 8), we examine many ways in which computer technologies can support students' learning and cognitive development.
5. **The ways in which teachers assess students' learning influence what and how students actually learn.** True—What and how students learn depend, in part, on how they expect their learning to be assessed.[21] For example, in the opening case study, Anne Smith's "No D" and multiple-submission policies encourage students to seek feedback about their work, benefit from their mistakes, and enhance their writing skills. In Chapter 10 we look more closely at the potential effects of classroom assessment practices on students' learning.

[16] Gonsalves & Cohen, 2010; Schlegel et al., 2016.
[17] Carpenter et al., 2020; Dunlosky & Lipko, 2007; Stone, 2000.
[18] Preckel et al., 2006; Strack & Esteves, 2015; Travis et al., 2020.
[19] Green, 2014; Parong et al., 2017, 2020; Rothbart, 2011; Tobias & Fletcher, 2011.
[20] Blumberg, 2014; Squire, 2011.
[21] Carpenter, 2012; Frederiksen, 1984; Haertel, 2013.

How many of the OOPS items did you answer correctly? Did any of the items contradict certain beliefs you had? If so, you're hardly alone. College students often agree with statements that seem obvious but are, in fact, partially or completely incorrect.[22] Furthermore, many students in teacher education classes reject research findings when those findings appear to contradict their personal beliefs and experiences.[23]

It's easy to be persuaded by "common sense" and assume that what seems logical must be true. Yet common sense and logic don't always align with how people actually learn and develop, nor do they always give us appropriate guidance about how best to help students succeed in the classroom. Educational psychologists believe that knowledge about teaching and learning should come from a more objective source of information, such as from systematic research. Increasingly, educators and policymakers alike are calling for **evidence-based practices**—the use of instructional methods and other classroom strategies that research has consistently shown to bring about significant gains in students' development and academic achievement.[24]

Educational psychologists focus on the scientific study of psychological principles that are relevant to education.

Ideas related to educational psychology have been around for centuries, as philosophers such as Socrates, Plato, and Aristotle (and more recently, Aquinas, Descartes, Locke, and others) wrote about concepts such as knowledge, beliefs, development, self, motivation, and memory. Yet, educational psychology didn't formally emerge as a field until later, perhaps around 1892 at the first meeting of the American Psychological Association (APA) and 1910 when the first issue of the *Journal of Educational Psychology* was published.[25] These events occurred about the same time that *psychology* (the study of the mind and behavior) was emerging as a scientific discipline separate from philosophy. Near the end of the 19th century, researchers such as Wilhelm Wundt, Hermann Ebbinghaus, and William James were among the first to conduct *experimental* research studies related to psychology. The use of scientific methods in psychology opened the doors for researchers to scientifically study topics related to teaching and learning.

At the dawn of this new field of educational psychology, William James, G. Stanley Hall, and John Dewey led the way as they believed that educational psychology should be a central force in developing a science of teaching.[26] Over the next few decades (into the middle of the 20th century), Edward Thorndike was a leader in laying the foundation for educational psychology. Thorndike believed that teachers would be more successful if they learned to apply psychology to teaching, similar to how farmers who know how to apply botany and chemistry to farming are more successful than those who do not.[27] Since then, researchers have confirmed Thorndike's belief and found that teachers are more successful if they have knowledge about student learning and development (along with the other knowledge and skills shown previously in Figure 1.3).[28]

As you progress through this text, you'll learn the names of many researchers and theories that have influenced the field of educational psychology since those early days. Although educational psychologists now use a wide variety of research methodologies and explore a broad range of topics (remember Figure 1.2), a consistent theme across the years has been an emphasis on the use of rigorous scientific methods to study the

[22] Gage, 1991; L. S. Goldstein & Lake, 2000; Woolfolk Hoy et al., 2006.
[23] Gregoire, 2003; Holt-Reynolds, 1992; T. M. McDevitt & Ormrod, 2008; Patrick & Pintrich, 2001.
[24] Cook et al., 2012. For example, see Darling-Hammond & Bransford, 2005; Waterhouse, 2006.
[25] Alexander et al., 2012; Berliner, 2006.
[26] Berliner, 2006.
[27] Thorndike, 1906.
[28] Ball & Forzani, 2010.

experiences of students, teachers, and others involved in educational activities.[29] Given the broad scope of educational psychology, the types of questions educational psychologists answer are also quite varied. Here are some example questions from each of the chapters in this book:

- Chapter 1: What strategies can students use to study more effectively?
- Chapter 2: How can teachers help students remember facts and concepts?
- Chapter 3: How can students become better problem solvers?
- Chapter 4: What strategies can teachers use to change students' misbehaviors?
- Chapter 5: How do teachers' beliefs affect student motivation?
- Chapter 6: How does children's thinking change as they get older?
- Chapter 7: What factors affect students' identity and sense of self?
- Chapter 8: What types of questions can teachers ask students to foster their thinking and learning?
- Chapter 9: How can teachers most effectively implement cooperative learning activities?
- Chapter 10: What are the characteristics of a valid test?

think about it
Based on what you've read so far in the text, how would you explain the discipline of "educational psychology" to one of your friends who is unfamiliar with it?

The science of educational psychology can provide teachers with guiding principles that can be used to answer all of these types of questions. Yet ultimately, it's up to teachers to decide how they can best apply the principles to meet the needs of their students and achieve their instructional objectives.

Topics in educational psychology are also studied by researchers in closely related disciplines, such as education, instructional design and technology, learning science, cognitive science, and other overlapping areas of psychology (e.g., behavioral, cognitive, developmental, social, and school psychology). In addition, neurologists, cognitive psychologists, and researchers from other disciplines are working together to discover how the brain influences people's behavior and learning and, conversely, how people's behavior and learning experiences can influence brain development. This rapidly expanding field, known as *cognitive neuroscience*, is making many noteworthy contributions to our understanding of human learning. As Figure 1.5 shows, educational psychology informs and is informed by many different disciplines.

One way that researchers contribute to the field of educational psychology is to publish their research findings in academic journals and books. Many educational psychologists also belong to regional, national, and international organizations to share their research and discuss ideas with others (see Figure 1.6 for examples). We synthesized much of this research as we developed the Big Ideas presented in this text.

Figure 1.5 Educational psychology informs and is informed by other disciplines.

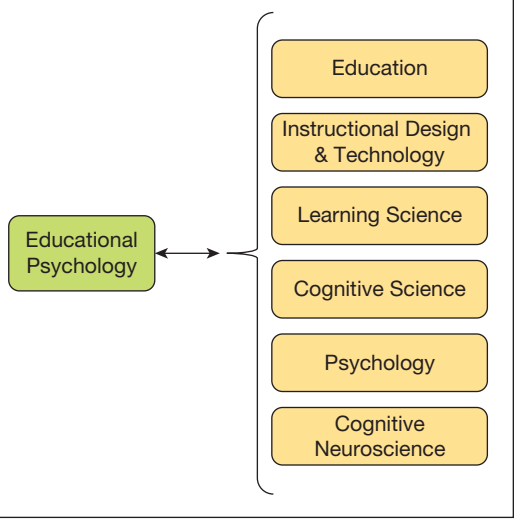


Figure 1.6 Examples of organizations that represent educational psychology.

Organizations	Website URL
American Educational Research Association (AERA)	http://aera.net/
American Psychological Association (APA)	http://www.apa.org/
Association for Psychological Science (APS)	http://www.psychologicalscience.org/
International Society of the Learning Sciences (ISLS)	https://www.isls.org/

[29] Harris et al., 2012; Reynolds & Miller, 2013.

When educational psychologists write about and present their research, they identify the particular research articles, books, conference presentations, and other sources on which they base their claims. Most educational psychology publications and conferences require authors to follow **APA style**, guidelines prescribed by the American Psychological Association for identifying sources and preparing references.[30] In APA style, a source is cited by presenting the author(s) and date of publication in the body of the text. For example, in APA style, the sources for the following sentence (from a prior paragraph) would be included at the end of the sentence: But actually, a little bit of anxiety can *improve* learning and performance, especially when students perceive a task to be something they can accomplish with reasonable effort (Preckel et al., 2006; Strack & Esteves, 2015; Travis et al., 2020). In this text, we've intentionally deviated from APA style by presenting the references in footnotes. We hope this style will help you focus on the *ideas* in the text instead of on the names and dates provided in the references. But when you find some of the ideas especially interesting, exciting, or surprising, we urge you to read the footnoted sources firsthand by finding the detailed citations in the book's References list.

Research can provide quantitative information, qualitative information, or both.

Many research studies involve **quantitative research**—research yielding data that is inherently numerical in nature or can easily be reduced to numbers, such as percentages, frequencies, or averages related to certain characteristics or phenomena. For example, a quantitative study might provide information about students' scores on achievement tests (e.g., 72 points out of 100 points), students' ratings on questionnaire items (e.g., a 4 on a rating scale ranging from 1 to 6), or school district records of students' attendance (e.g., 6 absences) and dropout rates (e.g., 23% of students drop out).

Other studies involve **qualitative research**—research yielding nonnumeric data (e.g., verbal reports, written documents, pictures) typically involving an in-depth examination of a complex phenomenon. For example, a qualitative study might involve lengthy interviews in which students describe their hopes for the future, a detailed case study of interpersonal relationships within a tight-knit clique of adolescent girls, or in-depth observations of several teachers who use different teaching strategies.

In many cases, educators can gain a better understanding of students and effective classroom practices when they consider findings from *both* quantitative and qualitative research. Research that includes both quantitative and qualitative elements is called **mixed methods research**.[31] For example, in the research project described in the opening case study, Anne Smith uses quantitative data to tabulate students' responses to various survey questions and to compute the percentages of various final class grades. But she also uses qualitative data when she looks closely at students' specific comments on the survey questions.

Different kinds of research lead to different kinds of conclusions.

In addition to yielding either quantitative or qualitative data (or both), research studies typically fall into one of four general categories: descriptive, correlational, experimental, or quasi-experimental. These various kinds of studies enable different kinds of conclusions and are appropriate for different types of research questions (see Table 1.1).

A **descriptive study** does exactly what its name implies: It *describes* a situation. Descriptive studies might provide information about the characteristics of students, teachers, or schools (e.g., 38% of the students at Northern High School are African American).

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[30] For more information on APA style, see its *Publication Manual* (APA, 2020) or visit www.apastyle.org.
[31] Creswell, 2014.

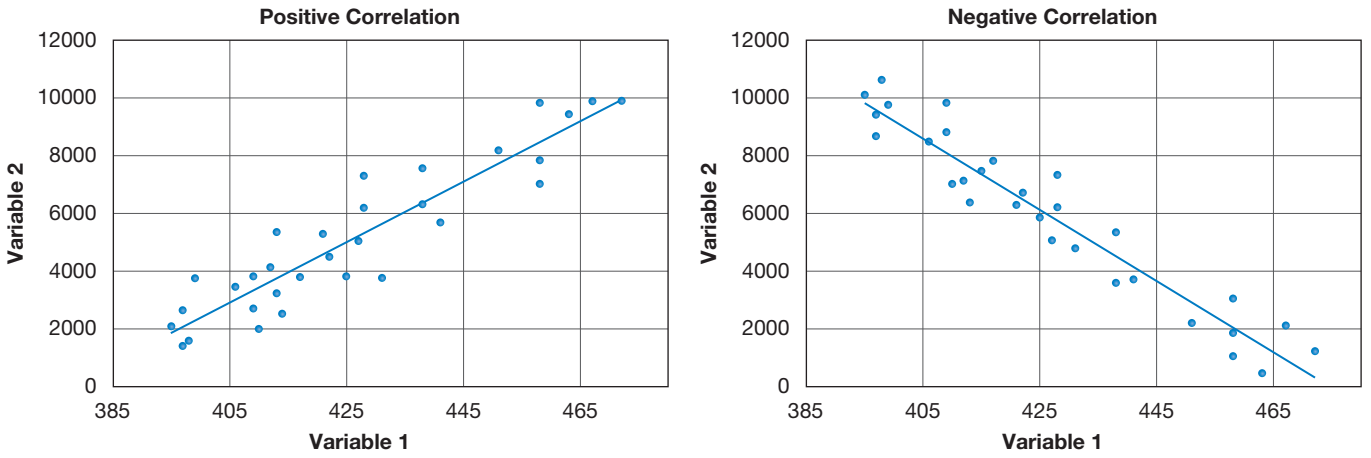
Table 1.1 Contrasting Various Types of Research

	QUALITATIVE RESEARCH	QUANTITATIVE RESEARCH		
	Descriptive Studies	Descriptive Studies	Correlational Studies	Experimental and Quasi-Experimental Studies
General Nature and Purposes	• Portray the complex, multifaceted nature of human behavior, especially in real-world social settings	• Capture the current state of affairs regarding a real-world issue or problem	• Identify associations among characteristics, behaviors, and/or environmental conditions • Enable predictions about one variable, given knowledge of the degree or quantity of another variable • Provide an alternative when experimental manipulations are unethical or impossible	• Manipulate one (independent) variable in order to observe its possible effect on another (dependent) variable • Eliminate other plausible explanations for observed outcomes (especially in carefully controlled experimental studies) • Enable conclusions about cause-and-effect relationships
Limitations	• Don't enable predictions about one variable based on another variable • Don't enable conclusions about cause-and-effect relationships	• Don't enable predictions about one variable based on another variable • Don't enable conclusions about cause-and-effect relationships	• Enable only imprecise predictions, with possible exceptions to the general relationships observed • Don't enable conclusions about cause-and-effect relationships	• May not completely eliminate alternative explanations for observed outcomes (especially true for quasi-experimental studies) • In some cases, involve artificial laboratory conditions that don't resemble real-life learning environments
Examples of Questions That Might Be Addressed	• What things do high-achieving students say they do "in their heads" when they read and study their textbooks? • What distinct qualities characterize high schools in which members of various adolescent gangs interact congenially and respectfully? • In what ways do teachers' instructional practices change when their jobs and salaries depend on their students' scores on statewide or national achievement tests?	• How pervasive are gender stereotypes in popular children's literature? • What kinds of aggressive behaviors occur in schools, and with what frequencies? • How well have students performed on a recent national achievement test?	• Are better readers also better spellers? • Are students more likely to be aggressive at school if they often see violence at home or in their neighborhoods? • To what extent are students' class grades related to their scores on achievement tests?	• Which of two reading programs produces greater gains in reading comprehension? • Which method is most effective in reducing aggressive behavior—reinforcing appropriate behavior, punishing aggressive behavior, or a combination of both? • Do different kinds of tests (e.g., multiple-choice vs. essay tests) encourage students to study in different ways?

They might also provide information about how frequently certain events or behaviors occur (e.g., students at Southern Elementary School were absent an average of 5 days of school last year). Descriptive studies allow us to draw conclusions about the way things are—the current state of affairs—based on data that has been collected. Virtually all qualitative studies are primarily descriptive in nature, and some quantitative studies fall into the descriptive category.

A **correlational study** explores possible relationships among two or more variables. A **variable** is something that can vary over time, across contexts, or among individuals. For instance, *interest in playing basketball* is a variable that can vary over time (e.g., Alejandra was interested in playing basketball when she was a child, but she has very little interest in playing now that she is an adult), across contexts (e.g., Zhang is interested in playing basketball with his friends, but not with his younger brothers), or among individuals (e.g., Jennifer is very interested in playing basketball, but Gitanjali is only slightly interested in playing basketball). In general, correlational studies enable researchers to draw conclusions about **correlation**—the extent to which two variables are associated somewhat

Figure 1.7 An example of a positive correlation (as Variable 1 increases, Variable 2 increases) and a negative correlation (as Variable 1 increases, Variable 2 decreases).



predictably. Two variables are *positively* correlated when one variable increases as the other *increases*, and variables are *negatively* correlated when one variable increases as the other *decreases* (see Figure 1.7). The bottom row of the fourth column in Table 1.1 presents three examples of possible correlational relationships: those between (1) reading and spelling ability, (2) aggressive behavior at school and violence at home, and (3) class grades and achievement test scores. Correlations are often described numerically with statistics known as *correlation coefficients*, described in Appendix A.

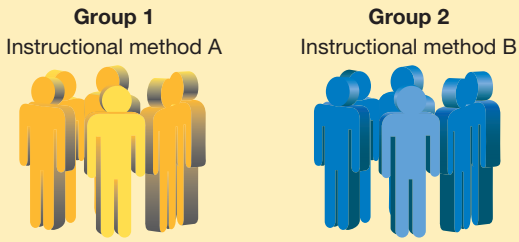
If a correlation exists between two variables, knowing the status of one variable allows us to make predictions about the other variable. For example, if we find a positive correlation between reading ability and spelling ability, we can predict that, on average, students who are proficient readers will also be good spellers. Our predictions will be imprecise at best, with exceptions to the general rule. For instance, we may occasionally see very good readers who are poor spellers. A more significant limitation of correlational studies is that although they may demonstrate that a relationship exists, they never tell us for certain *why* it exists. They don't identify which specific variables (e.g., previous experiences, personality, motivation) are the cause of the relationship. In other words, *correlation does not necessarily indicate causation*.

Descriptive and correlational studies describe things as they exist naturally in the environment. In contrast, an **experimental study**, or **experiment**, is a study in which the researcher somehow changes, or manipulates, one or more aspects of the environment (called *independent variables*) and then measures the effects of such changes on something else (called the *dependent variable*). In educational research the dependent variable is often some aspect of student behavior, such as end-of-year grades, skill in executing a complex physical movement, persistence in tackling difficult math problems, or ability to interact appropriately with peers.[32] A key feature of an experiment is that the researcher separates and controls variables, testing the possible effects of one variable while keeping constant all other potentially influential variables. When carefully designed and conducted, experimental studies enable researchers to draw conclusions about causation—about what variables cause or influence other variables.

[32] You might think of the distinction this way: Student behavior (the dependent variable) *depends* on instructional practice or some other aspect of the environment (the independent variable).

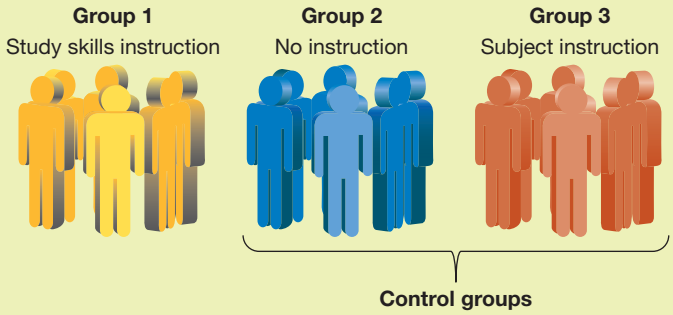
Often experimental studies involve two or more groups that are treated differently. Consider these examples:

- A researcher uses one instructional method to teach reading comprehension skills to one group of students and uses another instructional method to teach reading comprehension skills to a similar group of students. In this case, the instructional method is the independent variable. The researcher then assesses students' reading ability (the dependent variable) and compares the average reading-ability scores of the two groups.



- A researcher gives three similar groups of students varying amounts of practice with woodworking skills. Here, the amount of practice is the independent variable. The researcher subsequently scores the quality of each student's woodworking project (the dependent variable) and compares the average scores of the three groups.

- A researcher gives one group of students an intensive instructional program designed to improve their study skills. The researcher gives another group of students no instruction and gives a third group instruction in subject matter unrelated to study skills. The presence or absence of instruction in study skills is the independent variable (the second and third groups did not receive instruction in study skills). The researcher examines two dependent variables to determine whether the program had an effect on (1) the quality of students' study skills and (2) students' grade point averages.



Each of these examples includes **treatment groups** that receive a particular intervention. The third example also includes two **control groups**: one that receives no intervention and another that receives a *placebo* intervention that's unlikely to affect the dependent variable(s) in question. In many experimental studies, participants are assigned to groups *randomly*—for instance, by drawing names out of a hat or using a computer software program or app to randomly select participants for different groups. Such random assignment is apt to yield groups that are, on average, roughly equivalent on other variables (preexisting ability levels, personality characteristics, motivation, etc.) that might affect the dependent variable.

Random assignment to groups isn't always possible or practical, however, especially in research studies conducted in actual schools and classrooms. For example, when studying the potential benefits of a new teaching technique or therapeutic intervention, a researcher may not be able to completely control which students receive the experimental treatment and which do not, or a particular treatment or intervention may have important benefits for *all* students. In such situations, researchers often conduct a **quasi-experimental study**, in which they consider, but don't completely control, other influential variables. The following are examples:

- A researcher implements a new after-school homework program at one high school and identifies a comparable high school without such a program to serve as a control group. The researcher obtains achievement test scores for students at both schools both before and after the program's implementation. Ideally, to document the

homework program's effectiveness, the average test scores for the two high schools should be the same *before* the program begins. Then, if differences exist on students' achievement test scores (the dependent variables) at the end of the program, they may be attributed to the new homework program.

- A team of researchers wants to study the effects of safety instructions on children's behaviors on the playground. The researchers present the instructional intervention to first-graders the first week, second-graders the following week, and kindergartners and third-graders the week after that. The researchers monitor students' playground behavior before, during, and after the intervention to determine whether each grade-level group's risky playground behavior decreases immediately following the intervention.[33]

When researchers conduct such quasi-experimental studies, they don't control for all potentially influential variables and therefore can't completely rule out alternative explanations for the results they obtain. For instance, in the after-school homework example, it's possible that the school that implemented the new homework program had simultaneously begun to use more effective instructional methods during the school day and those methods are the reason for any increase in achievement scores. And in the playground safety example, perhaps certain other things coincidentally happened at the four grade levels during their respective safety-instructions weeks, and those things were the true causes of children's behavior improvements.

When carefully designed and conducted, experimental studies and, to a lesser degree, quasi-experimental studies enable us to draw conclusions about *causation*—about *why* behaviors occur. Yet for practical or ethical reasons, many important questions in education don't easily lend themselves to experimental manipulation and tight control of other potentially influential variables. For example, although we might find a correlation between children's aggression levels at school and the amount of violence in their home environments, it would be highly unethical to conduct an experimental study in which some children are intentionally placed in a violent environment. Consequently, some important educational questions can be addressed only with descriptive or correlational studies, even though such studies don't let us pin down precise cause-and-effect relationships.

Drawing conclusions about cause-and-effect relationships requires that all other possible explanations for an outcome be eliminated.

Whenever we look at the results of a research study—regardless of who has conducted the study and regardless of whether it has been described in a professional journal or other credible media source—we mustn't be too hasty to draw conclusions about cause-and-effect relationships. As an example, imagine that Hometown School District wants to find out which of two new reading programs, *Reading Is Great* (RIG) or *Reading and You* (RAY), leads to better reading in third grade. The district asks each of its third-grade teachers to choose one of these two reading programs and use it throughout the school year. The district then compares the end-of-year achievement test scores of students in the RIG and RAY classrooms and finds that RIG students have gotten substantially higher reading comprehension scores than RAY students. We might quickly jump to the conclusion that RIG promotes better reading comprehension than RAY—in other words, that a cause-and-effect relationship exists between instructional method and reading comprehension. But is this really so?

Not necessarily. If we look at the study more closely, we realize that the school district hasn't eliminated all other possible explanations for the difference in students' reading comprehension scores. Remember, the third-grade teachers personally *chose* the

[33] Here we're describing a study conducted by Heck et al., 2001.

instructional program they used. Why did some teachers choose RIG and others choose RAY? Were these two groups of teachers different in some way? Had RIG teachers taken more advanced courses in reading instruction, were they more open-minded and enthusiastic about using innovative methods, or did they devote more class time to reading instruction? Or, did the RIG teachers have students who were, on average, better readers to begin with? If the RIG and RAY classes were different from each other in any of these ways—or perhaps different in some other way we haven't thought of—then the district hasn't eliminated alternative explanations for why the RIG students have outperformed the RAY students. A better way to study the causal influence of reading program on reading comprehension would be to *randomly assign* third-grade classes to the RIG and RAY programs, thereby making the two groups similar (on average) in terms of student abilities and teacher characteristics.

Be careful that you don't jump to conclusions too quickly about what variables are affecting students' learning, development, and behavior in particular situations. You should scrutinize research reports carefully, always with these questions in mind: *Have the researchers separated and controlled variables that might have an influence on the outcome? Have they ruled out other possible explanations for their results?* Only when the answers to both of these questions are undeniably yes should you draw a conclusion about a cause-and-effect relationship.

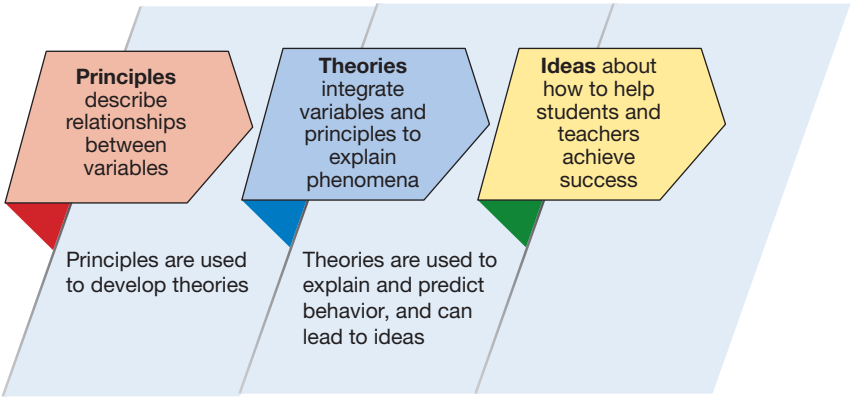
Principles and theories can help synthesize, explain, and apply research findings.

The large body of educational psychology research is more useful to teachers when it's organized into principles and theories. **Principles** describe the specific effects of certain variables on other variables or outcomes, such as those related to learning or development. Consider this research-based principle: Students are likely to learn more when they're interested in what they are learning. The influential or "potentially causal" variable in this principle is *interest*, which has an effect on students' *learning*. Teachers at any grade level and subject area can use this principle in a variety of ways. For example, when teaching about a particular war—say, about the American Civil War or the French Revolution—a social studies teacher could select readings with interesting storylines about specific historical figures to pique students' interest as a means to increase their learning.

Whereas principles tell us *what* variables are important, theories tell us *why* these variables are important. A **theory** is an integrated set of variables and principles developed to explain the underlying mechanisms of a phenomenon. Because human functioning is so complex, there is no one "mega-theory" in educational psychology to explain all of our thoughts, behaviors, and feelings. Instead, there are many smaller theories that explain various aspects of human functioning. For example, in Chapter 2 we discover that one prominent theory of how people learn—information processing theory—proposes that *attention* is an essential component of the learning process. If a learner doesn't pay attention, information rapidly disappears from memory. The importance of attention in information processing theory suggests that strategies that capture and maintain students' attention are apt to enhance students' learning. Therefore, information processing theory could explain *why* students are likely to learn and remember more when they're interested in what they're learning: they pay attention more closely to what they're supposed to be learning.

Sometimes people use the word *theory* to mean a guess, hunch, or an untested hypothesis. An example would be someone who says, "I have a theory about why he doesn't want to see her anymore." However, educational psychologists build theories over time based on evidence, not purely on speculation. Even so, theories continue to change as new research methods are devised, new research is conducted, and new research findings come to light. In contrast, principles tend to be fairly stable over time.

Figure 1.8 The big ideas in this text are based on theories derived from principles based on research.



Although current theories may undergo modifications in the future, they can still be quite useful even in their unfinished forms. They help us integrate thousands of research studies into concise understandings of how children typically learn and develop, and they enable us to make reasonable estimates about how students are likely to perform and achieve in particular classroom contexts. In general, then, theories can help us both explain and predict human behavior, and so they give us numerous ideas about how best to help students and teachers achieve success at school (see Figure 1.8). We have organized this text by grouping similar principles and theories together into *Big Ideas* to help you more easily understand the findings from many research studies.

1.3 Strategies for Learning and Studying Effectively

Big Idea 1.3 Students read, study, and learn more efficiently when they plan appropriately and use effective strategies.

This text includes many features intended to help you read about, study, and apply what researchers and experienced educators have learned about learning, development, motivation, and effective classroom practices. For example, each chapter begins with a few Big Ideas that capture the chapter's underlying themes. Each chapter also presents its major premises (guiding principles) and recommendations (key strategies) as boldfaced headings. In addition, the opening case studies and the figures, tables, exercises, concrete examples, margin questions, and application exercises interspersed throughout are all designed to enhance your understanding and memory of what you're reading.

Yet ultimately, how much you learn from the text is up to you. In upcoming chapters you'll learn a great deal about how people—including *you*—typically think about, learn, and remember new ideas. We're optimistic that you'll become a better student after reading the text, but in the meantime, here are some general strategies (based on educational psychology research) that you can use as you read and study.[34] We have organized these strategies into those that you can use before you study, while you study, and after you study.

[34] Ormrod, 2017.

Before you study, prepare for your study session.

When you're busy, it's tempting to rush into a study session without much planning. But you'll find that you can use your time more effectively if you plan your study sessions using these types of strategies:

- *Space your study sessions over time.* Plan ahead and spread out your study sessions over time. Students perform better on tests when their study sessions are spaced over time—a finding that's referred to as the **spacing effect** (or distributed practice effect).[35] This type of *spaced practice* will be more effective at helping you retain information than *massed practice*, during which you study the information all at once.[36] An example of spaced practice is studying three times during the week for 1 hour each time (for a total of 3 hours) instead of studying for 3 hours at one time (see Figure 1.9). Note that there's nothing special about three study sessions; it may be even more beneficial to study for more than three sessions between the new learning and test depending on the amount of material and time between the instruction and test.[37]

Figure 1.9 Spaced practice leads to more effective learning and retention than massed practice.

	Monday	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
Massed practice →	Instruction (lesson)			Study for 3 hours	Test
Spaced practice →	Instruction (lesson)	Study for 1 hour	Study for 1 hour	Study for 1 hour	Test

- *Set goals for each study session.* Decide what you want to accomplish during your study session and structure the session in a way that allows you to meet your goals. In Chapter 3, you learn that setting goals can help you to monitor your learning and stay focused on what's important. Sometimes you won't meet all your goals for a study session because something you need to do takes longer than planned—that's not unusual. But with time and experience, you should become better able to set and accomplish realistic goals for each of your courses, which will allow you to plan your days, weeks, and even months more effectively.
- *Be realistic about how much you can effectively learn and remember at any one time.* As you'll discover in Chapter 2, our brains only allow us to think about and learn so much information before we get tired and need a break for some mental "relaxation."[38] Estimate how long you will be able to study by considering factors such as (1) how much sleep you're getting, (2) how physically tired you will be from exercising or working (if you have a physically demanding job), and (3) the number of other mentally demanding activities you're participating in that day (if you'll be attending a lot of mentally demanding classes or working at a mentally demanding job, you likely won't be able to study for as long as if you'll be relaxing much of the day).

[35] Carpenter et al., 2012; Son & Simon, 2012.
[36] Benjamin & Tullis, 2010; Bird, 2010; Carpenter et al., 2009; Chen et al., 2018; Dunlosky et al., 2013; Lyle et al., 2020.
[37] Rawson & Dunlosky, 2012.
[38] Immordino-Yang et al., 2012.

- *Study at times when you're mentally alert.* Are you a "morning person"? A "night owl"? Identify the times you can study most effectively and then study during those times. You probably don't need to be as alert when you're running errands, checking social media, or doing your laundry, so save those tasks for when you're feeling less alert.
- *Select an appropriate environment for studying.* Don't underestimate the importance of selecting a place to study where you can concentrate. Find somewhere that's free of distractions. For example, you might need to tell others not to disturb you or go to a coffee shop if you can concentrate better there. Also, remove potential distractions from your study area; this may mean that you need to leave your tablet or phone in another room (or at least turn off your phone).[39] Things that distract you might not distract others, so figure out what things distract you and avoid them.

During your study session, use effective study strategies.

What you do *during* your study sessions significantly affects how much you will learn and remember. Here are some study strategies that can help you study more effectively:

- *Quickly review what you've learned previously.* Every time you study, you should devote a few minutes at the beginning of the session to remind yourself of what you have already learned previously. This quick review will not only serve as another review of the material, but it can also help you better assimilate the new information you're learning that day with what you've learned previously.
- *Preview what you're about to study.* Skim through the material quickly and pay attention to the general topics and the structure of the material by reading the headers and titles.[40] The purpose of this preview is to briefly identify the main topics of the material and to "activate" any prior knowledge you might have regarding these topics.
- *Pay attention to what you're studying.* You need to be mentally active when you study if you want to remember what you're studying.[41] If your mind starts to drift away from what you're studying or you get sleepy, very little of what you're "studying" is likely to be learned. If you're too tired, you may need to take a 5-minute break to do something that requires less attention. Or quit studying and come back again when you're more rested and less distracted.
- *Take notes while reading and during lectures and videos.* When you're taking notes related to a text (such as when you're reading a book), you'll remember more if you *make sense* of the information—such as by summarizing, paraphrasing, and organizing the ideas in the text—as opposed to simply copying important sentences.[42] When taking notes on material presented in a lecture or video and the material is complicated or presented quickly, you'll generally remember more of the material if you type notes into a laptop computer rather than take notes by hand (unless you type slower than you can write).[43] In this case, the speed at which you take notes is important because it gives you more time to focus on the lecture or video between taking notes. During lectures it can be important to write down as much information as possible to improve your memory of the lecture in the future. Better-quality notes have been shown to lead to better performance on memory tests of the material in the future.[44] For example, good notes reflect the main ideas of a lesson or reading assignment.[45]

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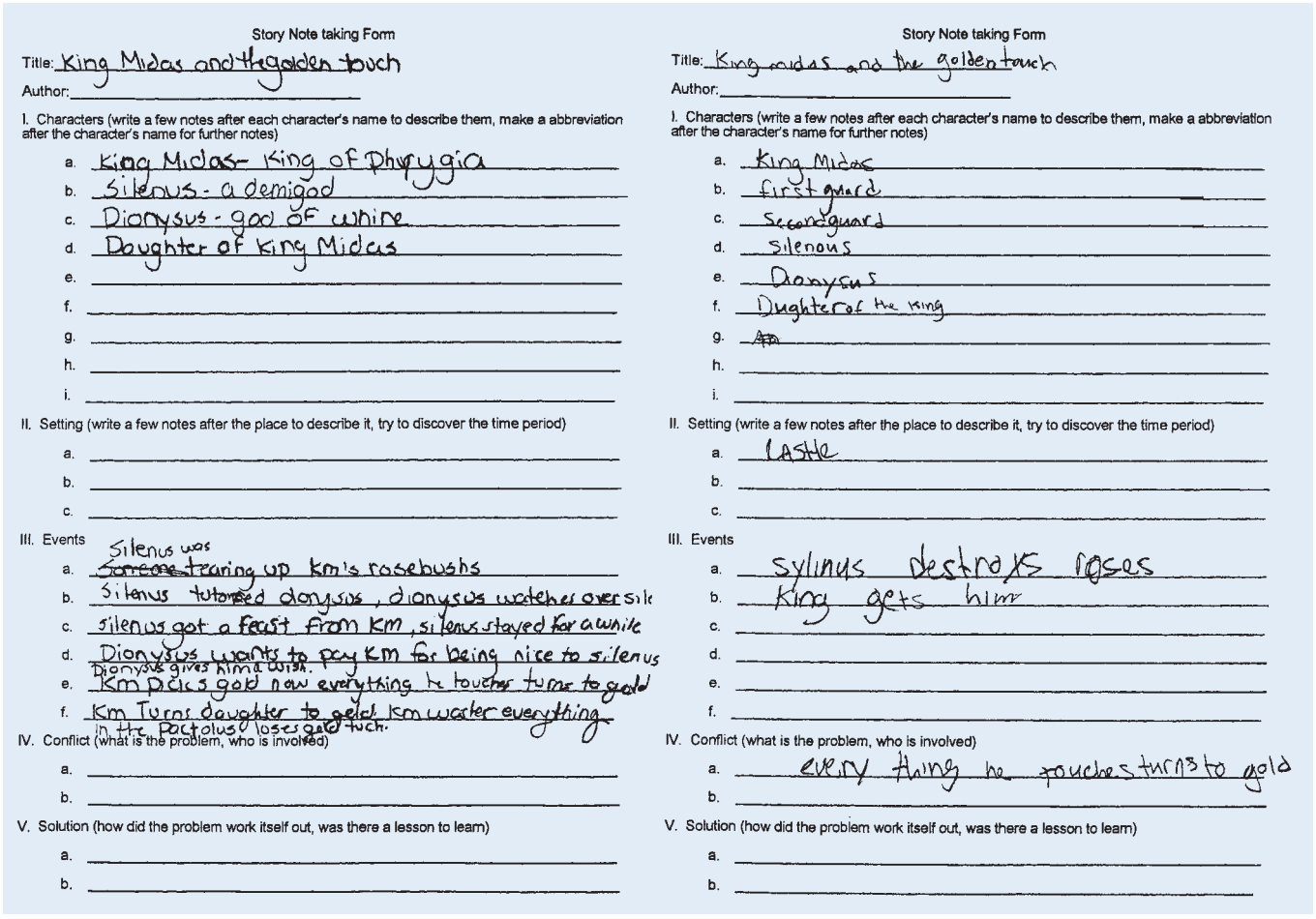
[39] Duckworth et al., 2016.
[40] Thomas & Robinson, 1972.
[41] Oberauer, 2019.
[42] Bretzing & Kulhavy, 1979; Mueller & Oppenheimer, 2014.
[43] Bui et al., 2013; Jansen et al., 2017.
[44] Jansen et al., 2017.
[45] A. L. Brown et al., 1981; Kiewra, 1985; J. Lee & Shute, 2010; Peverly et al., 2003.

Figure 1.10 Good class notes involve both quantity and quality, as seen in the notes on the left but not those on the right. Both sets were taken on this teacher-provided form during a seventh-grade lesson on Greek mythology.



Story Note taking Form

Title: King Midas and the golden touch

Author:

I. Characters (write a few notes after each character's name to describe them, make a abbreviation after the character's name for further notes)

a. King Midas- King of Phrygia
b. Silenus - a demigod
c. Dionysus - god of wine
d. Daughter of King Midas
e.
f.
g.
h.
i.

II. Setting (write a few notes after the place to describe it, try to discover the time period)

a.
b.
c.

III. Events

a. Silenus was ~~Someone~~ tearing up km's rosebushs
b. Silenus tutored dionysus, dionysus watched over sil
c. silenus got a feast from km, silenus stayed for awhile
d. Dionysus wants to pay km for being nice to silenus
e. Dionysus gives him a wish. km picks gold now everything he touches turns to gold
f. km Turns daughter to gold, km wasted everything in the Pactolus loses gold touch.

IV. Conflict (what is the problem, who is involved)

a.
b.

V. Solution (how did the problem work itself out, was there a lesson to learn)

a.
b.

Story Note taking Form

Title: King midas and the golden touch

Author:

I. Characters (write a few notes after each character's name to describe them, make a abbreviation after the character's name for further notes)

a. King Midas
b. first guard
c. Secondguard
d. silenous
e. Dionysus
f. Dughterof the king
g. ~~Am~~
h.
i.

II. Setting (write a few notes after the place to describe it, try to discover the time period)

a. castle
b.
c.

III. Events

a. sylinus destroys roses
b. King gets him
c.
d.
e.
f.

IV. Conflict (what is the problem, who is involved)

a. every thing he touches turns to gold
b.

V. Solution (how did the problem work itself out, was there a lesson to learn)

a.
b.

Figure 1.10 shows the notes that two seventh-graders took about King Midas in a unit on Greek mythology. Both sets were taken using a note-taking form their teacher provided. Notice how the notes on the left provide a good overall synopsis of the King Midas story and might reasonably help the student remember the story fairly accurately. In contrast, the notes on the right are probably too brief and disjointed to be useful.

- *Relate new information to your existing knowledge and prior experiences.* Think about how new ideas are consistent or inconsistent with your personal experiences, knowledge, and beliefs, as well as with things you've learned in other courses. As the earlier OOPS test demonstrated, some of what you currently "know" and believe may be sort-of-but-not-quite accurate or even downright *in*accurate. People's existing beliefs can occasionally have negative effects on new learning. For example, many students in teacher education classes adamantly reject research findings that appear to be inconsistent with their personal beliefs and experiences.[46] When you encounter puzzling or seemingly "wrong" ideas and findings, try to keep an open mind and consider how and why they might have some merit. Truly effective learners occasionally undergo *conceptual change*, revising their current understandings and beliefs in light of new and trustworthy evidence.

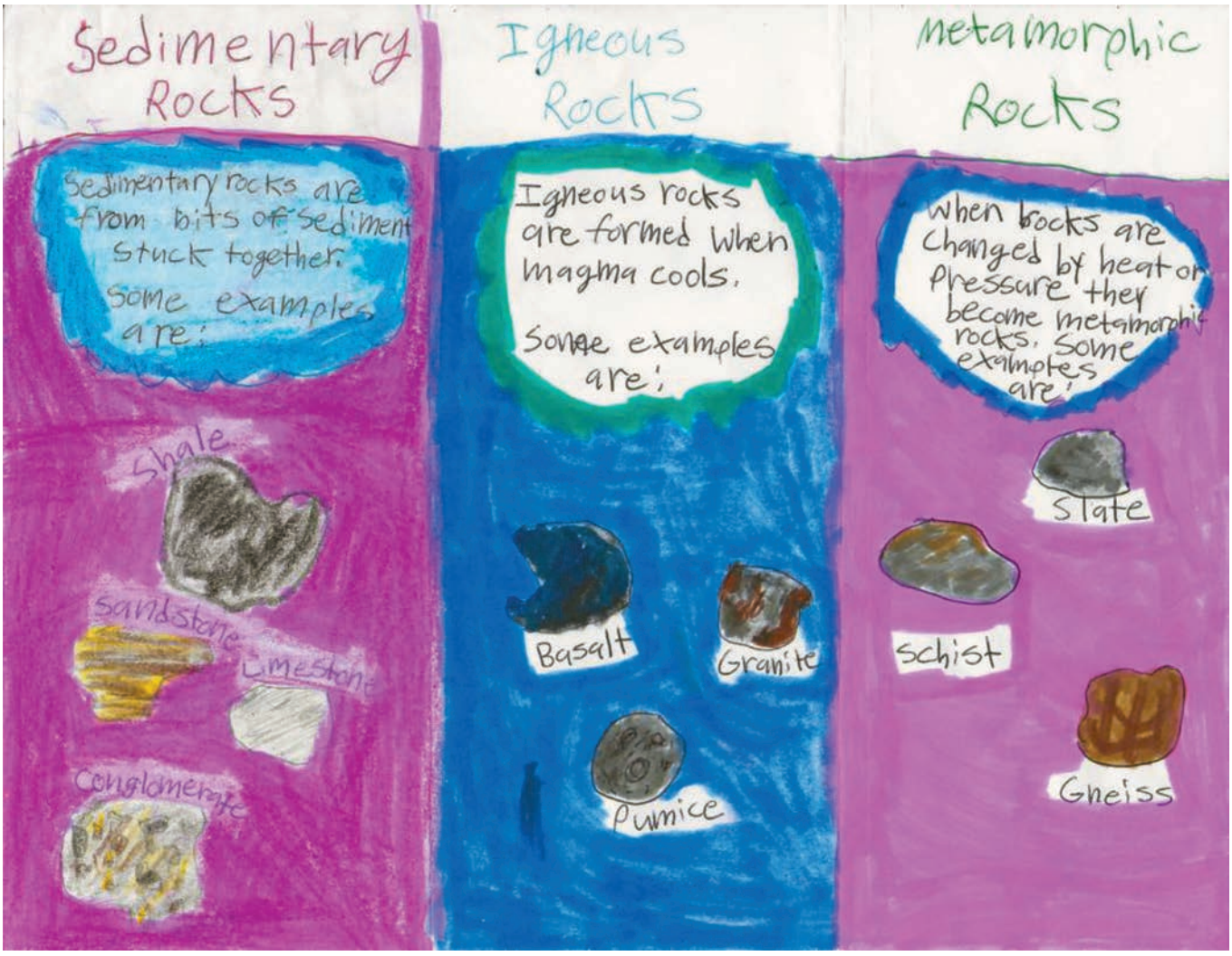
[46] Fives & Gill, 2015; Gregoire, 2003; Richardson, 2003.

Figure 1.11 This concept map shows the concepts in circles and the interrelationships among concepts indicated by lines with words.

- *Organize the new information.* Organizing information in an explicit, concrete manner requires you to actively consider how various pieces of information are related.[47] You can categorize related information together using outlines, diagrams (e.g., a Venn diagram), and tables (e.g., Table 1.1 organizes characteristics of qualitative and quantitative research studies).[48] If the information includes cause-and-effect relationships, you can show these relationships, either through explanations or graphically in a diagram using symbols and/or arrows.[49] Another effective approach is creating a **concept map**, a diagram that depicts the concepts and their interrelationships.[50] Figure 1.11 shows a concept map drawn by someone who read Section 1.2 of this chapter. The concepts are circled, and their interrelationships are indicated by lines with words or short phrases. Several concept-mapping software programs are available for creating and modifying concept maps quickly and easily (e.g., Kidspiration, MindMapper Jr.). Concept mapping certainly doesn't have to be high-tech, however. For example, even nonreading preschoolers can make simple concept maps using pictures of objects and pieces of yarn.[51]
- *Use visual imagery.* You've likely heard the saying, "A picture is worth a thousand words." Although a picture is not worth exactly 1000 words, the idea behind this saying is true in that pictures can capture a lot of information. You can use this concept by forming mental pictures of objects and ideas to aid your memory of information. You can also draw pictures, diagrams, or other graphics to help you capture the meaning of the information.[52]
- *Find examples and nonexamples of concepts and think of other examples.* You will be more likely to understand and remember abstract information when you tie it to concrete objects (see Figure 1.12) and events.[53] In this text, we try to help you do this by providing case studies and short examples that involve real children and teachers. We also include links to videos that depict classrooms in action and *See for Yourself* exercises such as the OOPS test, all of which can enhance your understanding and memory of new concepts and help you recognize them when you see them in your own interactions with children and adolescents. You can also identify your own educational applications of various concepts and principles as you read this text.
- *Elaborate on what you read by going beyond it and adding to it.* **Elaboration** involves embellishing on new information in some way, so try to think *beyond* the things you read. Draw inferences from the ideas presented and create analogies.[54]
- *Periodically check yourself to make sure you remember and understand what you have read.* To check your comprehension, try to summarize the material and ask yourself questions about it to ensure everything makes sense to you. A powerful way to do this is to explain what you're studying to someone else or yourself. Just talking out loud to yourself about what you're studying can help you learn it better. It can also be beneficial to create a drawing of what you're explaining while you're explaining, especially if the material lends itself to pictorial representation

[47] M. A. McDaniel & Einstein, 1989; Hattie, 2009; Mintzes et al., 1997; Nesbit & Adesope, 2006.
[48] L. Baker, 1989; M. A. McDaniel & Einstein, 1989; Wade, 1992.
[49] Nesbit & Adesope, 2006.
[50] Hattie, 2009; Haugwitz et al., 2010; Nesbit & Adesope, 2006; Novak, 1998; Schroeder et al., 2018.
[51] Stephanie Wehry, personal communication, April 8, 2011.
[52] Mayer, 2011, 2014; Mayer & Massa, 2003.
[53] Rawson et al., 2014.
[54] McDaniel & Donnelly, 1996.

Figure 1.12 To remember different types of rocks, this student created a diagram that organizes the rocks by type (sedimentary, igneous, and metamorphic), includes definitions and examples of each type (e.g., shale, sandstone), and provides visuals of specific rocks, as well as an overall image.



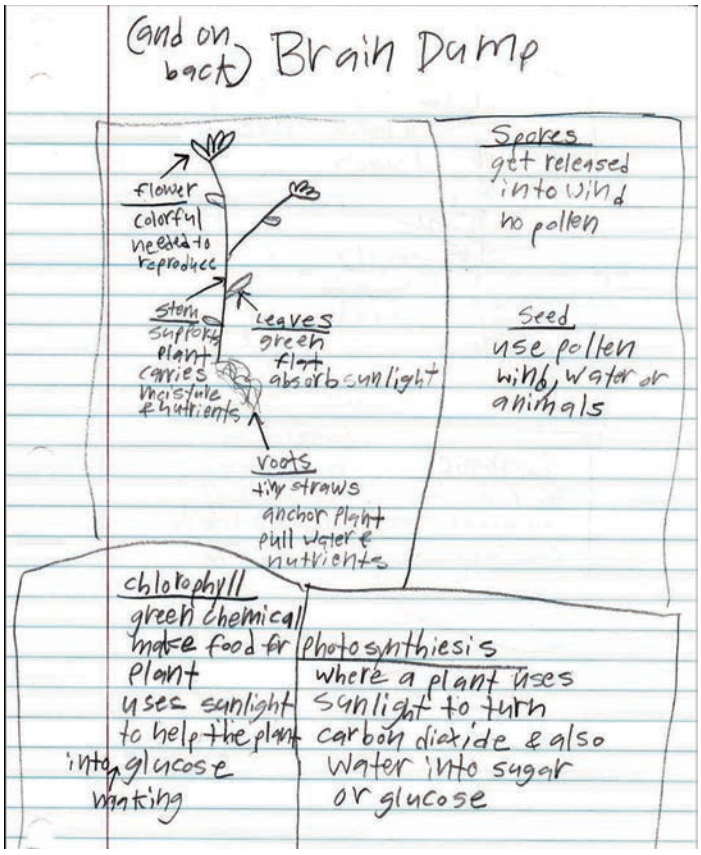
(e.g., the structure of neurons, molecules, or the respiratory system). And, it's a good idea to take the time to give these explanations to yourself or someone else a few times throughout your study session instead of waiting until the very end to give one long explanation.[55]

- *Practice retrieving information from your memory without any help.* Put away everything you've been using to study (e.g., books, notes, Internet access) and write, type, or draw everything you know about the topic you've been studying without any help (see Figure 1.13). Then, when you're finished, compare what you've created to your study material and identify anything important that you forgot to include. This type of *retrieval practice* has been shown to significantly help students remember information over time.[56] A similar strategy is to take practice tests without any notes because doing so also requires you to retrieve information from your memory.[57] Flashcards or apps that provide you with practice in retrieving your knowledge can also be helpful.

think about it
How often do you use the types of strategies presented in this section while reading your textbooks? Do you learn and remember information more effectively when you use them?

[55] Fiorella & Kuhlmann, 2020; Lachner et al., 2020.
[56] Karpicke, 2012; O'Day & Karpicke, 2020; Roediger & Karpicke, 2006.
[57] Agarwal et al., 2012.

Figure 1.13 This student put away her study materials and wrote down everything she could remember about what she studied for her test.



At the end of your study session, evaluate your progress and schedule additional study sessions as needed.

What you do before and during your study sessions is important, but what you do *at the end of* your study sessions can also help you to learn and remember information over the long term.

- *Evaluate the study schedule that you created before you studied.* If you just completed a study session and you believe that you remember everything you studied, then maybe you don't need to review again, especially if the test is not too far in the future. However, if during your session you couldn't remember everything or if you still had misunderstandings, then stick with the plan that you made before your study session and schedule time for more study sessions (as explained in the previous section about the spacing effect). Even if you can remember all of the information at the end of your study session, research indicates that you will likely improve your memory of the information by engaging in additional review sessions.[58] And after the test, if you forget some information and need to relearn it in the future, you will relearn it faster if you engage in more practice sessions before the test.[59]

[58] Rawson & Dunlosky, 2012.
[59] Berger et al., 2008; Ebbinghaus, 1885/1913.

Be an active participant and put forth mental effort in your learning and studying processes.

You should notice a few things about the study strategies presented in the prior sections. These strategies require you to (1) be actively involved in your learning, (2) put forth mental effort, and (3) monitor your progress. To learn effectively in school settings, you can't be a passive bystander hoping that somehow you'll "absorb" some information. Instead, you need to actively participate in your learning, which requires mental effort. It's important not to give up on using a strategy just because it requires effort. Some students stop using strategies—even strategies that are very effective—when they find them to be difficult and require effort because they believe that the strategies must not be effective if they require so much effort.[60] Making good decisions about which strategies to use and which material to spend the most time studying requires you to monitor your learning and to make adjustments when necessary.[61]

Finally, we encourage you to try these strategies when reading this text and participating in other classes or learning activities. Doing so will help you learn to use the strategies well so that you can help your students learn to use them too.

Summary

Each chapter in this text includes a summary organized around the Big Ideas listed at the beginning of the chapter. Following are the Big Ideas for Chapter 1.

1.1 Developing Expertise as a Teacher

Big Idea 1.1 Effective teachers continually work to enhance their professional knowledge and skills.

As a teacher, you must think of yourself as a life-long learner who always has new things to discover about effective educational practices, the subject matter you teach, and the out-of-school environments and cultural groups in which your students live. Some of these things you can learn about through books, professional journals, advanced coursework, the Internet, and collaboration with professional colleagues, but others may require immersing yourself in the local community or conducting action research. You must also be willing to reflect on and critically analyze your current assumptions, inferences, and instructional practices—good teachers acknowledge that they can sometimes be wrong, and they adjust their beliefs and strategies accordingly. One way you can analyze your instructional practices is to conduct your *own* action research to address specific questions you have about your students and classroom practices. Most importantly, you must remember that, as a teacher, the many little things you do every day can have a huge impact—either positive or negative—on students' academic and personal successes.

1.2 Using Research Findings to Make Instructional Decisions

Big Idea 1.2 Effective teachers use research findings and research-based theories to make decisions about instructional strategies, classroom management, and assessment practices.

Effective teachers use practices that are *evidence-based*—that is, they encompass strategies that research has consistently shown to bring about significant gains in students' development, academic achievement, and personal well-being. Evidence-based practices are developed based on research conducted, in part, by educational psychologists who study the nature of human learning, development, motivation, and related topics. As researchers learn more and more about what various phenomena and events are like (descriptive studies), what variables are associated with one another (correlational studies), and what events cause what outcomes (experimental studies), they gradually develop and continually modify theories that integrate and explain their findings. Teachers can—and *should*—draw on research findings and well-supported theories about children's learning and development in their day-to-day and long-term instructional decision making.

[60] Kirk-Johnson et al., 2019.
[61] Son & Metcalfe, 2000.

1.3 Strategies for Learning and Studying Effectively

Big Idea 1.3 Students read, study, and learn more efficiently when they plan appropriately and use effective strategies.

You can use what you learn about thinking and learning not only to help children and adolescents be successful in the classroom but also to help *you* learn more successfully. Before you study, you should plan ahead by spreading out your study sessions, having goals for each study session, and being realistic about what you can accomplish during each session. You should also study at times when you're mentally alert and in places where you can concentrate fully. As you begin studying, you should quickly review what you've already learned and preview what you're about to study. Then, as you proceed, you need to make sure that you're constantly paying attention to what you're studying and using strategies that will help you to remember the information later on. For example, you can take notes while you're reading or watching a lecture or video, relate the new information to your existing knowledge and prior experiences, organize the information, use visual imagery to form mental pictures of objects and ideas, find or think of examples and nonexamples of the concepts you're studying, elaborate on what you're learning, occasionally stop to monitor your understandings of what you've read and studied, and practice retrieving the information from your memory without any help. At the end of your study session, evaluate your study schedule and decide if you need to make any adjustments to the schedule based on what you've learned and what you still need to learn.

Case Study Practice Exercises

New Instructional App

High school math teacher Mr. Gualtieri begins his class on Monday with an important announcement: "Our school has just purchased a new instructional app that we can use on our classroom tablet computers. This app, called Problem-Excel, will give you practice in applying the mathematical concepts and procedures we'll be studying this year. I strongly encourage you to use it whenever you have free time so that you can get extra instruction and practice with things you might be having trouble with."

Mr. Gualtieri is firmly convinced that the new app will help his students better understand and apply certain concepts in his math curriculum this year. To test his hypothesis, he keeps a record of which students use the app and which students do not. He then looks at how well the two groups of students perform on his next classroom test. Much to his surprise, he discovers that, on average, the students who have used the app have earned *lower* scores than those who have not used it. "How can this be?" he puzzles. "Is the app actually doing more harm than good?"

1. Constructed-response question

Mr. Gualtieri wonders whether the instructional app is actually hurting, rather than helping, his students. Assume that the app has been carefully designed by an experienced educator. Assume, too, that Mr. Gualtieri's classroom test is a good measure of how well his students have learned the material they've been studying.

A. Explain why Mr. Gualtieri cannot draw a conclusion about a cause-and-effect relationship from the evidence he has. Base your response on principles of educational research.

B. Identify another plausible explanation for the results Mr. Gualtieri has obtained.

2. Multiple-choice question

Which one of the following results would provide the most convincing evidence that the Problem-Excel app enhances students' mathematics achievement?

a. Students at a high school are randomly assigned to two groups. One group works with Problem-Excel, and the other group works with an app called Write-Away, designed to teach better writing skills. The Problem-Excel group scores higher than the Write-Away group on a subsequent mathematics achievement test.

b. Ten high schools in New York City purchase Problem-Excel and make it available to their students. Students at these high schools get higher mathematics achievement test scores than students at 10 other high schools that have *not* purchased the app.

c. A high school purchases Problem-Excel, but only four of the eight math teachers at the school decide to have their students use it. The students of these four teachers score at higher levels on a mathematics achievement test than the students of the other four teachers.

d. All 10th-graders at a large high school take a mathematics achievement test in September. At some point during the next 2 months, each student spends 20 hours working with Problem-Excel. The students all take the same math achievement test again in December and, on average, get substantially higher scores than they did in September.

Chapter 2

Learning, Cognition, and Memory

Photo by Unsplash

Big Ideas to Master in this Chapter

2.1 The brain continues to change and learn over the course of a lifetime.

2.2 Attention and working memory limit the amount of information that learners can process and remember.

2.3 Learners can use strategies intentionally to store information in long-term memory.

2.4 Learners actively create much of what they know and believe about the world based on their existing knowledge and beliefs.

2.5 Human memory is fallible: Learners don't remember everything they learn, and sometimes they misremember what they've learned.

Case Study: Studying for A Test

Kayla is taking notes during her teacher's presentation in one of her 11th-grade classes. Today, Kayla is paying more attention than usual because she knows that the end-of-unit test is tomorrow, and she needs to do well to ensure that she maintains her A average in the class. The test will include mostly multiple-choice and short-answer questions related to the unit and textbook chapter they've been studying over the past 2 weeks. Kayla has completed all of the homework, but she only did the minimum required to get full credit, which didn't require reading the textbook.

To prepare for the test, Kayla decides to study in the evening by looking through her class notes and skimming the textbook chapter that includes material that will be on the test. She sees that some of the words in the textbook are bolded and they look important, so she uses an app on her phone to make some flashcards with the bolded words and their definitions. Because it's getting late, Kayla decides she's studied enough, and she goes to bed. While she's eating breakfast before school the next morning, she gets out her phone, scrolls through her social media to see if anything interesting happened while she was asleep, and then looks through a few of the flashcards she made. On the way to school, Kayla thinks to herself, "I should do pretty well on the test today, I've done pretty much all I can do to prepare."

Please answer these questions before you read further:

1. What strategies did Kayla use to study for the test?
2. What other strategies could Kayla have used to prepare for the test?
3. Do you think that Kayla is likely to remember most of what she learned in the future, such as in 2 months or next year? Why or why not?

Kayla prepared for the test by paying attention and taking notes during class (at least during the last class before the test), skimming the textbook, and making flashcards on her phone. All of these strategies are likely to help her learn the material, but there is much more that she could've done to prepare, such as using the types of strategies presented near the end of Chapter 1. For example, she could have started studying earlier in the week and begun reading the textbook the prior week, when the teacher assigned it. Kayla also could have related the information to her existing knowledge and experiences, organized it, used visual images, and elaborated on it.

Because Kayla learned the material mainly by repeating the information on the flashcards and not by using other strategies to any significant extent, she is unlikely to remember what she learned for very long. She may be able to get a good grade on her test the next day, but without reviewing the material again or using other strategies, she probably won't remember much of the information in 2 months or a year. Given the fact that Kala's likely to forget much of what she learned, do you think that she actually *learned* the material? To answer this question, we must first understand the nature of learning.

A good general definition of **learning** is *a long-term change in mental representations or associations due to experience*. Let's divide this definition into its three parts. First, learning is a *long-term change*, in that it isn't just a brief, transitory use of information—such as remembering someone's name only long enough to repeat it back after the person is introduced to you (e.g., "Nice to meet you, Mattheos")—but it doesn't necessarily last forever. In the prior case study, we can say that Kalya learned the material if she remembered it long enough to correctly answer questions about it several hours after she finished studying. Second, learning involves *mental representations or associations* and so it has its basis in the brain. Third, learning is a change *due to experience*, rather than the result of physiological maturation, fatigue, alcohol or drugs, or onset of mental illness.

Learning is closely related to **cognition**, which is a broad term that refers to any type of mental process, intellectual activity, or information processing in the mind, such as thinking, reasoning, remembering, perceiving, or imagining.[1] We present mental

[1] Wessinger & Clapham, 2009.

Chapter Outline

Case Study: Studying for a Test

2.1 Thinking and Learning in the Brain
- Functions of the Brain
- Teaching Strategies: Supporting Optimal Brain Functioning

2.2 A Model of Human Memory
- Sensory Register, Attention, and Working Memory
- Teaching Strategies: Remembering the Limitations of Attention and Working Memory

2.3 Long-Term Memory
- The Nature of Long-Term Memory
- Storing Information in Long-Term Memory
- Teaching Strategies: Encouraging Effective Long-Term Memory Storage Processes

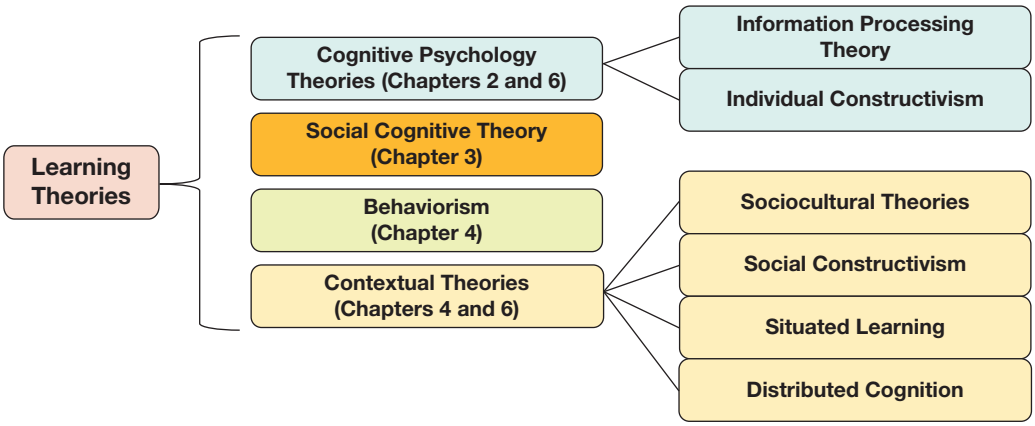
2.4 Learning as Active Construction
- Knowledge Construction
- Teaching Strategies: Helping Students Construct Knowledge

2.5 Why Learners May or May Not Remember What They Have Learned
- Recalling Information
- Teaching Strategies: Facilitating Retrieval

Summary

Case Study Practice Exercises: Vision Unit

Figure 2.1 General theoretical approaches to the study of learning. These theories are discussed throughout the book but are defined primarily in the chapters noted.



processes related to learning and cognition in this chapter and in Chapter 3. Because the brain is the place where learning and cognition occur, we begin this chapter by looking at the brain and some of its key characteristics that have been identified by neuroscientists. But much of what is known about the nature of learning and how to help students learn more effectively has been discovered by psychologists, not neuroscientists. Figure 2.1 shows several of the general theoretical approaches that have been developed by psychologists to study learning. For the most part, these diverse perspectives complement rather than contradict one another, and together they can give us a rich, multifaceted picture of human learning. The remainder of this chapter focuses primarily on cognitive psychology theories, while the other learning theories shown in Figure 2.1 are explained in upcoming chapters.

Cognitive psychology is a theoretical perspective that focuses on the mental processes underlying learning and behavior (such as perception, memory, and reasoning) and includes information processing theory, individual constructivism, and related perspectives.[2] Based on observations of people's responses to various situations and tasks, cognitive psychologists draw inferences (make educated guesses) about how people may perceive, interpret, and mentally manipulate information they encounter in the environment. Many cognitive psychologists speculate about what internal mechanisms underlie human cognition (such as attention and memory) and about how people mentally process new information (such as using strategies to remember information). In this chapter, you'll learn more about the four principles shown in Figure 2.2 that are fundamental to what cognitive psychologists have discovered about learning.

Figure 2.2 Four principles that cognitive psychologists have discovered about learning

Principles About Learning

- Learners can focus on and think about only a limited amount of information at one time.
- Effective learners use strategies intentionally to help them remember what they see, hear, and study.
- Learners actively create—rather than passively absorb—much of what they know and believe about the world.
- Learners use what they already know and believe to make sense of new experiences.

[2] Prominent cognitive psychologists include John Anderson, Richard Atkinson, John Bransford, Jerome Bruner, Jean Piaget, and Richard Shiffrin.

2.1 Thinking and Learning in the Brain

Big Idea 2.1 **The brain continues to change and learn over the course of a lifetime.**

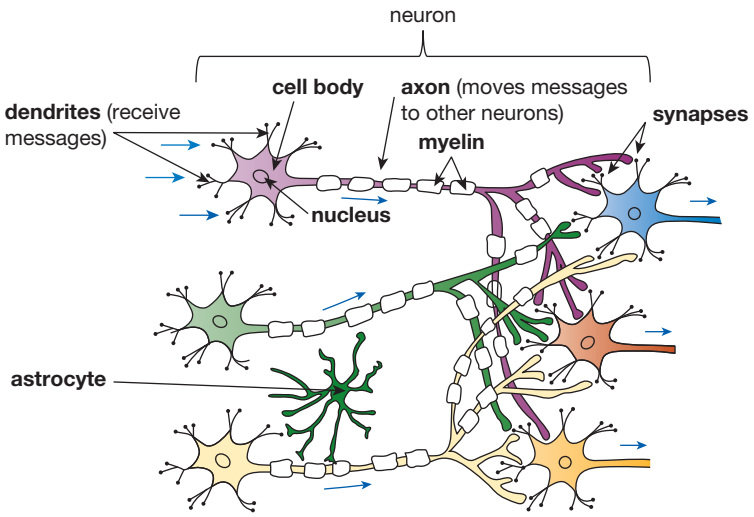
Functions of the Brain

The brain is an incredibly complicated mechanism that contains about 171 billion cells (86 billion neurons and 85 million other types of cells) that are microscopic in size and interconnected in countless ways.[3] Some **neurons** (nerve cells) receive information from the rest of the body, others synthesize and interpret the information, and still others send messages that tell the body how to respond to its present circumstances.

Neurons are composed of three primary components: the cell body, the dendrites, and the axon (see Figure 2.3). Like all cells in living creatures, every neuron has a *cell body*, which contains its *nucleus* and is responsible for its general well-being. In addition, a neuron has many branchlike structures, called *dendrites*, which receive messages from other neurons. A neuron also has an *axon*, a long, armlike structure that transmits information to other neurons. Neurons gradually acquire a white, fatty coating known as *myelin* that allows neurons to transmit messages much faster than they could previously. Curiously, neurons don't actually touch one another. Instead, they use a variety of chemical substances called *neurotransmitters* to send messages across **synapses**, which are small spaces between the neurons (see Figure 2.4). Any single neuron may have synaptic connections with hundreds or even thousands of other neurons.[4]

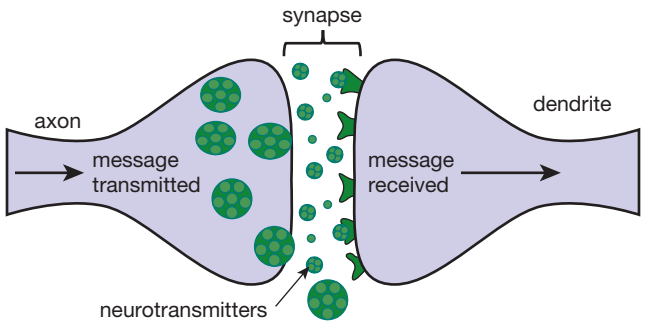
Accompanying neurons in the brain are *glial cells*, which serve a variety of specialized functions. Some act as a clean-up crew for unwanted garbage, others are "nutritionists" that control blood flow to neurons or "doctors" that tend to infections and injuries, and still others provide myelin to enhance the efficiency of neurons. Certain glial cells—star-shaped ones known as **astrocytes**—are intimately involved in learning and memory.[5]

Figure 2.3 Neurons consist of a cell body, dendrites, and axons. Messages (depicted by arrows in this figure) are received by dendrites and transmitted through the axon to other neurons via the synapses.



[3] Azevedo et al., 2009.
[4] C. S. Goodman & Tessier-Lavigne, 1997; Lichtman, 2001; Mareschal et al., 2007.
[5] Chung et al., 2015; Koob, 2009; Oberheim et al., 2009; Verkhratsky & Butt, 2007.

Figure 2.4 A synapse between the axon of one neuron and the dendrite of another neuron

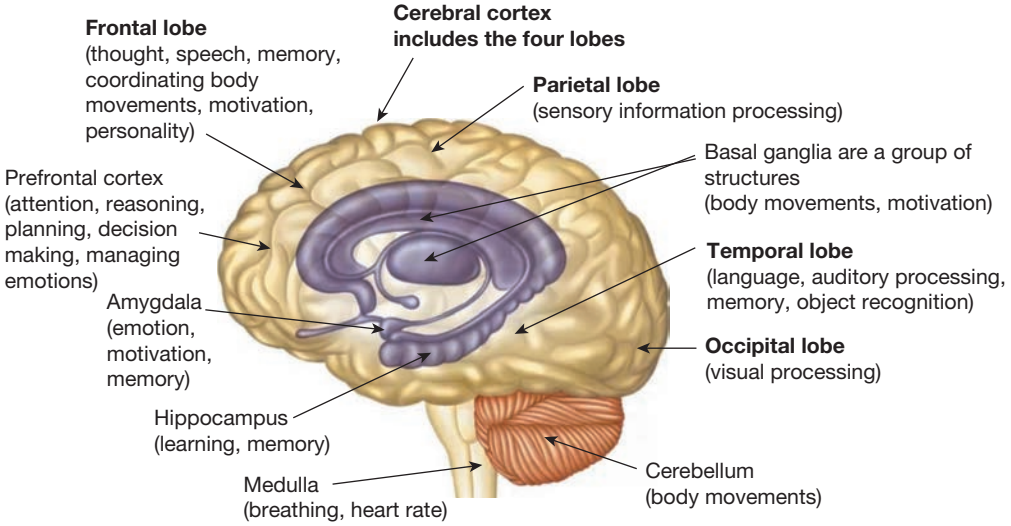


As you'll discover about cognitive development in Chapter 6, the brain changes in important ways over the course of childhood and adolescence. Yet four basic points about the brain are important to keep in mind as we explore cognition and learning in this chapter.

The various parts of the brain work closely with one another.

Groups of neurons and glial cells in different parts of the brain specialize in different things (see Figure 2.5). Structures in the middle parts (e.g., basal ganglia, amygdala) and lower parts (e.g., cerebellum, medulla) of the brain specialize in essential physiological processes (e.g., breathing, heart rate), body movements (e.g., walking, riding a bicycle), emotional responses and motivation (e.g., fear, reward processing), and basic perceptual skills (e.g., coordinating eye movements, diverting attention to potentially life-threatening stimuli). Complex thinking, learning, and knowledge are located primarily in the upper and outer parts of the brain collectively known as the **cerebral cortex**, which rests on the top and sides of the brain like a thick, bumpy toupee. The cerebral cortex can be divided into four lobes based on their functions: frontal lobe (thought, speech, memory, coordinating body movements, motivation, personality), parietal lobe (sensory information processing),

Figure 2.5 Some of the structures and functions of the brain



temporal lobe (language, auditory processing, memory, object recognition), and occipital lobe (visual processing). The front part of the frontal lobe is known as the *prefrontal cortex* and is largely responsible for sustaining attention, reasoning, planning, decision making, managing emotions, coordinating complex activities, and preventing nonproductive thoughts and behaviors.[6]

To some degree, the left and right halves of the cortex—its two *hemispheres*—have different specialties.[7] For most people, the left hemisphere takes primary responsibility for language and logical thinking, whereas the right hemisphere is more dominant in visual and spatial tasks. Yet contrary to popular belief, people rarely, if ever, think exclusively in one hemisphere. There's no such thing as "left-brain" or "right-brain" thinking: the two hemispheres constantly collaborate in day-to-day tasks. In fact, learning or thinking about virtually anything tends to be distributed across many parts of the brain. A task as seemingly simple as identifying a particular word in speech or print involves numerous areas of the cortex.[8]

Most learning probably involves changes in neurons, astrocytes, and their interconnections.

Since the early research in the 1940s by pioneer Donald Hebb, neuroscientists have shown that the physiological basis for most learning lay primarily in changes in the interconnections among neurons, including strengthening or weakening existing synapses, forming new synapses, or eliminating synapses.[9] Eliminating synapses is important because effective learning requires not only that people think and do certain things, but also that they not think or do other things; in other words, that they inhibit tendencies to think or behave in particular ways.[10] Researchers have also documented that new dendrites can grow when new learning occurs.[11] More recent research indicates that learning can also occur within the dendrites, not just within the synapses.[12]

In addition, *astrocytes* have been found to be just as (or more) important as neurons in learning and memory. Through chemically mediated connections with one another and with neurons, astrocytes have some control over what neurons do and don't do and how much neurons communicate with one another.[13] Many new astrocytes and some new neurons form throughout our lifetimes, especially in the *hippocampus* (a small, seahorse-shaped structure in the middle of the brain) and possibly in certain areas of the cortex (see Figure 2.5).[14] Learning experiences seem to stimulate the formation of new brain cells, although researchers don't yet know exactly how these new cells are related to learning and memory.

As for where learning occurs in the brain, the answer is: many places, depending on what is being learned. The prefrontal cortex is active when people must pay attention to and think about new information and events, and all of the cerebral cortex may be active to a greater or lesser extent in interpreting new information as it relates to existing

[6] Otero & Barker, 2014; Verghese et al., 2016.
[7] Byrnes, 2001; R. Ornstein, 1997; Siegel, 2012; M. S. C. Thomas & Johnson, 2008.
[8] Gonsalves & Cohen, 2010; Huey et al., 2006; Jung & Haier, 2007; Pereira et al., 2011; Posner & Rothbart, 2007; Schlegel et al., 2016.
[9] Hayashi-Takagi et al., 2015; Hebb, 1949.
[10] Bruer & Greenough, 2001; Byrnes, 2001; Chung et al., 2015; Dempster, 1992; Haier, 2001; Merzenich, 2001; C. A. Nelson et al., 2006.
[11] Xu et al., 2009.
[12] Sardi et al., 2018.
[13] Chung et al., 2015; Koob, 2009; Oberheim et al., 2009; Scharfman & Binder, 2013; Szu & Binder, 2016; Verkhratsky & Butt, 2007.
[14] Deng et al., 2010; Gould et al., 1999; Han et al., 2013; Koob, 2009; Moreno-Jiménez et al., 2019; C. A. Nelson et al., 2006; Sapolsky, 1999.

knowledge. The hippocampus also seems to be a central figure in learning and memory, in that it pulls together the information it simultaneously receives from various parts of the brain and is involved in helping individuals form and retrieve knowledge.[15] In short, many parts of the brain must work together to help us learn and remember information and researchers are still investigating how all of these parts coordinate during different types of activities.

The brain functions in close collaboration with—rather than in relative isolation from—the rest of the body.

Obviously the brain can't function without the nutrition and health of the rest of the body, and it gets new information from the eyes, ears, and other sensory organs. But in addition, thinking and learning are often intimately intertwined with people's physical actions and reactions.[16] For example, when people think about throwing a baseball—even if they aren't actually throwing one—they activate parts of the brain that control arm and hand muscles involved in throwing.[17] And when people are pondering complex situations (perhaps math problems or the shapes and locations of various objects in space), gestures with their hands or arms can sometimes help them think and talk about the situations more effectively.[18]

Knowing how the brain functions and develops tells us only so much about learning and instruction.

As you'll see in upcoming sections of this chapter, recent research on the human brain has yielded helpful insights regarding human memory and effective instructional practices. It has also enhanced our knowledge about the typical course of cognitive development (see Chapter 6) and the neurological bases of certain disabilities (e.g., dyslexia, dyscalculia, autism spectrum disorders).[19]

Yet even as researchers determine how and where learning occurs, current knowledge of brain physiology doesn't begin to tell us everything we need to know about learning or how to foster it. For example, brain research can't tell us much about what information and skills are most important for people to have in a particular community and culture.[20] Nor does it provide much specific guidance about how teachers can best help their students acquire such information and skills.[21] In fact, educators who speak of "using brain research" or "brain-based learning" are, in most instances, actually talking about what psychologists have learned from studies of human behavior rather than from studies of brain anatomy and physiology.

By and large, if we want to understand the nature of human learning and identify effective ways of helping children and adolescents learn more effectively, we must look primarily at what psychologists, rather than neurologists, have discovered.[22] Therefore, we continue our exploration of learning and cognitive processes by looking at what psychologists have discovered about human memory.

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[15] Bauer, 2002; Byrnes, 2001; Davachi & Dobbins, 2008; Huey et al., 2006; Suzuki et al., 2011; Urgolites et al., 2020.

[16] Abrahamson & Lindgren, 2014. The brain's reliance on other parts of the body to help it in its thinking processes is sometimes called *embodiment*.

[17] Spunt et al., 2010.

[18] Alibali et al., 2011; Goldin-Meadow & Beilock, 2010; Novack & Goldin-Meadow, 2015.

[19] Butterworth & Varma, 2014; Tager-Flusberg, 2007; Varma et al., 2008.

[20] L. Bloom & Tinker, 2001; Chalmers, 1996; Gardner, 2000.

[21] D. M. Beck, 2010; Byrnes, 2007; G. A. Miller, 2010; Schenck, 2011.

[22] Bowers, 2016.

Teaching Strategies: Supporting Optimal Brain Functioning

We urge you to be cautious when you read books, articles, and websites about promoting "brain-based learning" because many of them are speculative at best. Following are three recommendations that have a solid foundation in brain research.

Provide ongoing intellectual stimulation, but don't overdo it.

New challenges and learning opportunities—age-appropriate ones, of course—seem to enhance brain functioning, in part by nourishing existing neurons, synapses, and astrocytes and in part by stimulating the growth of new ones.[23] At the same time, teachers shouldn't inundate students with nonstop challenging tasks and assignments, to the point that students have little or no time for mental "relaxation." People seem to benefit from a certain amount of mental downtime—enough that they have a chance to reflect on their academic and personal experiences, identify new interconnections among things they've learned, and identify future plans and goals for their performance.[24]

Providing an occasional opportunity for mental downtime doesn't mean giving students lots of time in which they have nothing to do. Instead, such an opportunity might take the form of a reflective essay or small-group discussion about a topic or issue related to the day's lessons. When students have nothing to do in the classroom, many of them may have insufficient self-regulation skills to use the time productively, and thus they may engage in behaviors that interfere with their own and their classmates' learning (more on this point in Chapter 9).

Encourage physical exercise.

Physical exercise appears to be beneficial for brain health, especially if it includes aerobic activities that keep the cardiovascular system in good working order (see Figure 2.6). A particular benefit is that it enhances the functioning of the central executive—the

Figure 2.6 Teachers can encourage students to participate in school and club sports that require physical exercise

[23] Koob, 2009; C. A. Nelson et al., 2006.

[24] Chen et al., 2018; Immordino-Yang et al., 2012; Tyler & Burns, 2008.

component of working memory that helps learners keep their minds productively engaged in the task at hand.[25]

To make the most use of the time allotted for students to exercise, teachers can structure activities in ways that increase the amount of time students are physically active during that time.[26] For example, in games that require some students to wait their turn while one or more of their teammates actively participate, teachers can create more games with fewer students on each team. Another example is to modify games that require students to sit out when they are eliminated (e.g., tag, dodge ball), such as by requiring students to complete a physical activity (e.g., 10 push-ups, 15 sit-ups, or 20 jumping jacks) in order to reenter the game.

Encourage students to get plenty of sleep.

As you well know, a good night's sleep improves mental alertness and can help people ward off germs that can make them sick. Additionally, sleep supports the brain's efforts to consolidate new memories, rendering them more memorable over the long run, and sleep can improve cognitive and academic performance during the school day.[27] Unfortunately, typical school schedules, especially their early-morning starting times, are poor matches with the sleeping patterns of many high school students. To address this issue, the Seattle School District decided to start high school 55 minutes later and they found that students slept about 34 minutes longer and their grades rose 4.5%.[28]

Although teachers can't change school start times, they can support good sleeping habits in another way—in particular, by minimizing the likelihood that students will "pull an all-nighter" to prepare for a test or complete a complex assignment. For example, teachers might give numerous short quizzes—each on a small amount of classroom subject matter—rather than giving two or three comprehensive tests that each cover a large body of material (more on this point in Chapter 10). Teachers might also divide a 10-page paper into several small pieces, each of which is due on a different date, to help students distribute their work over time. And more generally, teachers can be reasonable about the amount of homework they assign by considering students' other out-of-school activities.

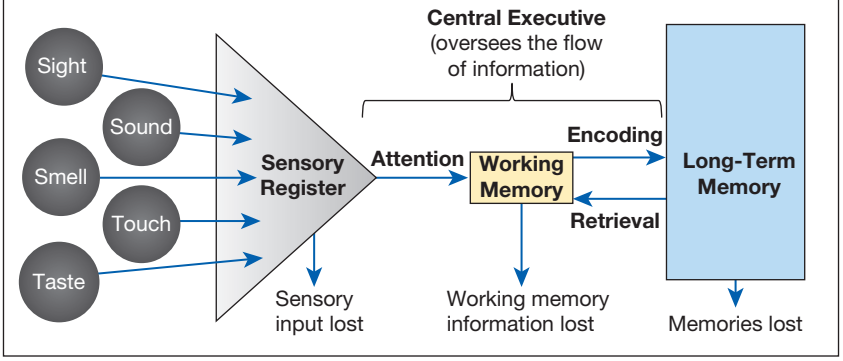
2.2 A Model of Human Memory

Big Idea 2.2 Attention and working memory limit the amount of information that learners can process and remember.

Information processing theory is a theoretical perspective that focuses on the specific ways in which learners mentally think about, or process, new information and events. Many of the early explanations by cognitive psychologists portrayed human thinking and learning as being similar to the ways in which computers operate. Since then, it has become clear that the computer analogy is too simple: People often think about and interpret information in ways that are difficult to explain in the one-thing-always-leads-to-another ways that characterize computers.[29] Instead, human memory is a complex, multifaceted phenomenon. To model our complex memory system, it can be helpful to think of it as having three general components that hold information for different lengths of time: sensory memory,

[25] Castelli et al., 2007; Moreau & Chou, 2019; Sanderson et al., 2017; Tomporowski et al., 2008.
[26] Erwin et al., 2016.
[27] Dinges & Rogers, 2008; Kirby et al., 2011; Payne & Kensinger, 2010; Rasch & Born, 2008; Rey et al., 2020; Walker, 2012.
[28] Dunster et al., 2018.
[29] For example, see Hacker et al., 2009; G. Marcus, 2008; Minsky, 2006.

Figure 2.7 A model of human memory



working memory, and long-term memory (see Figure 2.7).[30] Oversimplified as this model undoubtedly is, we can use it in combination with countless research studies to derive some general principles about how human memory operates.[31]

The term **memory** refers to a learner's ability to mentally "save" newly acquired information and behaviors. In some cases, we use the term to refer to the actual process of saving knowledge or skills for a period of time. In other instances, we use it to talk about particular "locations" where knowledge is held—for instance, in *working memory* or *long-term memory*. Of course, working memory and long-term memory are not physical locations in the brain (there's not a box in your brain used for long-term memory). Rather, as information is processed by the brain it's stored in neurons interconnected by synapses to form networks in different areas of the brain. The terms *working memory* and *long-term memory* are used simply as conceptual models to help us comprehend the concepts and principles discovered by researchers.

Sensory Register, Attention, and Working Memory

In this section, we focus specifically on the sensory register, attention, and working memory, which are shown on the left-hand side and middle of Figure 2.7.

Sensory input stays in a raw form only briefly.

If you've ever played at night with a sparkler—one of those metal sticks that, when lit, emits fiery sparks for a few minutes—you've seen the bright tail of light that follows it as it's waved around. If you've ever daydreamed during a class lecture, you may have noticed that when you tune back in, you can still "hear" the three or four words that were spoken just before you started paying attention to your instructor again. The sparkler's tail and the words that linger aren't actually "out there" in the environment. Instead, they're recorded in your sensory register.

The **sensory register** is the component of memory that holds the information you receive from your senses—*input*—in more or less its original, *un*encoded form. Much of what your body sees, hears, smells, touches, or tastes is stored in the sensory register. In other words, the sensory register has a large capacity: It can hold a great deal of information at any one time.

[30] For example, see R. C. Atkinson & Shiffrin, 1968; Reisberg, 1997; Willingham, 2004.

[31] Findings from recent brain research reveal that the various components of memory depicted in Figure 2.7 aren't completely separate entities; for example, see Baddeley, 2001; Nee et al., 2008; Öztekin et al., 2010.

That's the good news. The bad news is that information stored in the sensory register doesn't last very long.[32] Visual information (what you see) probably lasts for less than a second. For example, as a child, one of us authors (Jeanne) could never spell out her entire first name with a sparkler; the *J* had always faded before she got to the first *n*, no matter how quickly she wrote. Auditory information (what you hear) lasts slightly longer, perhaps for 2 or 3 seconds. To keep information for any time at all, it needs to move to *working memory*.

Attention is essential for most learning and memory.

Recently received sensory information—such as a sparkler's glittery light—doesn't last very long no matter what we do. But we can preserve a memory of it in some minimal way by paying **attention**: *Whatever a learner mentally pays attention to continues on to working memory*. If information in the sensory register doesn't get a learner's attention, it presumably disappears from the memory system, although it might be learned implicitly as we explain in an upcoming section.[33]

Paying attention involves directing not only the appropriate sensory receptors (in the eyes, ears, fingertips, etc.) but also the mind toward whatever needs to be learned and remembered.[34] Imagine yourself reading a textbook. Your eyes are moving down each page, but meanwhile you're thinking about something else, such as a recent argument with a friend, a high-paying job advertised online, or your growling stomach. What will you remember from the textbook? Absolutely nothing. Even though your eyes were focused on the words in your book, you weren't *mentally* attending to the words. This is an example of **mind wandering**—engaging in internal thoughts that are unrelated to your present environment.[35] In fact, psychologists believe that people engage in mind wandering somewhere between 20 and 50% of their waking hours.[36]

Young children's attention often moves quickly from one thing to another and is easily drawn to objects and events unrelated to the task at hand. Kindergarten children can even become distracted by things such as highly decorated classroom walls.[37] As children grow older, they become better able to focus their attention on a particular task and keep it there, and they're less distracted by irrelevant thoughts and events. Yet even adults can't keep their minds on a single task *all* the time.[38] **Selective attention** is the ability to focus on some information while at the same time ignore other information in the environment. Students need to use selective attention to focus on a test when they're in a quiet classroom and they can hear two teachers talking in the hallway outside. Selective attention is also needed to play your best tennis when the people on the court next to you are talking loudly to each other.

Even when learners *are* paying attention, they can attend to only a very small amount of information at any one time because attention has a *limited capacity*. If learners are reading a textbook and listening to a podcast at the same time, they can attend to the book or the podcast, but they can't attend to both simultaneously. Instead, they are switching their attention between the two activities. So although engaging in two or more activities is sometimes called *multitasking*, people aren't actually engaging in multiple tasks at the exact same time, they are switching their attention back-and-forth from one task to the other.

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[32] Cowan, 1995; Dahan, 2010; Darwin et al., 1972; Sperling, 1960.

[33] Some nonattended-to information may remain, but without the learner's conscious awareness of it, it can be extremely difficult to recall, especially over the long run; for example, see Cowan, 2007.

[34] Oberauer, 2019.

[35] Murray et al., 2020; Smallwood & Schooler, 2006.

[36] Kane et al., 2007; Killingsworth & Gilbert, 2010; Seli et al., 2018.

[37] Fisher et al., 2014.

[38] Barron et al., 2011; Dempster & Corkill, 1999; Reichle et al., 2010.

Switching between tasks is usually inefficient because it takes learners longer to complete the tasks, and they're more likely to make mistakes on the tasks than if they had completed the tasks separately.[39]

The ability to pay attention to two or more streams of information at the same time is called **divided attention**. People can often perform two or three well-learned, automatic tasks at once. For example, you can walk and chew gum at the same time, and you can probably drink a cup of coffee while you're driving a car. But when a task is detailed and complex (e.g., reading a textbook) or when a task requires considerable thought and concentration (e.g., understanding a lecture in a college class or driving a car on a busy city street), then people can usually attend to only *one* thing at a time.[40]

think about it
What tasks can you perform at the same time? What tasks are difficult or impossible to do at the same time?

Because attention has a limited capacity, only a very small amount of information stored in the sensory register moves on to working memory. Therefore, most of the sensory input that the body initially receives is quickly lost from the memory system.

Working memory has a short duration and limited capacity.

Working memory is the component of memory where attended-to information stays for a short time so that learners can make better sense of it. It "holds" what learners are conscious of at any moment in time and is where much of their active cognitive processing occurs. It's where they try to understand new concepts presented in a lecture, draw inferences from ideas encountered in a textbook passage, or solve a problem. Basically, this is the component that does most of the mental work of the memory system—hence its name *working* memory.

Rather than being a single entity, working memory seems to have several components for holding and working with different kinds of information.[41] For example, it appears to have a component specifically devoted to temporary storage of visual and spatial information called the *visual-spatial sketchpad*. It probably also has a component that enables very short-term retention of sounds, including spoken language, which is referred to as the *phonological loop*. There may also be similar working and holding areas for input from the other senses, as well as a component that integrates multiple kinds of information.

Working memory also seems to include some sort of supervisory component—which many theorists call a **central executive**—that focuses attention, oversees the flow of information throughout the memory system, selects and controls complex voluntary behaviors, and inhibits counterproductive thoughts and actions.[42] Such processes—collectively known as *executive functions*—improve over the course of childhood and adolescence (largely as a result of brain maturation) and significantly enhance students' academic performance.[43]

Information stored in working memory doesn't last very long—perhaps 5 to 20 seconds at most—unless learners do something more with it.[44] Accordingly, it's sometimes called *short-term memory*. For example, imagine that you meet someone at a party, they tell you their name, and you want to introduce them to your friend. Because you've paid attention to their name, it's presumably in your working memory. But then you discover that your friend is on their phone and you have to wait a minute until they're finished. How might you remember the name until you can introduce them? One common strategy is **rehearsal**—repeating it over and over—which can help you keep information in working

[39] Kirschner & De Bruyckere, 2017; Kirschner & van Merrienboer, 2013; Sana et al., 2013.
[40] J. R. Anderson, 2005; Cowan, 2007; Lien et al., 2006; Oberauer & Hein, 2012.
[41] Baddeley, 2012.
[42] Alloway et al., 2009; Aron, 2008; Banich, 2009; Cowan et al., 2006; Logie, 2011; E. E. Smith, 2000; J. Wood, 2007.
[43] Atkins et al., 2012; Best & Miller, 2010; Goldstein et al., 2014; Masten et al., 2012.
[44] For example, see Baddeley, 2001; L. R. Peterson & Peterson, 1959; W. Zhang & Luck, 2009.

memory until you need to use it. But once you stop repeating it (either in your mind or out loud), the information may quickly disappear.

For reasons that aren't entirely clear, the amount of information children can hold in working memory increases somewhat with age.[45] Yet even adults have only so much room to simultaneously hold and think about information. To see what we mean, put your working memory to work for a moment in the following exercise.

See For Yourself

A Divisive Situation

Try solving this division problem *in your head*. Put the numbers in your working memory and then close your eyes—no peeking!—as you try to calculate the answer:

$$59\overline{)49,383}$$

Did you find yourself having trouble remembering some parts of the problem while you were dealing with other parts? Did you arrive at the correct answer of 837? Most people can't solve a division problem with this many digits unless they write it down because working memory doesn't have enough space both to (1) hold all the numbers and (2) do all the math that the problem requires. Like attention, working memory has a *limited capacity*—perhaps just enough for a telephone number or very short grocery list.[46]

Sometimes students talk about putting class material in "short-term memory" so they can do well on an upcoming exam. Such a statement reflects two common misconceptions: (1) that this component of memory lasts for several days, weeks, or months and (2) that it has a fair amount of "room." Now you know otherwise: Information stored in working (short-term) memory lasts less than 20 seconds unless it's processed further, and only a few things can be stored there at one time. Working (short-term) memory is definitely *not* the "place" to leave information you'll need for a class later today, let alone for an exam later in the week. For such memory tasks, storage in long-term memory is in order.

think about it
Did you have these misconceptions about short-term memory before you read this section? If so, have you now revised your understanding?

Teaching Strategies: Remembering the Limitations of Attention and Working Memory

There are several implications related to the facts that (1) attention is critical for moving information into working memory and (2) working memory has a short duration (less than 20 seconds) and limited capacity.

Grab and hold students' attention.

What teachers do in the classroom can have a huge impact on the extent to which students pay attention to the subject matter at hand. For example, teachers can pique students' curiosity about a topic, perhaps by presenting unusual or puzzling phenomena or modeling their own enthusiastic interest. Incorporating a wide variety of instructional methods into the weekly schedule—hands-on activities, debates about controversial issues, cooperative problem-solving activities, and so on—also helps keep students actively attentive to and engaged in mastering new information and skills. The Classroom Strategies box "Getting and Keeping Students' Attention" offers several additional suggestions.

[45] Ben-Yehudah & Fiez, 2007; Kail, 2007.
[46] Cowan, 2010; Logie, 2011; G. A. Miller, 1956.

Classroom Strategies

Getting and Keeping Students' Attention

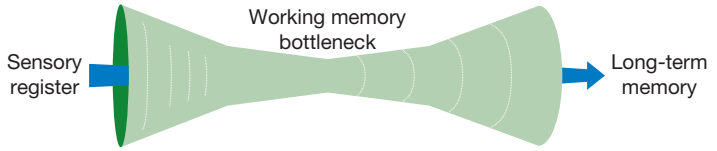
- **Create stimulating lessons in which students *want* to pay attention.**
  In a unit on nutrition, a high school biology teacher has students determine the nutritional value of various menu items at a popular local fast-food restaurant.
- **Get students physically involved with the subject matter.**
  After explaining how to calculate the areas of squares and rectangles, a fourth-grade teacher has students work in groups of three to practice by calculating the area of their irregularly shaped classroom floor. Students use tape measures to measure the perimeter of the classroom and then they sketch the shapes and lengths in their notebooks.
- **Incorporate a variety of instructional methods into lessons.**
  To introduce students to the U.S. Constitution, a middle school social studies teacher begins class by asking students: "Why do we need rules in our school?" Then, the teacher shows a map of the original 13 U.S. colonies and asks students to turn to the person next to them and discuss why it was necessary for the colonists to have rules. Next, the teacher gives each student two of the Articles of Confederation and asks them to research why the articles were needed and to note any other important information about the articles. Students present their findings to others in the class.
- **Provide frequent breaks from quiet, sedentary activities, especially when working with students in the elementary grades.**
  To provide practice with the alphabet, a kindergarten teacher occasionally has students make letters with their bodies. For example, one child stands with arms extended up and out to make a *Y* and two other children bend over and join hands to form an *M*.
- **In the middle school and high school grades, encourage students to take notes.**
  In a middle school science class, different cooperative groups have been specializing in and researching various endangered animal species. As each group gives an oral report about its species to the rest of the class, the teacher asks students in the audience to write down questions about things they would like to know about the animal. At the end of their oral report, members of the presenting group address their classmates' questions.
- **Minimize distractions when students must work quietly and independently or listen carefully to the teacher.**
  The windows of two fifth-grade classrooms in an elementary school overlook the school's playground area, and students in those rooms are often distracted when children in other classes are playing outside. Hence, in preparation for an upcoming statewide assessment, arrangements are made for children in other classes to play group games in the gymnasium during their recess periods.

Sources: Some strategies based on Di Vesta & Gray, 1972; Kiewra, 1989; Ku et al., 2008; Pellegrini & Bjorklund, 1997; Posner & Rothbart, 2007.

Keep the limited capacity of working memory in mind.

Virtually any learning activity imposes a **cognitive load**: a certain amount of information that learners must simultaneously think about, along with certain ways that they must think about it, to make sense of and remember what they're studying.[47] **Cognitive load theory** explains that instruction should be designed to manage the cognitive load on a learner's working memory in order to promote effective learning.[48] As depicted in Figure 2.8, working memory is similar to a bottleneck that is narrower than the sensory register and long-term working memory; and therefore, it limits the amount of information that can be passed between the two. When teachers design and conduct lessons, then, they must consider just how much of an information load a student's working memory can reasonably handle at any given time. For example, they should pace their presentation of

Figure 2.8 Working memory is a bottleneck in the flow of information



[47] R. E. Mayer, 2011; Plass et al., 2010; Sweller, 2008.
[48] Sweller, 1988; Sweller et al., 2019.

important information slowly enough that students have time to effectively process what they're seeing and hearing. They might repeat the same idea several times (perhaps rewording it each time), stop to write important points on the board, and provide numerous examples and illustrations.

A related strategy is to only focus on some aspects of the material the first time that it is being learned and then go back over it again and focus on the other aspects. A good example of this is when musicians practice a piece of music by themselves. A piece of music contains a lot of information that can easily overwhelm the working memory of novice musicians the first time they play it. To handle all this information the first time they play the piece, they may focus primarily on playing the notes correctly and not worry too much about the rhythm, tempo, or dynamics. The next few times they practice it, they may try to play the notes in the correct rhythm. And the next few times they play it, as they begin to master those aspects, they may focus more on playing the piece at the correct tempo and adjusting the dynamics (loudness) as indicated in the music. This progression allows musicians to manage the cognitive load and learn all of the aspects of the piece over time.

Another idea to help students handle complex, multifaceted tasks is to shift some of the cognitive load elsewhere—an idea that's sometimes referred to as **distributed cognition**.[49] One way to "distribute" the cognitive load is to use one or more physical objects (sometimes called *cognitive tools*) the culture has developed in order to make daily living easier and more productive. For example, when struggling with a challenging problem, many people make the task easier to handle by writing parts of it on paper or using an app or calculator to carry out multistep computations. These external memory aids can help students keep track of the ideas they generate—perhaps key points to include in a persuasive essay or alternative research designs for a science project.

Even with such instructional strategies and cognitive tools, however, the amount of new information presented in a typical classroom is much more than students can reasonably learn and remember, and students aren't always the best judges of what things are most important to focus on.[50] Teachers must help students zero in on the things that truly matter—for example, by emphasizing main ideas; offering guidelines on what and how to study; providing written, audio, or video materials that students can access later as they study; and omitting irrelevant information and unnecessary details from explanations and lectures.

2.3 Long-Term Memory

Big Idea 2.3 **Learners can use strategies intentionally to store information in long-term memory.**

The Nature of Long-Term Memory

When students are paying attention to and thinking about information in their working memory, that information will either move into their long-term memory or essentially drop out of their memory system. In this section, we focus on the structure of long-term memory and what learners can do to help move information from their working memory into their long-term memory.

[49] For example, see Pea, 1993; Salomon, 1993; E. R. Smith & Conrey, 2009. A related concept is distributed intelligence (see Chapter 6).

[50] P. A. Alexander & Jetton, 1996; Broekkamp et al., 2002; Gathercole et al., 2006.

Long-term memory is composed of declarative and procedural knowledge.

Long-term memory is where learners store general knowledge and beliefs about the world, recollections of past experiences, and information learned in school. Such knowledge about what and how things are is known as **declarative knowledge** and includes such items as facts, figures, and events (e.g., Thomas Jefferson was the third president of the United States). Long-term memory is also where learners store knowledge about how to perform various behaviors, such as how to ride a bicycle, swing a baseball bat, or write a cursive letter *J*. Such knowledge about how to do things is known as **procedural knowledge** and includes procedures, strategies, and motor skills. *Procedures* refer to knowledge about how to carry out a series of steps, and *strategies* are plans to achieve a goal.[51] When procedural knowledge includes knowing how to respond differently under varying circumstances, it's sometimes called *conditional knowledge*.

Long-term memory has a long duration and virtually limitless capacity.

Information stored in long-term memory lasts much longer than information stored in working memory—perhaps a day, a week, a month, a year, or a lifetime. Even when it's there, however, learners can't always find and retrieve it when they need it (as we'll see in upcoming sections). Long-term memory seems to be able to hold as much information as a learner needs to store there. There's probably no such thing as someone "running out of room." In fact, for reasons we'll discover shortly, the more information already stored in long-term memory, the easier it is to learn new things.

Some declarative knowledge is stored as concepts.

Some declarative knowledge is stored as **concepts**—mental groupings of objects or events that have something in common (see Figure 2.9 for examples). Even infants form concepts that enable them to categorize objects and events.[52] Some concepts, such as *butterfly*, *chair*, and *backstroke*, encompass a fairly narrow range of objects or events. Others, such as *insect*, *furniture*, and *swimming*, have a broad scope and may subsume a number of more specific concepts (e.g., furniture includes *chair*, *table*, *lamp*). Concepts are the representations in our minds of *categories*, which are classes of objects that belong together. For example, someone's furniture category would include the objects in the world that are representatives of the furniture concept that is in their declarative knowledge.[53]

The **classical theory of concepts** states that concepts can be defined precisely with rules that determine whether an object is a member of a category or not.[54] For example, a triangle can be defined as a geometric figure with three sides and three angles. Given these three defining features (i.e., it's a figure, it has three sides, and it has three angles), people

Figure 2.9 Examples of concepts in different disciplines

Discipline	Examples of Concepts
Language Arts	noun, paragraph, haiku, characterization, symbolism
Social Studies	peninsula, democracy, scarcity, primary documents
Mathematics	multiplication, trapezoid, slope, parallel, ratio, integral
Science	erosion, galaxy, fossil fuel, velocity, electron, entropy

[51] Mayer, 2012.
[52] J. M. Mandler, 2007; Quinn, 2002.
[53] Weisberg & Reeves, 2013.
[54] Bruner et al., 1956; Nosofsky et al., 1994.

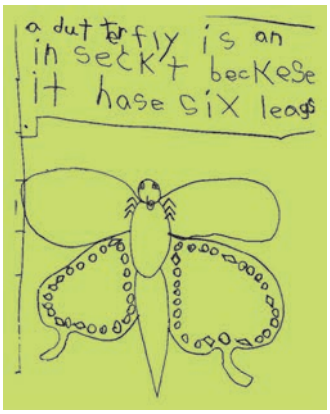


Figure 2.10 Eight-year-old Noah uses a defining characteristic of insects (that they have six legs) to identify a *butterfly* with six legs as an *insect*

can categorize shapes into triangles and nontriangles. Noah's butterfly-is-an-insect drawing in Figure 2.10 demonstrates that he used a defining characteristic of insects (that they have six legs) to identify the butterfly as an insect. Other concepts, however, do not have such explicit defining features. It can be quite difficult to provide a specific definition for concepts such as *game*, *bird*, *vegetable*, *vehicle*, and *furniture*, even though they are commonly used concepts. To explain these types of concepts, the **prototype theory** proposes that concepts are organized around a prototype that is an abstract, idealized example of the concept that has many of the typical features of the concept but that does not necessarily resemble any real-life example.[55] For instance, a bird similar to a robin would be more likely to be someone's prototype for a bird than an ostrich or penguin because robins have many typical features of birds (e.g., small size, have feathers, fly, live in trees) than ostriches and penguins. However, the bird wouldn't have to look exactly like a robin or any bird the person had ever seen before. When deciding whether an object is a member of a category, people compare the object to the prototype in their mind. In contrast, the **exemplar theory** contends that people compare objects to specific examples (exemplars) in their minds to determine whether an object fits in a category or not.[56] In this view, to determine if an object was a bird or not, people would compare the object to specific examples of birds that they had seen in the past, perhaps thinking of one they saw in their yard yesterday or of an image of a bird they saw online. In sum, people can categorize objects and form concepts by using defining features, prototypes, exemplars, or a combination of these approaches.

Information in long-term memory is interconnected and organized to some extent.

As you'll recall from our earlier discussion of the brain, neurons have many, many synaptic connections with one another, and thinking about almost any topic tends to involve many parts of the brain. It shouldn't surprise you to learn, then, that people's knowledge, beliefs, and skills tend to be interconnected in long-term memory. To get a glimpse of how ideas in your own long-term memory are interconnected and organized, try the following exercise.

See For Yourself

Horse

What's the first word that comes to mind when you see the word *horse*? And what word does that second word remind you of? And what does the third word remind you of? Beginning with the word *horse*, follow your train of thought, letting each word remind you of a new word or short phrase, for a sequence of at least eight words or phrases. Write down the sequence of things as they come to mind.

You probably found yourself easily following a train of thought from the word *horse*, perhaps something like this route:

horse → cowboy → lasso → rope → knot → Girl Scouts → cookies → chocolate

The last word in your sequence might be one with little or no obvious relationship to horses. Yet you can probably see a logical connection between each word or phrase and the one that follows it. Related pieces of information tend to be associated with one another in long-term memory, perhaps in a network similar to the one depicted in Figure 2.11.

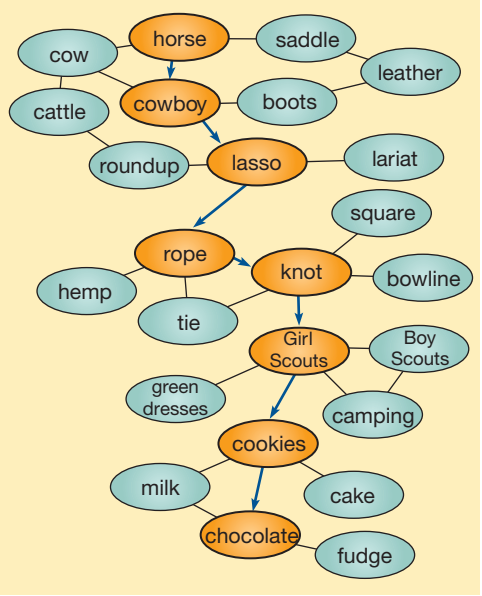
Learners often pull concepts together to construct general understandings of certain parts of their world. These understandings might take the form of a **schema**, which is a mental structure that includes a tightly organized set of facts about a specific concept or

[55] Hampton, 2006; Rosch & Mervis, 1975.
[56] Medin & Schaffer, 1978; Wisniewski, 2002.

phenomenon.[57] For example, let's return to the concept *horse*. You know what horses look like and you can recognize one when you see one, so you obviously have a concept for these animals. But now think about the many things you know *about* horses. What do they eat? How do they spend their time? Where are you most likely to see them? No doubt you can easily retrieve many facts about horses, perhaps including their fondness for oats and carrots, their love of grazing and running, and their frequent appearance on farms and at racetracks. The various things you know about horses are closely interrelated in your long-term memory in the form of a "horse" schema.

People have schemas not only about objects but also about events. When a schema involves a predictable sequence of events related to a particular activity, it's sometimes called a **script**.[58] The next exercise provides an example.

Figure 2.11 Related ideas are often associated with one another in long-term memory. Here you see one possible train of thought from *horse* to *chocolate*



See For Yourself

Alejandro

Read the following passage *one time only*.

> Alejandro was feeling bad today so he decided to go see the family doctor. He checked in with the doctor's receptionist, and then looked through several medical magazines that were on the table by his chair. Finally, the nurse came and asked him to take off his clothes. The doctor was very nice to him. He eventually prescribed some pills for Alejandro. Then Alejandro left the doctor's office and headed home.[59]

You probably had no trouble making sense of the passage because you've been to a doctor's office yourself and have a schema for how those visits usually unfold. You can therefore fill in a number of details that the passage doesn't tell you. For example, you probably inferred that Alejandro *went* to the doctor's office, although the story omits this essential step. Likewise, you probably concluded that Alejandro took off his clothes in the examination room, *not* in the waiting room, even though the story never makes it clear where Alejandro removed his clothes. When critical information is missing, as is true in the story about Alejandro, schemas and scripts often enable learners to fill in the gaps in a reasonable way.

think about it
What is your script for going to the grocery store or to a fast-food restaurant?

On a much larger scale, humans—young children included—construct general understandings and belief systems, or **theories**, about how the world operates.[60] Such self-constructed theories include many concepts and the relationships among them, such as correlational relationships and cause-and-effect relationships. Theories constructed by individuals are similar to the theories developed by researchers in that they include sets of concepts and principles developed to explain a particular phenomenon (as explained in Chapter 1). Yet, individuals' self-constructed theories are a little different from the ones developed by researchers because individuals develop their theories based on their knowledge, beliefs, and experiences that may or may not be based on scientific evidence. To see what some of your own theories are like, try the next exercise.

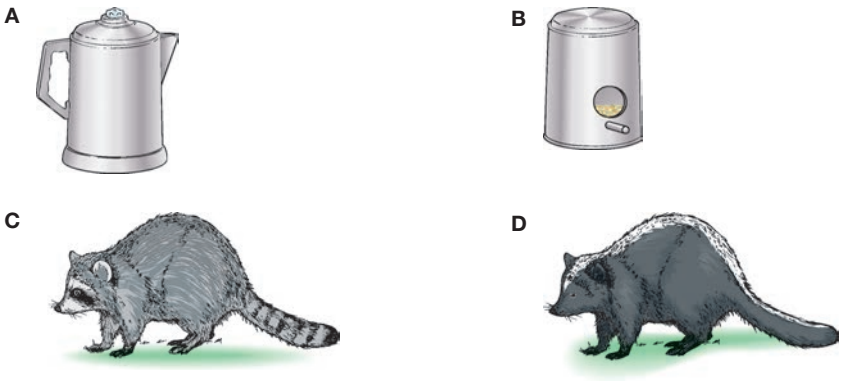
[57] For example, see Kalyuga, 2010; Rumelhart & Ortony, 1977; Schraw, 2006.
[58] Sometimes the term *script* is used in reference to knowing a specific set of steps for doing something, in which case it might be better classified as *procedural* knowledge than as declarative knowledge.
[59] G. H. Bower et al., 1979, p. 190.
[60] Gelman, 2003; Keil & Newman, 2008; Wellman & Gelman, 1998.

See For Yourself

Coffeepots and Raccoons

Consider each of the following situations:

1. People took a coffeepot that looked like Drawing A. They removed the handle, sealed the top, took off the top knob, sealed the opening to the spout, and removed the spout. They also sliced off the base and attached a flat piece of metal. They attached a little stick, cut out a window, and filled the metal container with birdseed. When they were done, it looked like Drawing B. Was the object now a coffeepot or a bird feeder?
2. Doctors took the raccoon in Drawing C and shaved away some of its fur. They dyed what was left black. Then they bleached a single stripe all white down the center of the animal's back. Then, with surgery, they put in its body a sac of super-smelly odor, just like the smell a skunk has. After they were all done, the animal looked like Drawing D. At this point, was the animal a skunk or a raccoon?[61]

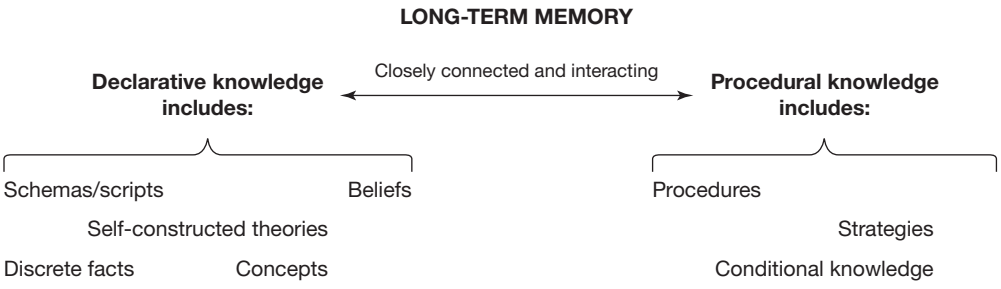


You probably concluded that the coffeepot had been transformed into a bird feeder but that the raccoon was still a raccoon despite its cosmetic makeover and stinky surgery. How is it possible that the coffeepot could be made into something entirely different, whereas the raccoon could not? Even young children seem to make a basic distinction between human-made objects (e.g., coffeepots, bird feeders) and biological entities (e.g., raccoons, skunks).[62] For instance, human-made objects are defined largely by the *functions* they serve (e.g., brewing coffee, feeding birds), whereas biological entities are defined primarily by their origins (e.g., the parents who brought them into being, their DNA).[63] Thus, when a coffeepot begins to hold birdseed rather than coffee, it becomes a bird feeder because its function has changed. But when a raccoon is cosmetically and surgically altered to look and smell like a skunk, it still has raccoon parents and raccoon DNA and so most people believe that it can't possibly be a skunk. Interestingly, many kindergarteners are willing to believe that the raccoon has changed into a skunk, at least until about second grade, when their beliefs align more closely to those of many older children and adults.

By the time children reach school age, they've constructed basic theories about their physical, biological, and social worlds.[64] By school age, children have also constructed preliminary theories about the nature of their own and other people's thinking. For instance, they realize that people's inner thoughts are distinct from external reality, and they understand that the people in their lives have thoughts, emotions, and motives that drive much of what they do. In general, self-constructed theories help children make sense of and remember personal experiences, classroom subject matter, and other new

[61] Both scenarios based on Keil, 1989, p. 184.
[62] Gelman & Kalish, 2006; Inagaki & Hatano, 2006; Keil, 1986, 1989.
[63] Greif et al., 2006; Inagaki & Hatano, 2006; Keil, 1987, 1989, 1992.
[64] Geary, 2005; Torney-Purta, 1994; Wellman & Gelman, 1998.

Figure 2.12 Long-term memory includes declarative and procedural knowledge that is closely connected and interacting



information.[65] Yet because children's theories often evolve with little or no guidance from more knowledgeable individuals, they sometimes include erroneous beliefs about the world that can wreak havoc with new learning (more about this point a bit later).

Although it's difficult to easily represent how long-term memory is organized, Figure 2.12 includes some of the long-term memory items we've presented so far. Declarative knowledge is composed of discrete facts that group together into concepts, which comprise schemas/scripts, theories, and beliefs. Procedural knowledge consists of procedures about how to do things, strategies for how to achieve goals, and conditional knowledge about when to use particular strategies. How well long-term memory is integrated and the ways in which it's integrated are to some degree the result of how learners first store information in long-term memory, as we see in our explanation of the next principle.

Storing Information in Long-Term Memory

In this section, we discuss what researchers have discovered about the processes involved in moving information from working memory to long-term memory.

Some long-term memory storage processes are more effective than others.

You may have heard teachers, parents, employers, or others say that they want students to become better thinkers. But have you ever considered what's involved in thinking? *Thinking* is a broad term that can include many different **cognitive processes**—that is, the specific things individuals do mentally as they try to interpret and remember what they see, hear, and study. Cognitive processes are important because they have a profound effect on what people learn and remember. An example of a cognitive process is **encoding**, in which a learner changes or adds to incoming information in some way in order to remember it more easily.

The process of "putting" something into memory is called **storage**. In contrast, the process of remembering previously stored information—that is, "finding" it in memory—is **retrieval**. The following exercise illustrates the retrieval process.

See For Yourself

Retrieval Practice

How quickly can you answer each of the following questions?

1. What is your name?
2. What is the capital of France?
3. What did you have for dinner 3 years ago today?
4. When talking about serving appetizers at a party, people sometimes use a French term instead of the word *appetizer.* What is that French term, and how is it spelled?

[65] Gelman, 2003; Reiner et al., 2000; Wellman & Gelman, 1998.

As you probably noticed when you tried to answer these questions, retrieving some information from memory (e.g., your name) is an easy, effortless process. But other things can be retrieved only after some thought and effort. For example, it may have taken you a few seconds to recall that the capital of France is Paris. Still other pieces of information—even though you certainly stored them in memory at one time—may be almost impossible to retrieve. Perhaps a dinner menu 3 years ago and the correct spelling of *hors d'oeuvre* fall into this category.

Intentionally storing new information in long-term memory involves encoding the information to move it from working memory into long-term memory. However, effectively storing new information in long-term memory usually involves connecting it to relevant information that's *already* in long-term memory—a process that requires bringing the "old" information back into working memory.[66] The next exercise illustrates this point.

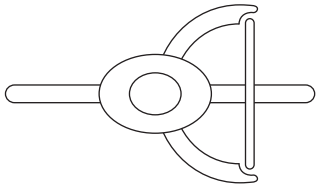
See For Yourself

Letters and a Picture

1. Study each of the following strings of letters until you can remember them perfectly:

   AIIRODFMLAWRS FAMILIARWORDS

2. Study the line drawing shown here until you can reproduce it accurately from memory.



No doubt you found the second letter string easier to remember because you could relate it to something you already knew: the words *familiar words.* How easily were you able to learn and remember the picture? Do you think you could draw it from memory next week? Do you think you could remember it more easily if it had the title "Bird's-Eye View of a Cowboy Riding a Bicycle"? The answer to the last question is almost certainly yes, because the title would help you relate the picture to familiar shapes, such as those of a bicycle and a cowboy hat.[67]

With the preceding exercise in mind, let's distinguish between two basic types of learning: rote learning and meaningful learning. Learners engage in **rote learning** when they try to learn and remember something without attaching much meaning to it. For example, you'd be engaging in rote learning if you tried to remember the letter string FAMILIARWORDS simply as a list of isolated letters or if you tried to remember the cowboy/bicycle drawing as a collection of random, unrelated lines and curves.

One common form of rote learning is *rehearsal*, repeating something over and over within a short time frame (typically a few minutes or less), either by saying it aloud or by continuously thinking about it in an unaltered, verbatim fashion. We've previously seen that rehearsal can help learners keep information in working memory indefinitely. Contrary to what many students think, however, rehearsal is *not* a very effective way of storing information in long-term memory. If learners repeat something often enough, it might eventually "stick," but the process is slow and tedious. Furthermore, for reasons we identify later, people who use rehearsal and other forms of rote learning often have trouble remembering what they've learned.[68]

In contrast to rote learning, **meaningful learning** involves recognizing a relationship between new information and something previously stored in long-term memory.

[66] For a good discussion of this point, see Kirschner et al., 2006.
[67] G. H. Bower et al., 1975.
[68] J. R. Anderson, 2005; Ausubel et al., 1978; Craik & Watkins, 1973.

Seeing the words *familiar words* in the letter string FAMILIARWORDS and seeing a bicycle-riding cowboy in a line drawing are two examples. Similarly, a first-grader might connect subtraction facts to previously learned addition facts in the same "family" (e.g., 5 – 3 = 2 is the reverse of 2 + 3 = 5), and a high school history student might see parallels between the "ethnic cleansing" in eastern Europe in the 1990s and the Nazis' belief in White supremacy in the 1930s and 1940s. In the vast majority of cases, meaningful learning is more effective than rote learning for storing information in long-term memory.[69] It's especially effective when learners relate ideas to *themselves* as human beings.[70]

think about it
In your own experiences as a student, how often have classroom assessments encouraged you to memorize information word for word rather than to learn it meaningfully?

Meaningful learning can take a variety of forms, and in many cases it involves adding to or restructuring information in some way. As an example, try the following exercise.

See For Yourself

Twelve Words

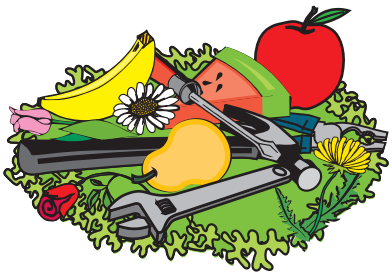
Spend 30 seconds trying to memorize the following 12 words. Then look away and write down the words in the exact order in which they come to mind.

daisy	apple	dandelion
hammer	pear	wrench
tulip	pliers	watermelon
banana	rose	screwdriver

In what order did you remember the words? Did you recall them in their original order, or did you rearrange them somehow? If you're like most people, you grouped the words into three categories—flowers, fruit, and tools—and remembered one category at a time. In other words, you *organized* the words. In **organization**, learners pull new information together into an integrated, logical structure. For example, they might group information into categories, similar to how the words in the previous exercise can be grouped into three categories. Alternatively, learners might identify interrelationships among various pieces of information. As an illustration, students in a physics class might learn that *velocity* is the product of *acceleration* and *time* (*v a t*) and that an object's *force* is determined by both the object's *mass* and its *acceleration* (*f m a*). The goal here isn't simply to memorize the formulas (that would be rote learning) but rather to make sense of the relationships the formulas represent. In most instances, learners who learn an organized body of information remember it better—and they can use it more effectively later on—than would be the case if they tried to learn the same information as a list of separate, isolated facts.[71]

Another effective long-term memory storage process is **visual imagery**, forming a mental picture of objects or ideas. As an example from the previous "Twelve Words" exercise, perhaps you formed a mental image of the 12 items in an elaborate, if not entirely edible, fruit salad (see Figure 2.13). To discover firsthand how effective visual imagery can be, try learning a bit of Mandarin Chinese in the next exercise.

Figure 2.13 A visual image for encoding a list of 12 words



[69] Ausubel et al., 1978; Ghetti & Angelini, 2008; Marley et al., 2008; R. E. Mayer, 2010b; Wittrock, 1974.
[70] Heatherton et al., 2004; Kesebir & Oishi, 2010; T. B. Rogers et al., 1977.
[71] Bjorklund et al., 1994; Haugwitz et al., 2010; Nesbit & Adesope, 2006; P. A. Ornstein et al., 2010.

See For Yourself

Five Chinese Words

Try learning these five Chinese words by forming the visual images described (don't worry about learning the tone marks over the words).

Chinese Word	English Meaning	Image
fáng	house	Picture a *house* with *fangs* growing on its roof and walls.
mén	door	Picture a restroom *door* with the word *MEN* painted on it.
kè	guest	Picture a person giving someone else (the *guest*) a *key* to the house.
fàn	food	Picture a plate of *food* being cooled by a *fan.*
shū	book	Picture a *shoe* with a *book* sticking out of it.

Now find something else to do for a couple of minutes. Stand up and stretch, get a glass of water, or use the restroom. But be sure to come back to your reading in just a minute or two. . . .

Now that you're back, cover the list above of Chinese words, English meanings, and visual images. Try to remember what each word means:

kè fàn mén fáng shū

Did the Chinese words remind you of the visual images you stored? Did the images, in turn, help you remember the English meanings? You may have easily remembered all five words, or you may have remembered only one or two. People differ in their ability to use visual imagery: Some form images quickly and easily, whereas others form them only slowly and with difficulty. Especially for people in the former category, visual imagery can be a powerful means of storing information in long-term memory.[72]

Still another form of meaningful learning is **elaboration**, in which learners use their prior knowledge to embellish on a new idea, thereby storing *more* information than was actually presented. In the preceding "Twelve Words" exercise, you could have used elaboration by creating a story or poem (e.g., "As *Daisy* and *Tulip* were walking, they ran across *Dandy* (for dandelion) and *Rose* . . . "). Another example is a student who reads that some species of dinosaurs had powerful jaws and sharp teeth might correctly deduce that those species were meat eaters. Similarly, if a student learns that the crew on Christopher Columbus's first trip across the Atlantic Ocean threatened to revolt and turn the ships back toward Europe, the student might speculate, "I'll bet the men were really scared when they continued to travel west day after day without ever seeing signs of land."[73] And to use elaboration to help you remember these strategies for encoding information into long-term memory, you could use the acronym MOVE to remember that Meaningful learning involves Organization, Visual imagery, and Elaboration to "move" information from working memory to long-term memory (see Figure 2.14).

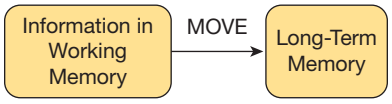


Figure 2.14 You can use the acronym MOVE to remember that Meaningful learning involves Organization, Visual imagery, and Elaboration to "move" information from working memory to long-term memory

The three forms of meaningful learning just described—organization, visual imagery, elaboration—are clearly constructive in nature: They all involve combining several pieces of information into a meaningful whole. When you organize

[72] Behrmann, 2000; Johnson-Glenberg, 2000; Konkle et al., 2010; Sadoski & Paivio, 2001; Urgolites & Wood, 2013; R. F. Williams, 2012.

[73] Notice that we're using the term *elaboration* to describe something that *learners* do, not something that teachers do. Elaboration as a *cognitive process* occurs inside rather than outside the learner. However, teachers can certainly help students engage in elaboration, as you'll discover later in the chapter.

Table 2.1 Long-Term Memory Storage Processes

PROCESS	DEFINITION	EXAMPLE	EFFECTIVENESS
Rote learning: Learning primarily through repetition and practice, with little or no attempt to make sense of what is being learned			
Rehearsal	Repeating information verbatim, either mentally or aloud	Word-for-word repetition of a formula or definition	Relatively ineffective: Storage is slow, and later retrieval is difficult
Meaningful learning: Making connections between new information and prior knowledge			
Organization	Making connections among various pieces of new information	Thinking about how one's lines in a play relate to the play's overall storyline	Effective if organizational structure is legitimate and consists of more than just a list of separate facts
Visual imagery	Forming a mental picture of something, either by actually seeing it or by envisioning how it might look	Imagining how various characters and events in a novel might have looked	Individual differences in effectiveness; especially beneficial when used in combination with elaboration or organization
Elaboration	Embellishing on new information based on what one already knows	Generating possible reasons that historical figures made the decisions they did	Effective if associations and additions made are appropriate and productive

information, you give it a logical structure (categories, cause-and-effect relationships, etc.). When you use visual imagery, you create mental pictures (perhaps a house with fangs or a restroom door labeled *MEN*) based on how certain objects typically look. And when you elaborate on new information, you combine it with things you already know to help you make better sense of it. These long-term memory storage processes are organized in Table 2.1 as another means to help you remember them.

Interestingly, many East Asian parents and teachers encourage frequent use of rehearsal and rote memorization as learning strategies.[74] Rehearsal and memorization are also common in cultures that value committing oral histories or verbatim passages of sacred text (e.g., the Bible, the Koran) to memory.[75] In contrast, many schools in mainstream Western culture are increasingly conducting lessons and encouraging strategies that foster meaningful learning. Even so, Western schools typically insist that students learn certain things—such as multiplication tables and word spellings—to automaticity, as explained in the next section.[76]

Practice makes knowledge more automatic and durable.

Storing something in long-term memory on one occasion is hardly the end of the learning process. When people continue to practice the information and skills they acquire—and especially when they do so in a variety of situations and contexts—they gradually become able to use what they've learned quickly, effortlessly, and automatically. In other words, people eventually achieve **automaticity** for well-practiced knowledge and skills.[77]

As noted earlier, rehearsal—repeating information over and over within the course of a few seconds or minutes—is a relatively *in*effective way of getting information into long-term memory. But when we talk about acquiring automaticity, we're talking about repetition over the long run: reviewing and practicing information and procedures at periodic intervals over the course of a few weeks, months, or years. When practice is spread out in this manner, people learn things better and remember them longer.[78]

[74] Dahlin & Watkins, 2000; D. Y. F. Ho, 1994; Purdie & Hattie, 1996.
[75] MacDonald et al., 2000; Rogoff et al., 2007; Q. Wang & Ross, 2007.
[76] Q. Wang & Ross, 2007.
[77] J. R. Anderson, 2005; P. W. Cheng, 1985; Graham et al., 2000; R. W. Proctor & Dutta, 1995; Semb & Ellis, 1994.
[78] Cepeda et al., 2008; Ennis & Chen, 2011; R. W. Proctor & Dutta, 1995; Rohrer & Pashler, 2007.

Practice is essential for gaining procedural knowledge.[79] Procedural knowledge ranges from relatively simple actions (e.g., correctly holding a pencil or gripping a tennis racket) to far more complex skills, such as writing in cursive or hitting a forehand stroke in tennis. These complex skills are acquired slowly over a period of time, often only with a lot of practice.[80] People who show exceptional ability in a particular skill domain—say, in figure skating or playing the piano—typically practice a great deal, often a minimum of 3 to 4 hours a day over a period of 10 years or more.[81] As an example from the workplace years ago, employees operating a cigar-making machine didn't reach their maximum speed at making cigars until after two years, when they had completed the process about 3 million times.[82]

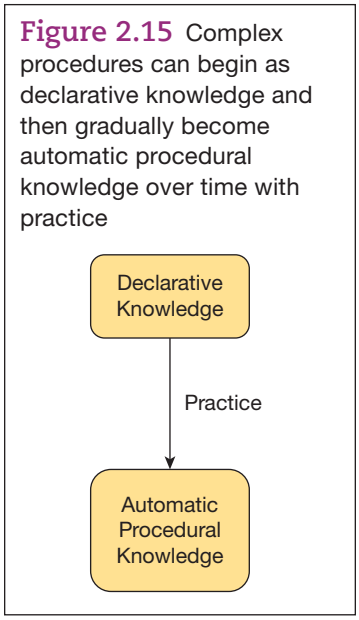


Figure 2.15 Complex procedures can begin as declarative knowledge and then gradually become automatic procedural knowledge over time with practice

Many complex procedures begin largely as explicit, declarative knowledge—in other words, as *information* about how to execute a procedure rather than as the actual *ability* to execute it. For example, hitting a forehand stroke in tennis may involve the following basic declarative knowledge: (1) turning sideways, (2) bending knees slightly, (3) bringing the tennis racket back to a hitting position, and (4) following through with the stroke after contacting the ball. When learners use declarative knowledge to guide them as they carry out a new procedure, their performance is slow and laborious and requires a lot of concentration and mental effort. At this point, teachers or coaches may need to remind learners about the steps involved in the procedure, and learners may need to talk themselves through their actions (e.g., "bring the racket back and then follow through"). But as they continue to practice the activity, their declarative knowledge gradually evolves into procedural knowledge. This knowledge becomes fine-tuned over time and eventually allows learners to perform an activity quickly and efficiently—that is, with automaticity (see Figure 2.15).[83]

Automaticity frees up working memory capacity for other tasks.

Working memory—the active, "thinking" part of the human memory system—can handle only so much at a time. Thus, when much of its capacity must be used for recalling single facts or carrying out simple procedures, little room remains for addressing the more complex aspects of a task. One key reason for learning some facts and procedures to automaticity, then, is to free up working memory capacity for complex tasks and problems that require those facts and procedures.[84] For example, fourth-graders who encounter the multiplication problem

$$\begin{array}{r} 87 \\ \times 59 \\ \hline \end{array}$$

can solve it more easily if they can quickly retrieve such basic facts as $9 \times 8 = 72$ and $5 \times 7 = 35$. High school chemistry students can more easily interpret Na_2CO_3 (sodium carbonate) if they don't have to stop to think about what the symbols *Na*, *C*, and *O* represent. And eighth-graders can spend more time focusing on the content and structure of their essays as they write if they have automatized basic spelling, grammar, and handwriting or keyboarding skills.[85]

[79] Ericsson et al., 2006.
[80] Ericsson, 2003; Macnamara et al., 2014; Proctor & Dutta, 1995.
[81] Ericsson, 1996; Horn, 2008.
[82] Crossman, 1959.
[83] J. R. Anderson, 1983, 1987; Baroody et al., 2013; Beilock & Carr, 2004.
[84] De La Paz & McCutchen, 2011; R. W. Proctor & Dutta, 1995; L. B. Resnick, 1989; Walczyk et al., 2007.
[85] Limpo & Alves, 2013.

With age and experience, children acquire more effective learning strategies and use them more intentionally.

Sometimes children learn from an experience without really giving the situation much thought. For example, as infants and toddlers acquire the basic vocabulary and syntax of their first language, they seem to do so without consciously trying to acquire these things or thinking about what they're learning. Much of this unconscious learning that occurs during infancy and toddlerhood is called *implicit learning*, and even older children and adults continue to learn some things about their environments in a nonintentional, "thoughtless" way.[86] For example, if one of us authors said, "I used to live in Colorado," you might immediately deduce that she lived in or near the Rocky Mountains, and you might even picture snow-capped mountains in your head. In this case you're automatically engaging in elaboration and visual imagery: The statement made no mention of the Rockies, so you supplied this information from your own long-term memory.

As children get older, they increasingly engage in intentional, *explicit learning*: They consciously think about, interpret, and reconfigure what they see and hear in their environment in their efforts to learn and remember information. For example, in the "Twelve Words" exercise you completed previously in the chapter, you may have quickly noticed the categorical nature of the words in the list and intentionally used the categories *flowers*, *fruit*, and *tools* to organize them. Similarly, in the "Five Chinese Words" exercise, you intentionally formed visual images in accordance with the instructions. When learners intentionally engage in certain cognitive processes to help them reach their goal of learning and remembering something, they're engaging in explicit learning using a **learning strategy**.

A general inclination to relate new information to prior knowledge—meaningful learning—occurs in one form or another at virtually all age levels.[87] More specific and intentional learning strategies (e.g., rehearsal, organization, visual imagery) are fairly limited in the early elementary years but increase in both frequency and effectiveness over the course of childhood and adolescence. The frequency of elaboration—especially as a process that learners intentionally use to help them remember something—picks up a bit later, often not until adolescence, and is more common in high-achieving students. Table 2.2 summarizes developmental trends in learning strategies across the grade levels.

Teaching Strategies: Encouraging Effective Long-Term Memory Storage Processes

Students who are paying attention and not overloaded with information are ready to actively think about what they're studying. To do so, they need to consciously and intentionally engage in effective meaningful learning strategies, such as organization, visual imagery, and elaboration. The following recommendations provide suggestions for how teachers can use these strategies to help students to encode information into their long-term memory.

Help students learn concepts through the use of defining features, examples, and nonexamples.

Remember from earlier in the chapter that our ability to categorize objects is based on recognizing the object's defining features and/or comparing the object to exemplars or a prototype in our mind. As a result, the strategies for teaching concepts to students generally involve (1) teaching them the defining features of the concept and (2) providing them with examples and nonexamples so that they will have exemplars and can form a prototype. The Classroom Strategies box "Teaching Concepts" provides some specific strategies for how to accomplish these things.

[86] P. A. Alexander et al., 2009; S. W. Kelly et al., 2001; Kihlstrom, 2013; Siegel, 2012.
[87] G. Mandler, 2011; Pressley & Hilden, 2006; Siegler & Alibali, 2005; R. F. Williams, 2012.

Developmental Trends

Table 2.2 Typical Learning Strategies at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **Grades K–2**	• Organization of physical objects as a way to remember them • Occasional rehearsal to remember verbal material; used infrequently and relatively ineffectively • Emerging ability to use visual imagery to enhance memory, especially with adult prompting • Few intentional efforts to learn new information; learning and memory are a by-product of other things children do (creating things, talking about events, etc.)	At the end of the school day, a first-grade teacher reminds students that they need to bring three things to school tomorrow: an object that begins with the letter *W* (for a phonics lesson), a signed permission slip for a field trip to a local historic site, and a warm jacket to wear on the field trip. Six-year-old Cassie briefly mumbles "jacket" to herself a couple of times and naively assumes she'll remember all three items without further mental effort.	• Get students actively involved in topics, perhaps through hands-on activities, engaging reading materials, or fantasy play. • Relate new topics to students' prior experiences. • Model rehearsal as a strategy for remembering things over the short run. • Provide pictures that illustrate verbal material. • Give students concrete mechanisms for remembering to do things (see upcoming discussions of *retrieval cues*).
JohnnyGreig/E+/Getty images **Grades 3–5**	• Spontaneous, intentional, and increasingly effective use of rehearsal to remember things for a short time period • Increasing use of organization as an intentional learning strategy for verbal information • Increasing effectiveness in use of visual imagery as a learning strategy	As 10-year-old Dimitri studies for an upcoming quiz on clouds, he looks at photos of four kinds of clouds in his science book and says each one's name aloud. Then he repeats the four cloud types several times: "Cumulus, cumulonimbus, cirrus, stratus. Cumulus, cumulonimbus, cirrus, stratus. . . . "	• Emphasize the importance of making sense of information. • Encourage students to organize what they're learning; suggest possible organizational structures. • Provide visual aids to facilitate visual imagery, and suggest that students create their own drawings or visual images of things they need to remember.
Photo by Unsplash **Grades 6–8**	• Predominance of rehearsal as a learning strategy • Greater abstractness and flexibility in categories used to organize information • Emergence of elaboration as an intentional learning strategy	Raj and Owen are studying for a middle school science quiz on kinds of rocks. "Let's group them somehow," Raj says. Owen suggests grouping them by color (gray, reddish, etc.). But after further discussion, the boys agree that sorting them into *sedimentary*, *igneous*, and *metamorphic* would be a better approach.	• Suggest questions that students might ask themselves as they study; emphasize questions that promote elaboration (e.g., "Why would _____ do that?" "How is _____ different from _____?"). • Assess true understanding rather than rote memorization in assignments and quizzes.
Photo by Unsplash **Grades 9–12**	• Continuing reliance on rehearsal as an intentional learning strategy, especially by low-achieving students • Increasing use of elaboration and organization to learn new material, especially by high-achieving students	In a high school history class, Kate focuses her studying on memorizing names, dates, and places. In contrast, Janika likes to speculate about the personalities and motives of such historical characters as Alexander the Great, Napoleon Bonaparte, and Adolf Hitler.	• Ask thought-provoking questions that engage students' interest and help students see the relevance of topics to their own lives. • Have students work in mixed-ability cooperative groups, in which high-achieving students can model effective learning strategies for low-achieving students.

Sources: Bjorklund & Coyle, 1995; Bjorklund & Jacobs, 1985; Bjorklund et al., 1994; Cowan et al., 2006; DeLoache & Todd, 1988; Gaskins & Pressley, 2007; Gathercole & Hitch, 1993; Kosslyn et al., 1990; Kunzinger, 1985; Lehmann & Hasselhorn, 2007; Lucariello et al., 1992; Marley et al., 2008; L. S. Newman, 1990; Oftinger & Camos, 2018; P. A. Ornstein et al., 2010; Plumert, 1994; Pressley, 1982; Pressley & Hilden, 2006; Schneider & Pressley, 1989; Schwamborn et al., 2010.

Help students organize ideas by making connections among them.

At all grade levels, many students focus on learning isolated facts, without gaining an understanding of how the facts fit together.[88] Yet the more interrelationships students identify within the subject matter they're learning—in other words, the better they *organize* it—the more easily they can remember and apply it later on. When students form many logical connections within the specific concepts and ideas of a topic, they gain a **conceptual understanding** of the

[88] M. Carr, 2010; De Corte et al., 2010; Lesgold, 2001; M. C. Linn & Eylon, 2011; Paxton, 1999.

Classroom Strategies

Teaching Concepts

- **Give a definition.**
  A high school geometry teacher defines a *sphere* as "the set of points in three-dimensional space that are equidistant from a single point."
- **Highlight the characteristics that all or most examples of a concept possess.**
  A teacher illustrates the concept *insect* with a line drawing that emphasizes its three body parts, three pairs of legs, and two antennae in bold black lines. The drawing downplays other, irrelevant characteristics that might be visible, such as the insect's color and the presence of wings.
- **Present a best example—a prototype that captures the key elements of the concept.**
  To illustrate the concept *democracy*, a social studies teacher describes a hypothetical, ideal government.
- **Present a wide range of examples in diverse contexts.**
  A music teacher plays a *minor chord* in several keys, first on a piano and then on a guitar, and then she plays a recording of a popular song that includes many minor chords.
- **Present nonexamples, especially near misses, to show what the concept is *not*.**
  When a teacher describes what a *mammal* is, he explains why frogs and lizards don't fall into this category.
- **Ask students to identify examples and nonexamples from among numerous possibilities.**
  A language arts teacher gives students a list of sentences and asks them to identify the sentences that contain a dangling participle.
- **Ask students to generate their own examples of the concept.**
  A teacher asks students to think of examples of *adjectives* they frequently use in their own speech.
- **Show students how various concepts are related to one another—their similarities and differences, their hierarchical relationships, and so on.**
  A science teacher explains that the concepts *velocity* and *acceleration* have somewhat different meanings, even though they both involve speed.

Sources: R. M. Best et al., 2006; Brophy et al., 2009; Carmichael & Hayes, 2001; R. G. Cook & Smith, 2006; R. M. Gagné, 1985; Ormrod, 2016; Rawson et al., 2015; Rosch, 1977; B. H. Ross & Spalding, 1994; Tennyson & Cocchiarella, 1986; Zamary & Rawson, 2018.

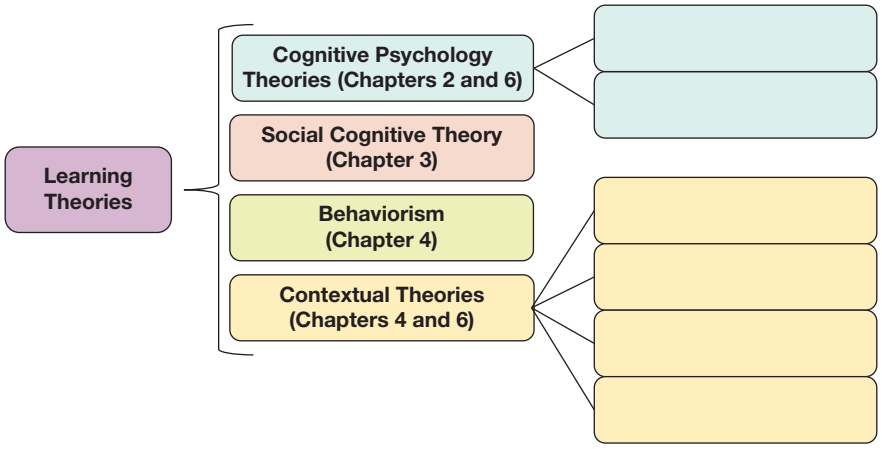
topic. For example, rather than simply memorize basic mathematical computation procedures, students should learn how those procedures reflect underlying principles of mathematics. And rather than learn historical facts as a list of unrelated people, places, and dates, students should put those facts within the context of major social and religious trends, economic considerations, human personality characteristics, and so on.

Here are some other strategies that teachers can use to help students organize new content material:

- Organize instructional units around a few core ideas and themes, always relating specific ideas back to this core.[89] For example, four of the core ideas in this chapter are shown in Figure 2.2, including that effective learners use strategies intentionally to help them remember information.
- Provide students with graphic organizers of the content either totally completed or partially completed (so that they can complete the remainder of the organizer).[90] For example, when studying learning theories, students could be given either the completed Figure 2.1 or partially completed Figure 2.16 (that they would then complete themselves) as a means to help them organize the content.
- Have students create charts or drawings that require them to pull together what they've been learning, as 9-year-old Trisha has done in her drawing of the water cycle in Figure 2.17.[91]
- Have students teach what they've learned to others—a task that may encourage them to focus on main ideas and pull these ideas together in a way that makes sense.[92]

[89] Brophy et al., 2009; Prawat, 1993; J. J. White & Rumsey, 1994.
[90] Colliot & Jamet, 2019.
[91] van der Veen, 2012; Wu & Rau, 2019.
[92] Hatano & Inagaki, 2003; McCaslin & Good, 1996; Roscoe & Chi, 2007.

Figure 2.16 When studying learning theories, students could be given either Figure 2.1 or this figure to complete as a means to help them organize the content



Ultimately, students are most likely to gain a conceptual understanding of a topic if they explore it in depth—for instance, by considering many examples, examining cause-and-effect relationships, and discovering how specific details relate to general principles. Accordingly, many educators advocate the principle *Less is more*: *Less* material studied more thoroughly is learned *more* completely and with greater understanding.[93]

Facilitate visual imagery.

Because all sighted people are visual learners, visual imagery can be a highly effective way to learn and remember information. Teachers can promote students' use of visual imagery in a variety of ways. For example, they can ask students to imagine how certain events in literature or history might have looked. They can provide visual materials (pictures, charts,

Figure 2.17 In this drawing, 9-year-old Trisha effectively integrates what she has learned about the water cycle

[93] Brophy et al., 2009; Marshall, 1992; Sizer, 1992, 2004.

videos, three-dimensional models, computer animations, etc.) that illustrate or graphically organize important ideas. And they can ask students to create their *own* pictures, diagrams, or models of things they're learning, as Trisha has done in her drawing of the water cycle (see Figure 2.17).[94] Often teachers help students remember new ideas more effectively when they encourage students to encode classroom subject matter *both* verbally and visually.[95] Teachers should try to integrate text and pictures as much as possible so that any text describing the picture is placed as close as possible to the part of the text that it refers to.[96]

Present questions and tasks that encourage elaboration.

The more students elaborate on new material—the more they add to it in some way using their existing knowledge—the more effectively they're apt to understand and remember it. The Classroom Strategies box "Encouraging Elaboration of Classroom Topics" describes and illustrates several ways teachers might help students effectively embellish on classroom topics.

Classroom Strategies

Encouraging Elaboration of Classroom Topics

- **Communicate the belief that students can and should make sense of what they're studying.**
  A middle school language arts teacher tells his class that he doesn't expect students to memorize the definitions he gives them for new vocabulary words. "Always put definitions in your own words," he says, "and practice using your new words in sentences. For example, one of the new words in this week's list is *garish.* Look at the definition I just gave you. In what situations might you use *garish*?"

- **Use analogies to compare the new information to something similar that the students already know.**
  An earth science teacher tells students that the geology of Virginia is like an ice cream sandwich because it's structured in layers with sedimentary rocks on top, igneous and metamorphic rocks mixed in the middle, and sedimentary rocks on the bottom (see Figure 2.18).

- **Ask questions that require students to draw inferences from what they're learning.**
  Students in a high school first-aid class have learned that when people suffer from traumatic shock, many normal bodily functions are depressed because less blood is circulating through the body. The teacher asks, "Given what you've learned about traumatic shock, why do experts recommend that if we find a person in shock, we *have the person lie down and keep him or her warm but not hot*?"

- **Have students apply what they've learned to new situations and problems.**
  To give her class practice in creating and interpreting bar graphs, a second-grade teacher asks children to write their favorite kind of pet on a sticky note she has given each of them. "Let's make a graph that can tell us how many children like different kinds of pets," she says. On the whiteboard the teacher draws a horizontal line and a vertical line to make the graph's *x*-axis and *y*-axis. "Let's begin by making a column for dogs," she continues. "How many of you wrote *dog* as your favorite pet? Seven of you? OK, put your sticky notes on the graph where I've written *dog.* We'll put them one above another to make a bar." After the dog lovers have attached their notes to the graph, the teacher follows the same procedure for cats, birds, fish, and so on.

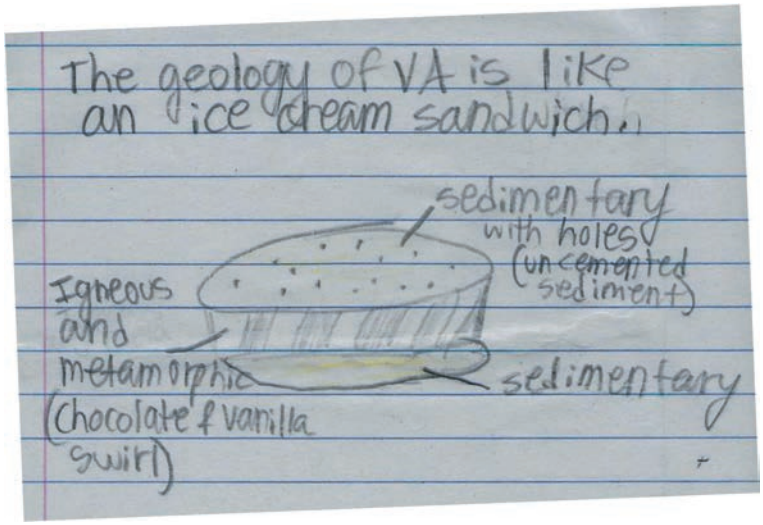
- **Focus on an in-depth understanding of a few general principles—the *big ideas* within a discipline—instead of covering many topics superficially.**
  In planning his geography curriculum for the coming school year, a fourth-grade teacher realizes that his students may gain little from studying facts and figures about numerous countries around the globe. Instead, he chooses six countries with very different cultures—Italy, Japan, Morocco, New Zealand, Peru, and Tanzania—that the class will focus on during the year. Through an in-depth study of these countries, the teacher plans to help his students discover how different climates, topographies, cultures, and religions lead to different lifestyles and economies.

- **Create opportunities for small-group or whole-class discussions in which students can freely exchange their views.**
  In a unit on World War II, a high school history teacher has students meet in small groups to speculate about the problems the Japanese people must have faced after atomic bombs were dropped on Hiroshima and Nagasaki.

Sources: Some strategies based on Brophy et al., 2009; Croninger & Valli, 2009; Middleton & Midgley, 2002; Slavin et al., 2003; N. M. Webb et al., 2008.

[94] R. K. Atkinson et al., 1999; Carlson et al., 2003; Edens & Potter, 2001; R. E. Mayer, 2010a; Sadoski & Paivio, 2001; Schwamborn et al., 2010; Van Meter, 2001; Van Meter & Garner, 2005; Verdi et al., 1996.
[95] R. E. Mayer, 2011; Moreno, 2006; Sadoski & Paivio, 2001; Winn, 1991.
[96] De Koning et al., 2020.

Figure 2.18 This student drew and labeled a diagram to show how the geology of Virginia is similar to an ice cream sandwich after her teacher used this analogy in class. This diagram may help the student encode the information through elaboration (the analogy) and visual imagery (the drawing).



Suggest mnemonics for hard-to-remember facts.

Some things are hard to make sense of—hard to learn meaningfully. For instance, why do bones in the human body have such names as *humerus*, *fibula*, and *ulna*? Why is *fáng* the Chinese word for "house"? Why is Augusta the capital of Maine? For all practical purposes, there's no logical reason to such facts.

When students are likely to have trouble making connections between new material and their prior knowledge, or when a body of information has an organizational structure with no obvious underlying logic (as is true for many lists), special memory tricks known as **mnemonics** (pronounced "ne-mon-iks") can help them learn classroom material more effectively.[97] Three commonly used mnemonics are described in Figure 2.19.

Focus assessments on meaningful learning rather than rote learning.

Teachers can use different types of assignments, exams, and other formal assessments to determine students' final class grades (we discuss assessments in detail in Chapter 10). Unfortunately, many teachers' classroom assessment practices can encourage students to learn school subjects in a rote rather than meaningful manner (e.g., see Figure 2.20). When students discover that assignments and exams focus primarily on recall of unrelated facts—rather than on understanding and application of an integrated body of knowledge—they may rely on rote learning, believing that this approach will yield a higher score and that meaningful learning would be counterproductive.[98] Consider a teacher who assesses students on their ability to remember 10 digits of the mathematical constant pi (3.141592653) for "pi day." Although this assessment may be worthwhile because some students find it "fun," it ultimately serves no practical purpose and may be counterproductive because it focuses on the rote learning of a constant that is readily available on

[97] Bulgren et al., 1994; M. S. Jones et al., 2000; Liao et al., 2019; Pressley et al., 1982; Scruggs & Mastropieri, 1989.

[98] Crooks, 1988; Newstead, 2004.

Figure 2.19 Common mnemonic techniques

VERBAL MEDIATION

A **verbal mediator** is a word or phrase that creates a logical connection, or "bridge," between two pieces of information. Verbal mediators can be used for such paired pieces of information as foreign-language words and their English meanings, countries and their capitals, chemical elements and their symbols, and words and their spellings. Following are examples:

Information to Be Learned	Verbal Mediator
Handschuh is German for "glove."	A glove is a *shoe* for the *hand*.
Quito is the capital of Ecuador.	Mos*quito*es are at the *equator*.
Au is the symbol for gold.	'*Ay, you* stole my *gold* watch!
The word *principal* ends with the letters *pal* (not *ple*).	The *principal* is my *pal*.
The *humerus* bone is the large arm bone above the elbow.	The *humorous* bone is just above the *funny* bone.

KEYWORD METHOD

Like verbal mediation, the **keyword method** aids memory by making a connection between two things. This technique is especially helpful when there is no logical verbal mediator to fill the gap—for example, when there is no obvious sentence or phrase to relate a foreign-language word to its English meaning. The keyword method involves two steps, which can be illustrated using the Spanish word *amor* and its English meaning, "love":

1. Identify a concrete object to represent each piece of information. The object may be either a commonly used symbol (e.g., a heart to symbolize love) or a sound-alike word (e.g., a suit of armor to represent *amor*). Such objects are *keywords*.
2. Form a mental image of the two objects together. To remember that *amor* means "love," you might picture a knight in a suit of armor with a huge red heart painted on his chest.

You used the keyword method when you learned the meanings of *fáng*, *mén*, *kè*, *fàn*, and *shū* in the "Five Chinese Words" exercise earlier in the chapter. Following are additional examples:

Information to Be Learned	Visual Image
Das Pferd is German for "horse."	Picture a *horse* driving a *Ford*.
Augusta is the capital of Maine.	Picture *a gust of* wind blowing through a horse's *mane*.
Tchaikovsky composed "Swan Lake."	Picture a *swan* swimming on a *lake*, wearing a *tie* and *cough*ing.

SUPERIMPOSED MEANINGFUL STRUCTURE

A larger body of information, such as a list of items, can often be learned by superimposing a meaningful organization—a familiar shape, word, acronym, sentence, rhythm, poem, or story—on the information. Following are examples of such **superimposed meaningful structures**:

Information to Be Learned	Superimposed Meaningful Structure
The shape of Italy	A "boot"
The Great Lakes (Huron, Ontario, Michigan, Erie, Superior)	HOMES
Strings on a guitar (E A D G B E)	Edgar ate dynamite. Good-bye, Edgar.
The number of days in each month	Thirty days has September. . . .
How to turn a screw (clockwise to tighten it; counterclockwise to loosen it)	Righty, tighty; lefty, loosey.
How to multiply in a mathematical expression of the form (*axb*)(*cxd*)	FOIL: multiply the *F*irst terms within each set of parentheses, then the two *O*uter terms, then the two *I*nner terms, and finally the *L*ast terms

calculators and computers, which could take away time from students truly understanding the concept of why pi is important (Do you think that most students understand that the circumference of a circle is pi multiplied by the diameter?). Ultimately, teachers must communicate in every way possible—including in their classroom assessments—that it's more important to *make sense* of classroom material than to memorize it.

Figure 2.20 Seventh-grade science students complete these and other fill-in-the-blank questions while they watch a video about dinosaurs. Although the questions probably help students pay attention to the video, they encourage rote rather than meaningful learning.

1) One of the coolest things about dinosaurs is that of all the millions there were, we only know about a few thousand of them.
2) The word "fossil" comes from the Latin word meaning dug up.
3) What four things can fossils tell us about dinosaurs?
1 age 3 what they did when living
2 look like 4 size/weight
4) Two steps in the process of fossilization are:
- need to die - then are covered in layers of sediment
5) One of the processes which forms a fossil is pre-mineralized This means that minerals replace the bones of the dinosaur.
6) The evidence that dinosaurs once lived is found in discovering fossils.
7) Scientists can learn about dinosaurs by observing where their fossils are buried, how deep the fossils are, and what is buried nearby the dinosaur fossils.
8) Dinosaurs lived on earth for about 160 million years.
9) Dinosaurs died out about 65 million years ago.
10) One reason dinosaurs may have become extinct is a meteorite.

Figure 2.21 Occasional rote practice of numerals and letters can be helpful in promoting automaticity, but too much conveys the idea that learning basic skills is boring and tedious. Here 5-year-old Gunnar has practiced writing numerals 1 through 9, although he practiced writing 9 *backward*!

Provide many opportunities to practice important knowledge and skills.

There are a few reasons that it's beneficial for people to learn some knowledge and skills to automaticity. One reason is that doing so enables them to participate more effectively at physical activities, such as typing or playing a sport. The best athletes practice the skills in their sport over and over to achieve expertise. Another reason to achieve automaticity at a task is to free up "room" in working memory capacity to do more complex tasks.[99] For example, to read well, students must be able to recognize most of the words on the page without having to sound them out or look them up in the dictionary.

Ultimately, students can learn basic information and skills to automaticity only by using and practicing them repeatedly over time.[100] This is not to say that teachers should fill each day with endless drill-and-practice exercises involving isolated facts and procedures (e.g., see Figure 2.21). Automaticity can sometimes occur just as readily when the basics are embedded in a variety of stimulating and challenging activities. Furthermore, students should practice new skills within the context of instruction and guidance that help them *improve* those skills. The Classroom Strategies box "Helping Students Acquire New Skills" provides examples of instructional strategies that can help students more effectively acquire procedural knowledge.

At the same time, teachers must be aware that automaticity has a downside.[101] In particular, students may quickly recall certain ideas or perform certain procedures when other, less automatic ideas or procedures are more useful. Students can be more flexible—and thus more likely to identify unique approaches to situations or creative solutions to problems—if they aren't automatically "locked in" to a particular response. We revisit this issue in our discussion of *mental set* in Chapter 3.

[99] De La Paz & McCutchen, 2011; R. E. Mayer & Wittrock, 1996; Sweller, 1994; Walczyk et al., 2007.
[100] Karpicke, 2012; R. W. Proctor & Dutta, 1995; Rohrer & Pashler, 2010.
[101] Killeen, 2001; E. J. Langer, 2000; LeFevre et al., 1988.

Classroom Strategies

Helping Students Acquire New Skills

- **Help students understand the logic behind the procedures they're learning.**
  As a teacher demonstrates the correct way to swing a tennis racket, he asks his students, "Why is it important to have your feet shoulder-width apart rather than together? Why is it important to follow through with your swing after you hit the ball?"
- **When skills are especially complex, break them into simpler tasks that students can practice one at a time.**
  Knowing that driving a car involves many procedures, a driver education teacher begins behind-the-wheel instruction by having students practice steering and braking in an empty school parking lot. Only later, after students have mastered these skills, does she have them look in the rearview mirror and use their turn signal to change lanes.
- **Provide mnemonics that can help students remember a sequence of steps.**
  A math teacher presents this equation:

$$y = \frac{3(x + 6)^2}{2} + 5$$

  "When x equals 4, what does y equal?" she asks. She gives students a mnemonic, *Please excuse my dear Aunt Sally*, that they can use to help them remember how to solve problems involving such complex algebraic expressions. First, you simplify things within parentheses (this is the *P* in *Please*). Then, you simplify anything with an exponent (this is the *e* in *excuse*). Then, you do any necessary multiplication and division (these are the *m* and *d* in *my dear*). Finally, you do any remaining addition and subtraction (these are the *A* and *S* in *Aunt Sally*).
- **Give learners many opportunities to practice new skills.**
  A basketball coach requires each of his players to shoot 30 foul shots at the end of every practice to help them improve their shooting.
- **Provide frequent feedback to help students improve.**
  A science teacher asks his students to write lab reports after each week's lab activity. He writes numerous comments when he grades the reports to describe the strengths he sees and to provide suggestions for making the reports more objective, precise, or clear.

Sources: P. A. Alexander & Judy, 1988; J. R. Anderson et al., 1996; Beilock & Carr, 2004; Ennis & Chen, 2011; Hattie & Timperley, 2007; Hecht et al., 2003; R. W. Proctor & Dutta, 1995; Shute, 2008; van Merriënboer & Kester, 2008.

Be on the lookout for students who have unusual difficulty with certain cognitive processes.

Some students may show ongoing difficulties in processing and learning from academic lessons or social interactions. Students with **learning disabilities** have significant deficits in one or more specific cognitive processes. For instance, they may have trouble remembering verbal instructions, recognizing words in print (*dyslexia*), or thinking about and remembering information involving numbers (*dyscalculia*). Students with **attention-deficit hyperactivity disorder (ADHD)** may show marked deficits in attention, have trouble inhibiting inappropriate thoughts and behaviors, or both. Most experts believe that learning disabilities and ADHD have a biological basis, sometimes as a result of genetic inheritance and sometimes as a result of adverse environmental conditions (e.g., exposure to toxic substances) during early brain development.[102]

When students have been officially identified as having a learning disability or ADHD, specialists are often called on to assist them in their learning. Even so, most of these students are in general education classrooms for much or all of the school day. Strategies for working effectively with them include the following:[103]

- Identify and capitalize on the times of day when students learn best.
- Minimize distractions (e.g., provide a quiet work location or headphones that block distracting noises).
- Explicitly present the information students need to learn and be explicit about how various ideas are organized and interrelated.

[102] Barkley, 2010; Nigg, 2010; Rosen et al., 2009; Shaywitz et al., 2006.
[103] Barkley, 2006; Brigham & Scruggs, 1995; Eilam, 2001; E. S. Ellis & Friend, 1991; J. M. Fletcher et al., 2007; N. Gregg, 2009; Meltzer, 2007; Pellegrini & Bohn, 2005; Wilder & Williams, 2001.

- Use multiple modalities to present information (e.g., supplement verbal explanations with pictures or simple diagrams).
- Assertively address students' areas of weakness (e.g., in reading or math).
- Provide technological aids that can enhance students' performance (e.g., text-to-speech software for poor readers, spell checkers for poor spellers).
- Teach mnemonics for important facts and procedures.
- Help students organize and use their time effectively.
- Teach general learning and memory strategies.
- Provide a structure to guide students' learning efforts (e.g., present a partially filled-in outline for taking notes; suggest questions to answer while reading a textbook chapter; break large projects into small, manageable steps).
- Keep study sessions short and provide frequent breaks so that students can release pent-up energy.
- Regularly monitor students' recall and understanding of classroom material.

Some of these strategies should look familiar because you've seen them at earlier points in the chapter. We revisit others when we discuss metacognition and self-regulation in Chapter 3. By and large, the most effective strategies for students with special educational needs are the same ones that are especially effective with *any* learner. Clearly, then, effective instruction involves a lot more than simply telling students what they need to learn.

2.4 Learning as Active Construction

Big Idea 2.4 **Learners actively create much of what they know and believe about the world based on their existing knowledge and beliefs.**

Knowledge Construction

As we noted in the prior section, people learn some things implicitly, by mindlessly "soaking up" certain regularities in their environment.[104] However, a theme from the prior section is that in order to encode information, people need to be actively involved in the process of learning. In fact, a good deal of learning involves a process of **construction**: In an effort to make sense of their experiences, people use many separate tidbits of information to create a general understanding, interpretation, or recollection of some aspect of their world.[105] People are apt to construct their own, unique understandings of any given topic or situation, and these understandings may be accurate—or *not*—to varying degrees. Theories that focus primarily on the nature of constructive processes in learning are collectively known as **constructivism**.

Individual constructivism is a theoretical perspective that focuses on how learners construct their own idiosyncratic meanings from their experiences. This perspective can be contrasted with **social constructivism**, which focuses on how learners construct their knowledge through their interactions with another person or a group of people.

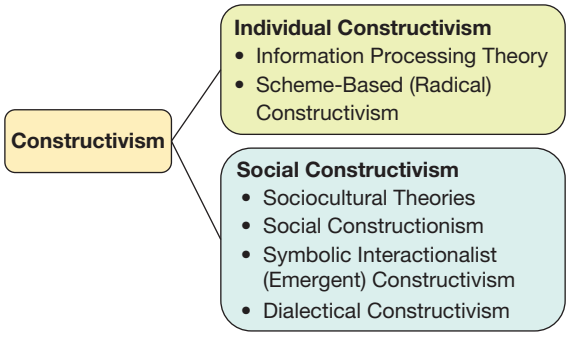
[104] For example, see Aslin & Newport, 2012.

[105] For two classic works on constructive processes in learning, see Bransford & Franks, 1971; Neisser, 1967.

This distinction between individual and social constructivism is very simplistic because, in reality, there are many different types of constructivism, which have different assumptions about the nature of knowledge construction and have different philosophical origins. However, we find this basic distinction useful to individuals new to these ideas. It's beyond the scope of this text to delve deeply into constructivist theories and philosophies, but some of the different types of constructivism are presented in Figure 2.22.

This section focuses primarily on individual constructivism, and specifically on information processing theory. However, ideas related to scheme-based (radical) constructivism are explained in Chapter 6, and ideas related to social constructivism are explained in Chapters 4 and 6.

Figure 2.22 A simplified representation of several different types of constructivism



Sources: Based on O'Donnel (2012); Prawat (1996).

Learners use what they already know and believe to help them make sense of new experiences.

In the following exercise, you'll almost certainly be able to see the process of construction in your own learning.

See For Yourself

Rocky

Read the following passage *one time only*:

> Rocky slowly got up from the mat, planning his escape. He hesitated a moment and thought. Things were not going well. What bothered him most was being held, especially since the charge against him had been weak. He considered his present situation. The lock that held him was strong, but he thought he could break it. He knew, however, that his timing would have to be perfect. Rocky was aware that it was because of his early roughness that he had been penalized so severely—much too severely from his point of view.[106]

Now summarize what you've just read in two or three sentences.

Were you able to make sense of the passage? What did you think it was about? A prison escape? A wrestling match? Or something else altogether? The passage leaves a lot unsaid; for instance, it tells us nothing about where Rocky was, what kind of "lock" was holding him, or why timing was important. Yet you were probably able to use the information you were given to construct an overall understanding of Rocky's situation. Most people find meaning of one sort or another in the passage.

Active, constructive processes in learning—what theorists sometimes refer to as *meaning making*—is also evident in the following exercise.

[106] R. C. Anderson et al., 1977, p. 372.

See For Yourself

Three Pictures

Look at the three pictures in Figure 2.23. What do you see in each one?

Figure 2.23 What do you see in these pictures?

Figures from "Age in the Development of Closure Ability in Children" by C. M. Mooney, 1957, *Canadian Journal of Psychology, 11*, p. 220. Copyright 1957 by Canadian Psychological Association. Reprinted with permission.

Most people perceive the picture on the left as being that of a woman, even though many of her features are missing. Enough features are visible—an eye and parts of her nose, mouth, chin, and hair—that you can construct a meaningful perception from them. Do the other two pictures provide enough information to enable you to construct two more faces? Constructing a face from the figure on the right may take you a while, but it can be done.

Objectively speaking, the three configurations of black splotches, and especially the two rightmost ones, leave a lot to the imagination. The woman in the middle is missing half of her face, and the man on the right is missing the top of his head. Yet knowing what human faces typically look like may have been enough to enable you to mentally add the missing pieces and perceive complete pictures. Curiously, once you've constructed faces from the figures, they then seem obvious. If you were to close this text now and not pick it up again for a week or more, you would probably see the faces almost immediately, even if you had had considerable trouble perceiving them originally.

In the "Rocky" and "Three Pictures" exercises you just completed, you were able to make sense of situations even though a lot of information was missing. Your prior knowledge—perhaps about typical prison escapes or wrestling matches and certainly about how human facial features are arranged—allowed you to fill in many missing details. Prior knowledge and beliefs usually play a major role in the meanings people construct.

When different learners construct different meanings from the same situation, it's often because they each bring unique prior experiences and knowledge to the situation. For instance, when the "Rocky" passage was used in an experiment with college students, physical education majors frequently interpreted it as a wrestling match, but music education majors (most of whom had little or no knowledge of wrestling) were more likely to think it was about a prison break.[107] Not only do learners bring different areas of expertise to a learning task, but they also bring different childhood experiences, cultural backgrounds, and general knowledge and assumptions about the world, and such differences are apt to have a significant impact on their meaning-making efforts.

[107] R. C. Anderson et al., 1977.

Prior knowledge and beliefs affect new learning, usually for the better but sometimes for the worse.

What learners already know provides a **knowledge base** on which new learning—especially *meaningful* learning—can build. For example, when you read the passage about Alejandro's visit to the doctor's office earlier in the chapter, you could make sense of the passage only if you've visited a doctor many times and know how such visits typically go. Generally speaking, people who already know something about a topic learn new information about the topic more effectively than people who have little relevant background.[108]

Occasionally, however, prior knowledge *interferes* with new learning. In some cases it may do so because learners make inappropriate connections. For example, when a fourth-grader named Rita was asked why America was once called the "New World," she responded that some of the early European explorers "wanted to get to China 'cause China had some things they wanted. They had some cups or whatever—no, they had furs."[109] Rita apparently associated the word *China* with dinnerware—including cups—and also knew that some early explorers sought exotic animal furs. In fact, the early explorers who were seeking a quick route to China wanted to get certain spices and other commodities unavailable at home—*not* cups or furs.

Learners' prior knowledge is either insufficient or incorrect. For example, imagine a group of children who think Earth is flat. This idea might be consistent with their early experiences, especially if they live in, say, Illinois or Kansas. You now tell them that the world is actually round. Rather than replacing the flat idea with a round one, they might pull both ideas together and conclude that Earth is shaped something like a pancake, which is flat *and* round. Alternatively, they might envision a hollow-sphere version of Earth, with people living on a flat surface within it (see Figure 2.24).[110]

Figure 2.24 One way of imagining an Earth that is both flat and round

As you can see, then, learners sometimes construct **misconceptions**—beliefs that are inconsistent with widely accepted and well-validated explanations of certain phenomena or events. Figure 2.25 presents examples of misconceptions that children and adolescents may bring with them to the classroom. Especially when such misconceptions are embedded in learners' general theories about the world, instruction intended to correct them may have little impact.[111] Instead, thanks to the process of elaboration—a process that usually facilitates learning—learners may interpret or distort the new information to be consistent with what they already "know" and thus continue to believe what they've always believed. For example, one 11th-grade physics class was studying the idea that an object's mass and weight do *not*, by themselves, affect the speed at which the object falls. Students were asked to build egg containers that would keep eggs from breaking when dropped from a third-floor window. They were told that on the day of the egg drop, they would record the time it took for the eggs to reach the ground. Convinced that heavier objects fall faster, a student named Barry added several nails to his egg container. Yet when he dropped it, classmates timed its fall at 1.49 seconds—a time very similar to that for other students' lighter containers. Rather than acknowledge that light and heavy objects fall at the same rate, Barry explained the result by rationalizing that "the people weren't timing real good."[112]

This tendency to look for what one thinks is true and to ignore evidence to the contrary is known as **confirmation bias**. For example, when students in a science lab observe results that are inconsistent with their expectations, many are apt to discredit the results, perhaps

[108] P. A. Alexander et al., 1994; Cromley & Azevedo, 2007; Hutchinson et al., 2016; Kintsch, 2009; Schneider, 1993; Shapiro, 2004.
[109] VanSledright & Brophy, 1992, p. 849.
[110] W. F. Brewer, 2008; Vosniadou et al., 2008.
[111] Derry, 1996; P. K. Murphy & Mason, 2006; Sinatra & Pintrich, 2003; C. L. Smith et al., 1997.
[112] Hynd, 1998a, p. 34.

Figure 2.25 Common student misconceptions

ASTRONOMY

Fact: Earth revolves around the sun.

Misconception: The sun revolves around Earth. It "rises" in the morning and "sets" in the evening, at which point it "goes" to the other side of Earth.

Fact: Earth is shaped more or less like a sphere.

Misconception: Earth is shaped like a round, flat disk *or* Earth is a hollow sphere with people living on a flat surface inside.

Fact: The four seasons are the result of the angle at which the sun's rays hit different parts of Earth's surface; distance from the sun is a largely irrelevant factor.

Misconception: The seasons are the result of Earth's distance from the sun; Earth is closer to the sun in the summer, farther away in the winter.

BIOLOGY

Fact: A living thing is something that carries on such life processes as metabolism, growth, and reproduction.

Misconception: A living thing is something that moves and/or grows. The sun, wind, clouds, and fire are living things.

Fact: A plant is a living thing that produces its own food.

Misconception: A plant takes in food from the ground. It grows in a garden and is relatively small.

PHYSICS

Fact: An object remains in uniform motion until a force acts on it; a force is needed only to *change* speed or direction.

Misconception: Any moving object has a force acting on it. For example, a ball thrown in the air continues to be pushed upward by the force of the throw until it begins its descent.

Fact: Light objects and heavy objects fall at the same rate unless other forces (e.g., air resistance) differentially affect the objects (e.g., feathers tend to fall slowly because they encounter significant air resistance relative to their mass).

Misconception: Heavy objects fall faster than light objects.

HISTORY AND GEOGRAPHY

Fact: Dinosaurs had long been extinct at the time that early human beings appeared on Earth.

Misconception: Dinosaurs and early humans inhabited Earth at the same time.

Fact: Maps and globes typically include a lot of human-constructed information that isn't evident on the physical Earth.

Misconception: The lines separating countries or states are marked on Earth.

Fact: Erosion is an ongoing process.

Misconception: Erosion is largely something that happened in the past; for example, the Grand Canyon is no longer eroding.

Fact: Rivers run from higher elevation to lower elevation.

Misconception: Rivers run from north to south (going "down" on a map). For example, rivers can run from Canada into the United States, but not vice versa.

MATHEMATICS

Fact: Multiplication and division can lead to either larger or smaller numbers (e.g., 5 divided by 1/2 is 10, a number larger than 5).

Misconception: Multiplication always leads to a larger number, and division always leads to a smaller number.

Fact: The size of a fraction is a function of the proportion of the top number relative to the bottom number.

Misconception: Fractions with large numbers indicate larger amounts than fractions with small numbers (e.g., the erroneous conclusion that 4/35 must be larger than 4/5).

Sources: W. F. Brewer, 2008; Brophy et al., 2009; S. Carey, 1986; Hynd, 1998a; Kyle & Shymansky, 1989; V. R. Lee, 2010; Liben & Myers, 2007; M. C. Linn & Eylon, 2011; Maria, 1998; Martínez et al., 2008; J. Nussbaum, 1985; K. J. Roth & Anderson, 1988; Sneider & Pulos, 1983; Vosniadou, 1994; Vosniadou & Brewer, 1987; Vosniadou et al., 2008; "rivers" misconception courtesy of R. K. Ormrod.

complaining that "our equipment isn't working right" or "I can never do science anyway."[113] Similarly, when students in a history class read accounts of a historical event that conflict with prior, not-quite-accurate beliefs about the event—especially if those beliefs are widely held in their cultural group—they may stick with their initial understandings.[114]

As you can see, then, although prior knowledge and beliefs about a topic are usually beneficial to learning, they can sometimes hinder learning.

Learners differ in the factors that influence their ability to learn and remember.

Children and adolescents differ considerably in the various factors that influence their ability to learn and remember in the classroom, including their attention spans, working memory capabilities, long-term memory storage processes, and prior knowledge. For

[113] Minstrell & Stimpson, 1996, p. 192.

[114] Levstik, 2011; Porat, 2004.

example, on average, girls have a slight edge over boys in keeping their attention focused on classroom activities and in performing certain kinds of memory tasks, such as remembering lists and specific life events.[115] And students of both genders vary in their general ability to think about, encode, and respond to new events and ideas quickly and easily. Some of this variability is the result of differences in working memory capacity and executive functioning. Students with a smaller overall capacity and minimal ability to mentally control what they're thinking about often have trouble remembering instructions, tackling complex tasks, and keeping their minds on a task at hand—all of which adversely affect their academic achievement levels.[116] Working memory and executive functioning difficulties are especially common in children who have grown up in chronically stressful living conditions, often as a result of living in extreme poverty.[117]

Students' prior knowledge can also vary significantly because each student has been exposed to a unique set of experiences, interpersonal relationships, and cultural practices and beliefs. Thus, students from diverse backgrounds may come to school with somewhat different knowledge—different concepts, schemas, scripts, self-constructed theories, and so on—that they'll use to make sense of any new situation.[118] To see what we mean, try the next exercise.

See For Yourself

The War of the Ghosts

Read the following story *one time only*:

> One night two young men from Egulac went down to the river to hunt seals, and while they were there it became foggy and calm. Then they heard war-cries, and they thought, "Maybe this is a war-party." They escaped to the shore, and hid behind a log. Now canoes came up, and they heard the noise of paddles, and saw one canoe coming up to them. There were five men in the canoe, and they said:
>
> "What do you think? We wish to take you along. We are going up the river to make war on the people."
>
> One of the young men said: "I have no arrows."
>
> "Arrows are in the canoe," they said.
>
> "I will not go along. I might be killed. My relatives do not know where I have gone. But you," he said, turning to the other, "may go with them."
>
> So one of the young men went, but the other returned home.
>
> And the warriors went on up the river to a town on the other side of Kalama. The people came down to the water, and they began to fight, and many were killed. But presently the young man heard one of the warriors say, "Quick, let us go home: that Indian has been hit." Now he thought: "Oh, they are ghosts." He did not feel sick, but they said he had been shot.
>
> So the canoes went back to Egulac, and the young man went ashore to his house, and made a fire. And he told everybody and said, "Behold I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick."
>
> He told it all, and then he became quiet. When the sun rose he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried.
>
> He was dead.[119]

Now cover the story, and write down as much of it as you can remember.

[115] Das et al., 1994; Halpern, 2006; Halpern & LaMay, 2000.
[116] Alloway, Gathercole et al., 2009; DeMarie & López, 2014; Miyake & Friedman, 2012.
[117] Evans & Schamberg, 2009; Masten et al., 2012; Noble et al., 2007.
[118] Berti et al., 2010; E. Fox, 2009; Levstik, 2011; Pritchard, 1990.
[119] Bartlett, 1932, pp. 71–72.

Compare your own rendition of the story with the original. What differences do you notice? Your version is almost certainly the shorter of the two, and you probably left out many details. But did you also find yourself distorting certain parts of the story so that it made more sense to you?

A Native American ghost story, "The War of the Ghosts" may be inconsistent with some of the schemas and scripts you've acquired from your own experiences, especially if you were raised in a non–Native American culture. In an early study of long-term memory, students at England's Cambridge University were asked to read this story twice and then to recall it at various times later on. Students' recollections of the story often included additions and distortions that made the story more consistent with English culture. For example, people in England rarely go "to the river to hunt seals" because seals are saltwater animals and most rivers have freshwater. Students might therefore say that the men went to the river to *fish*. Similarly, the ghostly aspect of the story didn't fit comfortably with most students' religious beliefs and so it was often modified. When one student was asked to recall the story 6 months after he had read it, he provided the following account:

> Four men came down to the water. They were told to get into a boat and to take arms with them. They inquired, "What arms?" and were answered "Arms for battle." When they came to the battle-field they heard a great noise and shouting, and a voice said: "The black man is dead." And he was brought to the place where they were, and laid on the ground. And he foamed at the mouth.[120]

Notice how the student's version of the story leaves out many of its more puzzling aspects—puzzling, at least, from his own cultural perspective. This finding demonstrates that learners' prior knowledge can affect how they understand new situations and provides another example of how learners actively construct their knowledge.

Teaching Strategies: Helping Students Construct Knowledge

Given the selective and constructive nature of human learning and memory, the things students learn in instructional settings are rarely complete and precise reproductions of what a teacher or textbook has presented. A teacher's goal, then, should not—and *cannot*—be that students absorb all the information they're given. A more achievable goal is that students construct appropriate and useful understandings of academic subject matter—that they make reasonable *sense* of it.

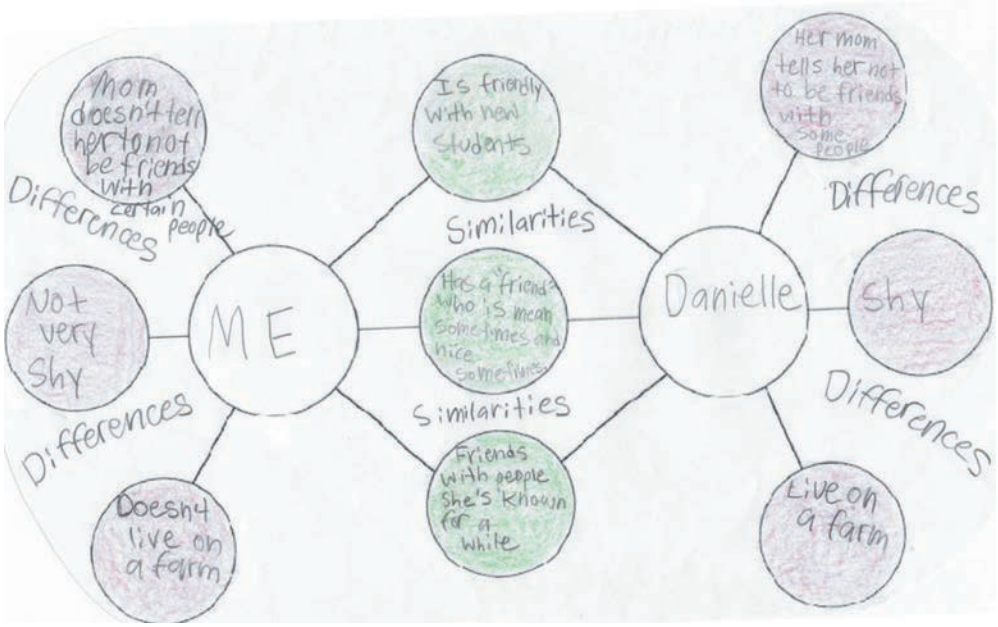
Relate new ideas to students' prior knowledge and experiences.

Students can more effectively learn and remember classroom subject matter if they connect it to many other things they already know. Yet students don't always make such connections on their own, and as a result they're likely to resort to rote learning. Teachers can promote more meaningful learning by encouraging students to relate new material to one or more of the following:

- Concepts and ideas in the same subject area—for example, recognizing that multiplication in arithmetic is simply a variation of addition
- Concepts and ideas in other subject areas—for example, considering how advances in atomic physics have affected historical events
- Students' general knowledge of the world—for example, relating the concept of *inertia* to how passengers are affected when an automobile quickly turns a sharp corner

[120] Bartlett, 1932, p. 65.

Figure 2.26 To help students relate characters in a book to their own experiences, a teacher asked his students to identify similarities and differences between themselves and a character in the book (in this case, Danielle)



- Students' personal experiences—for example, identifying similarities and differences between a character in a book and themselves (see Figure 2.26)
- Students' current activities and needs outside of the classroom—for example, applying persuasive writing skills in crafting a personal essay for a college application
- Students' sense of place—for example, connecting themes in novels to local people and places[121]

Ideally, teachers should use students' existing knowledge as a starting point whenever they introduce a new topic—a strategy known as **prior knowledge activation**. For example, in a first-grade classroom, teachers might begin a unit on plants by asking students to describe what their parents do to keep flowers or vegetable gardens growing. Or, in a secondary English literature class, teachers might introduce Sir Walter Scott's *Ivanhoe* (in which Robin Hood is a major character) by asking students to tell the tale of Robin Hood as they know it.

Take advantage of students' diverse background knowledge in designing instruction.

Although some students may lag behind their classmates in such basic academic skills as reading, writing, and computation, they're apt to bring many strengths to the classroom. They may have a wealth of knowledge about pop culture (e.g., music lyrics, dialogues from popular movies) or they may be quite clever at improvising with everyday objects.[122] If they work part time, they may have a good understanding of the working world. If financial resources have been particularly scarce in their family, they may have a special appreciation for basic human needs and true empathy for victims of war or famine around the world. As these examples demonstrate, students who lack basic academic skills may have more knowledge and skills in other areas than their peers.

[121] Azano, 2011.
[122] Alim, 2007; Freedom Writers, 1999; Torrance, 1995.

Teachers can take advantage of these diverse backgrounds when designing instruction. For example, teachers can ensure that students with diverse backgrounds participate in class discussions to share their perspectives. And during activities when students work together in groups, teachers can place students with different backgrounds in the same group. Then, as students work on activities in their group, they can share their unique perspectives and knowledge, as well as help their peers understand ideas from different perspectives.[123]

Provide experiences on which students can build.

In some instances, students simply don't have the background knowledge they need to understand a new topic. In such cases, teachers can provide concrete experiences that provide a foundation for classroom lessons. For example, students can better understand how large some dinosaurs were if they see a life-size dinosaur skeleton at a natural history museum. They can more easily understand the events of an important battle if they visit the battlefield. Often teachers can create foundational experiences at school, perhaps by offering opportunities to work with physical objects and living creatures (e.g., timing the fall of light versus heavy objects, caring for a class pet), providing online activities that simulate complex activities (e.g., running a lemonade stand, dissecting a frog), or conducting in-class activities similar to those in the adult world (e.g., trying a mock courtroom case, conducting a political campaign).

Identify and address students' misconceptions.

Teachers often present new information with the expectation that it will correct students' erroneous beliefs. Yet students of all ages can hold on quite stubbornly to their existing misconceptions about the world, even after considerable instruction that explicitly contradicts them.[124] In some cases students never make the connection between what they're learning and what they already believe, perhaps because they're engaging in rote learning as they study academic subject matter. In other instances students truly try to make sense of classroom material, but—thanks to the process of elaboration—they interpret new information in light of what they already "know" about the topic, and they may reject or discredit something that doesn't fit. (Recall the earlier discussion of *confirmation bias*.)

When students hold scientifically inaccurate or in other ways counterproductive beliefs about the world, teachers must work actively and vigorously to help them revise their thinking. That is, teachers must encourage **conceptual change**. The Classroom Strategies box "Promoting Conceptual Change" presents and illustrates several potentially useful techniques.

Regularly assess students' understandings.

Teachers must continually keep in mind that students will each interpret classroom subject matter in their own idiosyncratic ways, and occasionally they may construct *mis*information. They may also interpret nonacademic interactions in ways their teachers didn't anticipate. For example, the first day that 8-year-old Darcy attended third grade at a new school, she accidentally got egg in her hair. Her teacher, Mrs. Whaley, took her to the nurse's office to have the egg washed out. As revealed in the journal entries in Figure 2.27, Darcy initially misinterpreted Mrs. Whaley's comment as unflattering criticism. Not until 5 days later did she learn Mrs. Whaley's intended meaning.

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[123] Miyake & Kirschner, 2014.

[124] Chambliss, 1994; Chinn & Brewer, 1993; Hynd, 1998b; M. C. Linn & Eylon, 2011; Strike & Posner, 1992; Vosniadou, 2008.

Classroom Strategies

Promoting Conceptual Change

- **Probe for misconceptions that may lead students to interpret new information incorrectly.**
  When a third-grade teacher asks, "What is gravity?" one student replies that it's "something that pulls you down." The teacher points to Australia on a globe and asks, "What do you mean by *down*? What do you think would happen if we traveled to Australia? Would gravity pull us off Earth and make us fall into space?"

- **Provide information and experiences that explicitly contradict students' misunderstandings.**
  In a lesson about air, a first-grade teacher addresses the common misconception that air has no substance. She asks students to predict what will happen when she submerges an upside-down glass in a large bowl of water, and the children have differing opinions about whether the "empty" glass will fill with water. The teacher stuffs the glass with a crumpled paper towel, turns it upside down, and pushes it straight down into the water. The paper towel remains dry, leading the class to a discussion of how air takes up space.

- **Ask questions that challenge students' misconceptions.**
  A high school physics teacher has just begun a unit on inertia. Some students assert that when a baseball is thrown in the air, a force continues to act on the ball, pushing it upward for a short while. The teacher asks, "What force in the air could possibly be pushing that ball upward after it has left the thrower's hand?" The students offer several possibilities but acknowledge that none of them provides a satisfactory explanation.

- **Show students how an alternative explanation is more plausible and useful (i.e., how it makes more sense) than their original belief.**
  The same physics teacher from the prior example points out that the baseball continues to move upward even though no force pushes it in that direction. He brings in the concept of *inertia*: The ball needs a force only to get it *started* in a particular direction. Once the force has been exerted, other forces (gravity and air resistance) alter the ball's speed and direction.

- **Give students corrective feedback about responses that reflect misunderstanding.**
  Students in a fourth-grade class have just completed a small-group lab activity in which they observe the reactions of earthworms to varying conditions. Their teacher asks them, "What happens if an earthworm dries out?" One student responds, "They like water; they like to splash around in it . . . if they're in the hot sun they can die because they'll dry up . . . their cells will get hard." The teacher acknowledges that the student is right about the preference for moist conditions while also gently refining the student's explanation: "Right, good. I don't think they usually like to splash around in water so much, but they like to stay where it's moist."

- **Build on any kernels of truth in students' existing understandings.**
  When asked "What is rain?" a sixth-grader says that it's "water that falls out of a cloud when the clouds evaporate . . . it comes down at little times like a salt shaker when you turn it upside down . . . there's little holes [in the cloud] and it just comes out." The teacher identifies two accurate understandings in the student's explanation: (1) clouds have water and (2) evaporation is involved in the water cycle. She uses this knowledge as starting points for further instruction; for instance, she clarifies where in the water cycle evaporation is involved (i.e., in cloud formation) and how a cloud actually *is* water, not a shaker-like water container.

- **When pointing out misconceptions, do so in a way that maintains students' self-esteem.**
  A fourth-grade teacher begins a lesson on plants by asking, "Where do plants get their food?" Various students suggest that plants get their food from dirt, water, or fertilizer. The teacher responds, "You know, many children think exactly what you think. It's a very logical way to think. But actually, plants *make* their food, using sunlight, water, and things in the soil." The teacher then introduces the process of photosynthesis.

- **Engage students in discussions of the pros and cons of various explanations.**
  A high school psychology teacher tells students that they're going to examine whether animals should be used for scientific testing. The teacher divides students into groups of four and places two students in Group A and two students in Group B. Group A students receive resources (e.g., website links) to use as they research the pros of animal testing and Group B receives similar resources to research the cons. After their research, each group argues for their position while the other group takes notes. Then, students switch positions and argue for the other position. Lastly, all four students write down the best arguments for both sides using evidence to support their rationales.

- **Ask students to apply their revised understandings to new situations and problems.**
  When several students express the belief that rivers always run from north to south, a middle school geography teacher reminds them that water travels from higher elevations to lower elevations, not vice versa. She then pulls out a map of Africa. "Let's look at the Nile River," she says. "One end of the Nile is here [she points to a spot on Egypt's Mediterranean coast] and the other end is here [she points to a spot in Uganda]. In which direction must the Nile be flowing?"

Sources: C. Chan et al., 1997; Chinn & Samarapungavan, 2009; D. B. Clark, 2006; diSessa, 2006; Hattie & Timperley, 2007; M. C. Linn & Eylon, 2011; Mason et al., 2008; P. K. Murphy & Mason, 2006; Pine & Messer, 2000; Pintrich et al., 1993; Putnam, 1992; Slusher & Anderson, 1996; C. L. Smith, 2007; Stepans, 1991, p. 94 (salt shaker example); Vosniadou, 2008; Zohar & Aharon-Kraversky, 2005.

Figure 2.27 As you can see from her journal entries, 8-year-old Darcy initially interpreted a casual remark to the school nurse in a way very different from the teacher's intended meaning. Fortunately, the teacher corrected the misunderstanding a few days later.

October 22nd
I went to a new school today. My teacher's name is Mrs. Whaley. I accidentally cracked an egg on my head. Mrs. Whaley told the nurse that I was a show off and a nuisance. I got really sad and wanted to run away from school, but I didn't leave.

. . .

October 27th
We presented our book reports today. I was the last one to present my book report. Whenever I did my book report, they laughed at me, but the teacher said they were laughing with me. I asked the teacher why she had called me a nuisance the first day. And she said, "Darcy, I didn't call you a nuisance. I was saying to Mrs. Larson that it was a nuisance to try to wash egg out of your hair." I was so happy. I decided to like Mrs. Whaley again.

It's essential, then, that teachers regularly monitor students' understandings about both academic topics and nonacademic issues. Asking questions, encouraging dialogue, listening carefully to students' ideas and explanations—all of these strategies can help teachers get a handle on the "realities" students have constructed for themselves.

2.5 Why Learners May or May Not Remember What They Have Learned

Big Idea 2.5 Human memory is fallible: Learners don't remember everything they learn, and sometimes they *mis*remember what they've learned.

Recalling Information

As we've seen, a great deal of the environmental input a learner receives never reaches long-term memory (as shown by the arrows labeled "lost" in Figure 2.7). Perhaps the learner didn't pay attention in the first place, so the information never went beyond the sensory register. Or perhaps after attending to it, the learner didn't continue to process it, so it went no further than working memory. Even when information does reach long-term memory, it needs considerable time—often several hours or longer—to completely "firm up," or *consolidate*, in the brain. Anything that interferes with this **consolidation** process—even something as seemingly "minor" as not getting a good night's sleep—adversely affects long-term memory of new information.[125]

But let's assume that new information of some sort *has* had the time and conditions it needs to consolidate in the brain. Under such circumstances, it may or may not be easy to retrieve, as reflected in the following general principles.

How easily something is recalled depends on how it was initially learned.

Retrieving information from long-term memory appears to involve following a pathway of associations. Almost literally, it's a process of going down Memory Lane. One idea reminds you of another idea—that is, one idea *activates* another—the second idea reminds

[125] Payne & Kensinger, 2010; Rasch & Born, 2008; Wixted, 2005.

you of a third idea, and so forth, in a manner similar to what happened when you followed a train of thought from the word *horse* earlier in the chapter. If the pathway of associations eventually leads you to what you're trying to remember, you will remember it. If the path takes you in other directions, you won't.[126] To be memorable, then, a new piece of information must be connected with other things already in long-term memory.

To illustrate this point, consider two adult brothers who grew up in Oregon. On a plane flight to visit some friends in Virginia they overhear people in the seats behind them discussing Civil War sites they plan to visit after they arrive in Virginia. One of the brothers asks the other, Gregg, if Virginia was part of the Union or Confederacy during the American Civil War. He thinks about it for a few seconds and then Gregg says that Virginia was part of the Confederacy. His brother asks him how he remembered that, and Gregg says:

> I remembered that the Union and Confederacy were separated by the Mason Dixon Line, with the Union to the north of the line and the Confederacy to the south. Then, I remembered driving from Pennsylvania to Florida when we were kids and mom saying that we were crossing the Mason-Dixon Line when we went from Pennsylvania to Maryland. I know that Virginia is south of Maryland so then I knew that Virginia must have been part of the Confederacy. I also remember seeing a map that showed the Mason-Dixon Line at the southern border of Pennsylvania. And now that we're talking about it, I remember that Richmond, Virginia, was the capital of the Confederacy.

Gregg's explanation demonstrates some important points about retrieving information from long-term memory. It's important to begin a memory search in a logical place. Gregg began his search by thinking about how states near Virginia were divided during the Civil War, which led him to search his memory for what he knew about the Mason-Dixon Line. Then, once he was able to remember the location of the Mason-Dixon Line, he was able to use his related knowledge that Virginia was part of the Confederacy.

Gregg's explanation also shows that people are more likely to retrieve information when they have *many* possible pathways to it; in other words, when they've associated the information with many other things they know and with many different contexts in which they might use it. If Gregg hadn't remembered the driving trip that he took when he was a child, he still could have answered the question correctly by visualizing the map showing the Mason-Dixon Line or by remembering that Richmond, Virginia, was the capital of the Confederacy. His knowledge gave him at least three possible pathways to answer this question correctly. By making connections to existing knowledge—that is, by engaging in meaningful learning—learners are more likely to know where to look for information when they need it. Otherwise, they may never retrieve it again.

think about it
Think of an exam you've recently taken. Which student would have gotten a higher score: one who had studied the course material verbatim or one who had engaged in meaningful learning?

Remembering depends on the context and retrieval cues.

Sometimes learners acquire and practice certain behaviors and ways of thinking in a very limited set of environments—say, in their science or foreign language classes. When this happens, the learners may associate those behaviors and ways of thinking *only* with those particular environments and thus fail to retrieve what they've learned when they're in other contexts. This tendency for some responses and cognitive processes to be associated with and retrieved only in some contexts but not others—or more easily retrieved in certain physical or social contexts—is often called **situated learning** or **situated cognition**.[127] For example, if students associate principles of geometry only with math classes, they may not retrieve those principles at times when geometry would come in handy, such as when

[126] As an example of such interference in long-term memory retrieval, see Healey et al., 2010.
[127] J. S. Brown et al., 1989; Greeno et al., 1996; Lave & Wenger, 1991; Light & Butterworth, 1993; Robbins & Aydede, 2009; Säljö & Wyndhamn, 1992.

trying to determine whether a 10-inch pizza that costs $8.00 is a better value than an 8-inch pizza that costs $6.00.[128]

In general, learners are more likely to retrieve previously acquired knowledge and skills in a new context if that context provides one or more **retrieval cues** that trigger "travel" along potentially helpful pathways in long-term memory.[129] You can see what we mean in the next exercise.

See For Yourself

The Great Lakes

1. If you went to school in North America, at one time or another you probably learned the names of the five Great Lakes. See if you can recall all of them in the next 15 seconds before you read any further.
2. If you had trouble remembering all five lakes within that short time, here's a hint: The first letters of the Great Lakes spell the word *HOMES*. Now can you recall all five lakes?

If you did poorly at Step 1, the word *HOMES* probably helped you at Step 2 because it gave you some ideas about where to "look" in your long-term memory. For example, if you couldn't initially remember Lake Michigan, *HOMES* told you that one of the lakes begins with the letter *M*, leading you to brainstorm *M* words until, possibly, you stumbled on "Michigan." The letters in *HOMES* acted as retrieval cues that started your search of long-term memory in the right directions.

think about it
Can you think of a time when the response options for a question on a multiple-choice test provided the retrieval cues you needed to answer the question correctly?

Fortunately, not all school learning is "stuck" in a particular classroom. People use many of the skills they've learned at school—reading, writing, arithmetic, map interpretation, and so on—in a variety of everyday situations in the outside world.[130] Nevertheless, people don't use what they've learned in the classroom as often as they might. We explore this issue further in discussions of transfer in Chapter 3.

How easily something is recalled and used depends on how often it has been recalled and used in the past.

Practice doesn't necessarily make perfect, but as we've seen, it does make knowledge more durable and automatic. Practice also makes knowledge easier to "find" later when it's needed.[131] When we use information and skills frequently, we essentially "pave" the pathways we must travel to find them, in some cases creating superhighways.

Recall often involves construction or reconstruction.

Have you ever remembered an event very differently than a friend did, even though the two of you had participated actively and equally in the event? Were you and your friend both certain of the accuracy of your own memories and therefore convinced that the other person remembered the situation incorrectly? Like storage, retrieval has a constructive side, which can explain your differing recollections.

Retrieving something from long-term memory isn't necessarily an all-or-none phenomenon. Sometimes people retrieve only certain parts of something they've previously learned. In such situations they may construct their "memory" of an event by combining

[128] Sometimes the terms *situated learning* and *situated cognition* refer to circumstances in which it's simply *easier* to learn, think, or behave in a certain physical or social context or with certain culturally created physical or cognitive tools (e.g., Greeno & Engeström, 2014; Hickey, 2011; van de Sande & Greeno, 2012).
[129] Balch et al., 1992; Holland et al., 2005; Tulving & Thomson, 1973.
[130] J. R. Anderson et al., 1996.
[131] Finn & Roediger, 2011; Pyc & Rawson, 2009.

the tidbits they can recall with their general knowledge and assumptions about the world.[132] The following exercise illustrates this point.

See For Yourself

Missing Letters

Fill in the missing letters of the following words:

1. exist-nce
2. adole---nce
3. perc--ve
4. gesundh--t

Could you retrieve the missing letters from your long-term memory? If not, you may have found yourself making guesses using either your knowledge of how the words are pronounced or your knowledge of how words in the English language are typically spelled. Perhaps you used the "*i* before *e* except after *c*" rule for Word 3; if so, you correctly reconstructed *perceive*. Perhaps you also recalled the *escence* spelling pattern in such words as *obsolescence* and *effervescence*, in which case you would have spelled *adolescence* correctly. But if you applied the common spelling pattern *ance* to Word 1, you misspelled *existence*. Neither pronunciation nor typical English spelling patterns would have helped you with *gesundheit*, a German word often used after someone sneezes.

When people fill in gaps in what they can recall based on what seems logical, they often make mistakes—a phenomenon known as **reconstruction error**. Sometimes, of course, they never learned the missing information to begin with, and so their constructions are merely "best guesses" about the facts. Regardless of how accurate a "retrieved" memory is, however, the very process of thinking or rethinking about it promotes further consolidation—in many instances *reconsolidation*—that strengthens whatever a person previously knew or decided must be true.[133]

Long-term memory isn't necessarily forever.

People certainly don't need to remember everything. For example, you probably have no reason to remember the name of the cashier at Starbucks, the plot of a show you watched last month on Netflix, or the due date of an assignment you turned in last semester. Much of the information you encounter is, like unsolicited email, not worth keeping for the long haul. In fact, neurobiologists have suggested that forgetting the specifics of some experiences allows individuals to exhibit more flexible thinking and enables them to generalize their past experiences by not being limited to situation-specific details from the past.[134] People can then use these generalizations to make better decisions and respond more efficiently in the future to changes in the environment.

Unfortunately, people sometimes forget *important* things as well as inconsequential ones. Why do people forget things that they may need to remember in the future? Some instances of forgetting may reflect **retrieval failure**—a person simply isn't looking in the right "place" in long-term memory.[135] Perhaps the forgetful person hasn't learned the information in a meaningful way, or perhaps the person doesn't have a good retrieval cue. Other times, people forget because of **decay**—knowledge stored in long-term memory may gradually weaken over time and eventually disappear altogether, especially if it isn't used

[132] Brainerd & Reyna, 2005; Ranganath, 2010; Roediger & McDermott, 2000.
[133] Monfils et al., 2009; Schiller et al., 2010.
[134] Fawcett & Hulbert, 2020; Richards & Frankland, 2017.
[135] Einstein & McDaniel, 2005; Loftus & Loftus, 1980.

very often.[136] Neuroscientists believe that decay may be the result of the weakening or elimination of synaptic connections between neurons.[137] To some degree, then, the expression "Use it or lose it" may apply to human memory. And finally, forgetting can occur as new neurons are produced, either through typical neural activity or as a result of learning something new, because these new neurons can introduce new synaptic connections and modify existing connections in ways that affect existing memories.[138] Fortunately, teachers can do many things to increase the odds that their students *do* remember academic subject matter, as we'll see in the next section.

Teaching Strategies: Facilitating Retrieval

So far in this chapter, we've presented many strategies that teachers can use to help students encode information and actively construct their knowledge. We won't repeat those strategies here, but we wanted to remind you that using encoding strategies (e.g., organization, visualization, elaboration, practice) and helping students to construct their knowledge can help them to retrieve the information in the future. However, *the process of retrieving information from long-term memory also produces learning*.[139] When students retrieve knowledge, that knowledge can be changed in ways that can help them reconstruct that knowledge again in the future. The next few recommendations provide examples of how teachers can help students learn through the processes of retrieval.

Give students time to think about questions.

When teachers ask students questions, some students may recall or generate an answer almost immediately, while others need more time to do so. Yet some teachers are impatient, giving students very little time—in some cases *less than a second*—to respond to questions. If students don't respond in that short time, the teachers speak again, perhaps by asking a different question or answering a question themselves. Some teachers are equally reluctant to let much time lapse after students answer questions or make comments in class—once again, they may allow 1 second or less of silence—before responding to a statement or asking another question.[140] The problem here is one of insufficient **wait time**.

When teachers instead allow at least *3 seconds* to elapse after their own questions and after students' comments, dramatic changes can occur in students' behaviors. More students (especially females and minority students) participate in class, and students begin to respond to one another's comments and questions. Students are more likely to support their reasoning with evidence or logic and are more likely to speculate when they don't know an answer. Furthermore, students are more motivated to learn classroom subject matter, are better behaved in class, and actually learn more. Such changes are in part due to the fact that with increased wait time, *teachers'* behaviors change as well. Teachers ask fewer simplistic questions (e.g., those requiring recall of facts) and more thought-provoking ones (e.g., those requiring elaboration). They modify the direction of a discussion to accommodate students' comments and questions, and they allow their classes to pursue a topic in greater depth than they had originally planned. And their expectations for many students, especially previously low-achieving ones, begin to improve.[141]

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[136] Altmann & Gray, 2002; J. R. Anderson, 2005; Schacter, 1999.
[137] Migues et al., 2016; Richards & Frankland, 2017.
[138] Epp et al., 2016; Richards & Frankland, 2017.
[139] Karpicke & Grimaldi, 2012; Karpicke & Roediger, 2008.
[140] Jegede & Olajide, 1995; M. B. Rowe, 1974, 1987.
[141] Castagno & Brayboy, 2008; Giaconia, 1988; Mohatt & Erickson, 1981; M. B. Rowe, 1974, 1987; Tharp, 1989; Tobin, 1987.

Give hints that help students recall or reconstruct what they've learned.

Sometimes forgetting is simply a matter of retrieval difficulty: Students either can't "find" knowledge that's in long-term memory or else neglect to "look" for it altogether. In such situations, retrieval cues are often helpful and appropriate. For example, if a student asks how the word *liquidation* is spelled, a teacher might say, "*Liquidation* means to make something liquid. How do you spell *liquid*?" Another example comes from one of the author's (Jeanne's) former teacher interns, Jesse Jensen. A student in her eighth-grade history class had been writing about the Battle of New Orleans, a decisive victory for the United States in the War of 1812. The following exchange took place:

> ***Student:*** Why was the Battle of New Orleans important?
>
> ***Jesse:*** Look at the map. Where is New Orleans?
>
> (The student points to New Orleans.)
>
> ***Jesse:*** Why is it important?
>
> ***Student:*** Oh! It's near the mouth of the Mississippi. It was important for controlling transportation up and down the river.

In the early grades teachers typically provide many retrieval cues: They remind students about the tasks they need to do and when to do them ("I hear the fire alarm. Remember, we all walk quietly during a fire drill" or "It's time to go home. Do you all have the field trip permission slip to take to your parents?"). But as students grow older, they must develop greater independence, relying more on themselves and less on their teachers for certain things they need to remember. At all grade levels, teachers can teach students ways of providing retrieval cues for themselves. For example, if second-grade teachers expect children to bring signed permission slips to school the following day, they might ask the children to write a reminder on a piece of masking tape that they attach to their jackets or backpacks. If middle school teachers give students a major assignment due several weeks later, they might suggest that students help themselves remember the due date by taping a note to their bedside table or typing a reminder in their phone calendars. In such instances, teachers are fostering *self-regulation*, a topic we explore in Chapter 3.

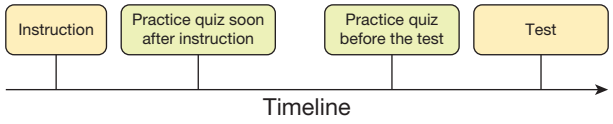
Provide opportunities for students to practice retrieving information.

Students are more likely to remember information from instruction over time when they practice actively retrieving the information—a research finding known as the **testing effect** (also called the *retrieval practice effect* and *retrieval-based learning*).[142] Because students remember more information over time, they score higher on tests than if they had not practiced retrieving the information, even when the tests are given 5 to 8 months after the initial instruction.[143] And generally speaking, actively retrieving information is more effective than other study strategies such as highlighting and rereading.[144]

Teachers can provide opportunities for students to engage in active retrieval in a variety of ways. One way is to ask students to engage in *free recall*, in which students write down, type, or draw everything they can remember about the information they're studying without looking at any study materials (e.g., textbooks, notes).[145] Another way to promote active retrieval is to give students a practice quiz soon after a lesson and/or as a

[142] Fazio & Marsh, 2019; McDaniel & Einstein, 2000; Roediger & Karpicke, 2006.
[143] Agarwal et al., 2012; McDaniel et al., 2011.
[144] Adesope et al., 2017; Bae et al., 2019; Karpicke, 2012.
[145] Karpicke, 2012; Roediger & Karpicke, 2006.

Figure 2.28 Quizzing students after instruction and/or before a test can increase their recall of knowledge and improve their test scores



review prior to a test (see Figure 2.28).[146] The quizzes can be completed on paper, online, or via a clicker response system. Teachers should provide feedback for incorrect answers to help students learn concepts they didn't understand. Teachers should also give students feedback related to correct answers in case students didn't know the answer but guessed correctly, or if they weren't completely confident in their answers.[147] Students should then be encouraged to restudy information that they still don't understand. Teachers can also encourage students to quiz themselves (e.g., flashcards). Finally, some evidence suggests that combining free recall with practice quizzes can be even more beneficial to students' long-term retention of material than using only one of these strategies alone.[148]

Intermix practice problems with problems from previous lessons.

Please complete the following practice problems that could be assigned to fourth-grade students after a lesson about division.

See For Yourself

Word Problems in Mathematics

Solve the following word problems:

1. The basketball camp has 96 children participating. If there are 8 basketball teams, how many children are on each team?
2. Joanie made 24 chocolate chip cookies with her father. She wants to share all of the cookies equally with her 4 friends. How many cookies will each of her friends receive?
3. Sachiel has 70 tomato seeds. He wants to plant an equal amount of seeds in each of the 5 rows in his garden. How many seeds will he plant in each row?

If you were given a fourth problem to solve in the previous exercise, would you read the entire problem or simply divide the first number by the second number without reading the problem? It's likely that some students would identify the strategy needed to solve these problems: divide the first number by the second number. If so, they may complete any remaining problems without reading the problems closely, especially if they could obtain the correct answer more quickly without reading the entire problem. When students are given practice problems that are similar in format (like those in the *See For Yourself* exercise), it's called *blocked practice*. Alternatively, practice problems can be intermixed with problems from previous lessons—a strategy known as **interleaved practice**.[149] For example, the teacher could mix in word problems that require addition, subtraction, and multiplication with the problems that require division (see Figure 2.29). By doing so, students would need to read each problem closely and select the appropriate strategy before using the strategy of adding, subtracting, multiplying, or dividing.

[146] Agarwal et al., 2012; Dunlosky et al., 2013; McDaniel et al., 2011.
[147] Butler & Roediger, 2008; Carneiro et al., 2018.
[148] Bae et al., 2019.
[149] Rohrer, 2012; Taylor & Rohrer, 2010.

Students who engage in interleaved practice score higher on tests than students who engage in blocked practice.[150] Completing interleaved practice allows students to retrieve not only their declarative and procedural knowledge, but also their *conditional knowledge* about *when* to use particular strategies. Practice using conditional knowledge is especially important if the testing or performance situation requires students to use their conditional knowledge; for example, when the test questions are interleaved. Interleaved practice can be applied to almost any academic discipline, such as foreign languages (e.g., conjugating verb tenses), art (e.g., matching artists with examples of their paintings), and science (e.g., solving problems involving Newton's laws and the conservation of energy), among others.

Figure 2.29 For interleaved practice, the order of the problems is intermixed with problems from previous lessons.

Order of Problems For:	
Blocked Practice	**Interleaved Practice**
1. Multiplication	1. Division
2. Multiplication	2. Addition
3. Multiplication	3. Multiplication
4. Division	4. Subtraction
5. Division	5. Division
6. Division	6. Multiplication

Space review sessions over time.

As noted in Chapter 1, students perform better on tests when their review sessions are spaced over time (a research finding that's called the **spacing effect**).[151] This increase in performance has been found to occur not only for declarative knowledge, but also for procedural knowledge, such as typing, archery, and javelin throwing.[152] Teachers can apply the spacing effect to their teaching by incorporating brief reviews into their instruction. These reviews should include not only content that students learned in the previous class, but also information learned several weeks or months earlier. Another strategy is for teachers to give students review questions as part of their homework assignments. Administering more quizzes, either graded or ungraded, can also be a way to have students retrieve previously learned information. Finally, giving tests that are cumulative (i.e., including at least some questions based on all of the information in the class up to that date) can provide students with an incentive to review previously learned information. Taking cumulative tests can also serve as reviews because students are required to retrieve the information again during the test.[153]

Summary

As a way of summarizing the contents of the chapter, let's return to the Big Ideas presented at the beginning of the chapter.

2.1 Thinking and Learning in the Brain

Big Idea 2.1 The brain continues to change and learn over the course of a lifetime.

At the most basic level, learning probably involves changes in neurons, astrocytes, and their interconnections in the brain. Different parts of the brain specialize in different tasks, but many parts of the brain in both hemispheres tend to work closely together in everyday tasks. Although brain research provides useful insights into cognitive development and the neurological bases of certain disabilities, by and large teachers must look elsewhere—in particular, to psychological and educational research—for guidance about how best to help students learn. Teachers can support optimal brain functioning by providing some brief mental relaxation breaks and encouraging students to get regular physical exercise and plenty of sleep.

2.2 A Model of Human Memory

Big Idea 2.2 Attention and working memory limit the amount of information that learners can process and remember.

A somewhat oversimplified model of human memory—but a very useful one nevertheless—has three distinct components. One component, the *sensory register*, holds incoming sensory

[150] Pan et al., 2019; Rohrer et al., 2015, 2020; Taylor & Rohrer, 2010.
[151] Carpenter et al., 2012; Son & Simon, 2012.
[152] Moulton et al., 2006; Schmidt & Lee, 2005.
[153] Carpenter et al., 2012.

information for 2 or 3 seconds at most. What a learner pays attention to moves on to *working memory*, where it's held for a somewhat longer period while the learner actively thinks about, manipulates, and interprets it. Yet working memory can hold only a small amount of information at one time, and information that isn't being actively thought about tends to disappear quickly (typically in less than 20 seconds) unless the learner processes it sufficiently to store it in long-term memory. Because attention is so critical to getting information into working memory, teachers should use strategies to get and keep students' attention, such as incorporating variety into their lessons and minimizing distractions. Teachers also need to keep in mind the limited capacity of working memory and not overload students with too much information at one time.

2.3 Long-Term Memory

Big Idea 2.3 Learners can use strategies intentionally to store information in long-term memory.

Long-term memory can be divided into declarative knowledge (e.g., facts, concepts, schemas, beliefs, self-constructed theories) and procedural knowledge (e.g., procedures, strategies, conditional knowledge) that is interconnected and organized to some extent. Long-term memory appears to have as much capacity as human beings could ever need. In fact, the more information learners already have there, the more easily they can store new facts and ideas. Effective storage typically involves *meaningful learning*—that is, connecting new information with existing knowledge and beliefs. By making such connections, learners make better sense of their experiences, retrieve what they've learned more easily, and create an increasingly organized and integrated body of knowledge that helps them interpret new experiences. As children grow older, they gradually take charge of their own learning, and most of them increasingly use effective learning strategies to remember classroom subject matter. Sometimes, however, learners of all ages distort new information, such that they construct inaccurate and potentially counterproductive understandings.

Teachers can take into account the general nature of human learning by continually emphasizing the importance of understanding classroom subject matter—making sense of it, drawing inferences from it, seeing how it all ties together, and so forth—rather than simply memorizing it in a rote, "thoughtless" manner. Such an emphasis must be reflected not only in teachers' words but also in their instructional activities, assignments, and assessment practices. Teaching students specific concepts involves providing defining features, examples, and nonexamples of the concepts. Teachers can foster encoding by organizing the content, using visual images, encouraging elaboration, and suggesting mnemonics for hard-to-remember facts. And teachers can help students learn procedural knowledge—especially knowledge that requires physical actions—by providing many opportunities for students to practice the skills and by giving students frequent feedback along the way.

2.4 Learning as Active Construction

Big Idea 2.4 Learners actively create much of what they know and believe about the world based on their existing knowledge and beliefs.

Learning isn't simply a process of "soaking up" information from the environment. Rather, it's a process of *creating meanings* from both informal experiences and formal instruction. In their attempts to make sense of the world, learners combine some (but not all) of what they observe with their existing knowledge and beliefs to create ever-expanding and distinctly unique understandings of the world. Their prior knowledge and beliefs usually help them learn new information more readily, which is why teachers can help students construct knowledge by encouraging them to relate new material to their existing knowledge. However, existing knowledge can sometimes get in the way and learners may construct misconceptions. It's important for teachers to be alert to students' misconceptions about academic topics and work hard to promote *conceptual change*.

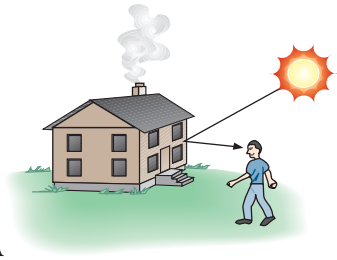
2.5 Why Learners May or May Not Remember What They Have Learned

Big Idea 2.5 Human memory is fallible: Learners don't remember everything they learn, and sometimes they *mis*remember what they've learned.

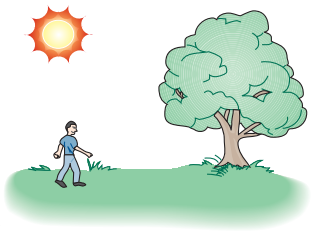
Learners are more likely to remember new information over the long run if they stored it effectively to begin with—for instance, if they organized it, formed visual images of it, or elaborated on it—and if they've learned it to a level of automaticity. Yet retrieval is also somewhat context dependent: Learners are more likely to remember something if their environment provides retrieval cues that get them "looking" in the right "places" in long-term memory. Retrieval is often a constructive or reconstructive process: Learners recall only part of what they've learned or experienced and then fill in the gaps—perhaps correctly, perhaps not—based on their existing knowledge and beliefs about the world. Teachers can help students remember information correctly by providing students time to think about questions and giving hints that help them recall what they've learned. It's also important for teachers to provide opportunities for students to practice retrieving information, such as by engaging in free recall or taking practice quizzes. Finally, teachers can enhance students' learning and performance by reviewing material over time, such as by incorporating reviews into regular teaching activities and homework assignments.

Case Study Practice Exercises

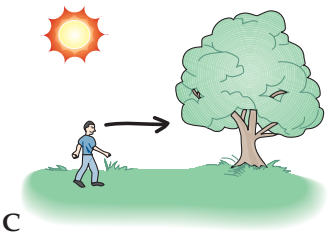
Vision Unit



A



B



C

Ms. Kontos is teaching a unit on human vision to her fifth-grade class. She shows her students a diagram of the various parts of the human eye, such as the lens, cornea, pupil, retina, and optic nerve. She then explains that people can see objects because light from the sun or another light source bounces off those objects and into their eyes. To illustrate this idea, she shows them Picture A.

"Do you all understand how our eyes work?" she asks. Her students nod that they do.

The next day Ms. Kontos gives her students Picture B. She asks students to draw one or more arrows on the picture to show how light enables the child to see the tree. More than half of the students draw arrows something like the one shown in Picture C.

1. **Constructed-response question**

   Obviously, most of Ms. Kontos's students have not learned what she thought she had taught them about human vision.

   A. Explain why many students believe the opposite of what Ms. Kontos has taught them. Base your response on contemporary principles and theories of learning and cognition.

   B. Describe two different ways in which you might improve on this lesson to help students gain a more accurate understanding of human vision. Base your strategies on contemporary principles and theories of learning and cognition.

2. **Multiple-choice question**

   Many elementary-age children think of human vision in the way that Ms. Kontos's fifth-graders do—that is, as a process that originates in the eye and goes outward toward objects that are seen. When students revise their thinking to be more consistent with commonly accepted scientific explanations, they are said to be

   a. acquiring a new script.
   b. acquiring procedural knowledge.
   c. undergoing conceptual change.
   d. revising their worldview.

Chapter 3

Complex Cognitive Processes

Photo by Unsplash

Big Ideas to Master in this Chapter

3.1 Effective learners regularly plan for their learning, monitor it, reflect on it, and strive to improve it.

3.2 Specific facts don't always have much applicability to the outside world, but many general principles, strategies, and attitudes acquired at school are potentially applicable to a wide variety of situations.

3.3 Learners tend to be more effective problem solvers and more creative thinkers if they have considerable knowledge from which to draw and if they can think flexibly about new tasks and problems.

3.4 Thinking involves a variety of cognitive processes, such as problem solving, critical thinking, and reasoning.

Case Study: Taking Over

In accordance with Massachusetts state standards, students are expected to master numerous mathematical concepts and procedures, including working with exponents and irrational numbers, graphing linear equations, and applying the Pythagorean theorem. Yet many students in Ms. Gaunt's eighth-grade class haven't yet mastered more basic concepts and operations, such as percentages, negative numbers, and long division. A few haven't even learned basic number facts.

Before long, Ms. Gaunt discovers that many students have beliefs and attitudes that also impede their learning progress. For instance, some think that a teacher's job is to present material in such a way that they "get it" immediately and will remember it forever. Thus, they neither work hard to understand the material nor take notes during her explanations. And most students are concerned only with getting the right answer as quickly as possible. They depend on calculators to do their mathematical thinking for them and complain when Ms. Gaunt insists that they solve a problem with pencil and paper rather than a calculator. Students rarely check to see whether their solutions make logical sense. For example, in a problem such as this one:

> Raj can type 35 words a minute. He needs to type a final copy of his English composition, which is 4,200 words long. How long will it take Raj to type his paper?

a student might submit an answer of 147,000 minutes—an answer that translates into more than 100 days of around-the-clock typing—and not give the outlandishness of the solution a second thought. (It would actually take Raj 2 hours to type the paper.)

In mid-February, Ms. Gaunt begins moving through lessons more rapidly so that she can cover the mandated eighth-grade math curriculum before the upcoming statewide math competency exam. "Students can't do well on the exam if they haven't even been exposed to some of the required concepts and procedures," she reasons. "Mastery probably isn't possible at this point, but I should at least *present* what students need to know. Maybe this will help a few of them with some of the test items."[1]

Before you read further, please answer this question:

- What factors are preventing the students in Ms. Gaunt's class from learning the material in the eighth-grade math curriculum?

One factor impeding students' learning is their lack of prerequisite knowledge and skills on which the eighth-grade curriculum depends. For instance, if students haven't learned basic number facts—let alone achieved automaticity for them—even simple word problems may exceed their working memory capacity. But students' beliefs about learning and problem solving are also coming into play. In their minds, learning should come quickly and easily if the teacher does her job. They don't seem to realize that understanding classroom subject matter is an active, constructive process involving considerable effort on their part and that certain strategies (e.g., taking notes) can enhance their learning. And they view mathematical problem solving as a quick, mindless enterprise that involves plugging numbers into a calculator and writing down the result, rather than a step-by-step process that requires logical reasoning and frequent self-checking.

Study skills and problem solving are examples of **complex cognitive processes**, processes in which learners go beyond the specific information they're studying, perhaps to apply it to a new situation, use it to solve a problem or create a product, or critically evaluate it. Mastering basic facts and skills is important, but learners gain little if they can't also *do something* with what they've learned. In this chapter, we look at a variety of complex cognitive processes, including self-regulation, metacognition, transfer, problem solving, creativity, and critical thinking (see Figure 3.1).

[1] We thank a friend (who wishes to remain anonymous) for sharing this case.

Chapter Outline

Case Study: Taking Over

3.1 Self-Regulation and Metacognition
- Effective Self-Regulated Learning
- The Roles of Metacognition
- Teaching Strategies: Promoting Self-Regulation Skills and Metacognitive Development

3.2 Transfer
- Factors that Affect Transfer
- Teaching Strategies: Fostering Transfer

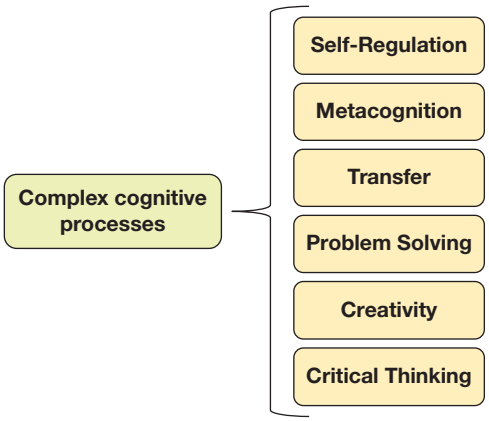
3.3 Problem Solving and Creativity
- General Principles Related to Problem Solving and Creativity
- Teaching Strategies: Encouraging Problem Solving and Creativity

3.4 Thinking
- Attributes of Critical Thinking
- Teaching Strategies: Developing Students' Critical Thinking Skills

Summary

Case Study Practice Exercises: Interview with Charlie

Figure 3.1 This chapter includes many different types of complex cognitive processes



3.1 Self-Regulation and Metacognition

Big Idea 3.1 **Effective learners regularly plan for their learning, monitor it, reflect on it, and strive to improve it.**

Effective Self-Regulated Learning

Truly effective learning requires learners to actively and consciously engage in activities directed specifically at thinking about and learning something. In other words, effective learners engage in **self-regulation** (sometimes referred to as *self-regulated learning* or *self-regulated behavior*) by taking control of, monitoring, and evaluating their own learning and behavior.[2] To get a sense of how self-regulating you are, test yourself in the following exercise.

See For Yourself

Self-Reflection About Self-Regulation

For each of the following situations, choose the alternative that most accurately describes your attitudes, thoughts, and behaviors as a college student. Only *you* will see your answers, so be honest!

1. With respect to my final course grades, I'm trying very hard to
   a. earn all As.
   b. earn all As and Bs.
   c. keep my overall grade point average at or above the minimally acceptable level at my college.
2. As I read or study a textbook, I
   a. often notice when my attention is wandering, and I immediately try to get my mind back on my work.
   b. sometimes notice when my attention is wandering, but not always.
   c. often get so lost in daydreams that I waste a lot of time.
3. Whenever I finish a study session, I
   a. write down how much time I've spent on my schoolwork.
   b. make a mental note of how much time I've spent on my schoolwork.
   c. don't really think much about the time I've spent.

[2] Good general references on this topic include Bandura, 1986, 1989; Zimmerman & Moylan, 2009; Zimmerman & Schunk, 2004.

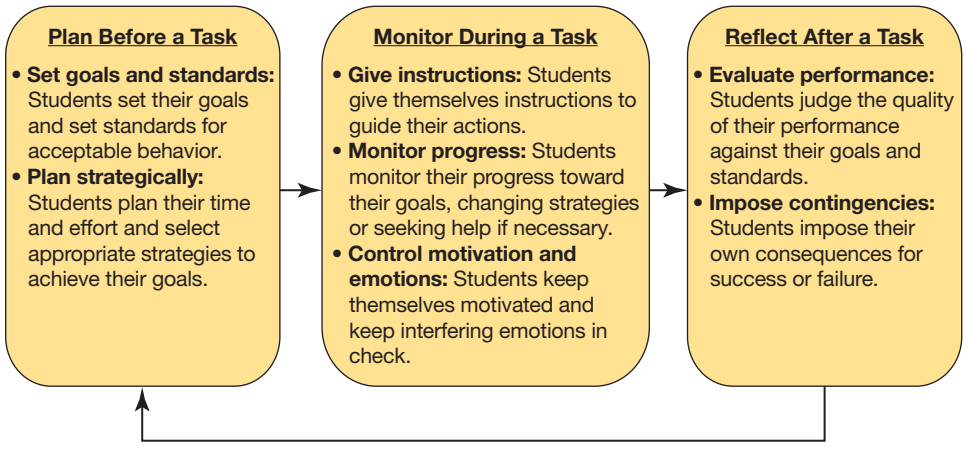
4. When I turn in an assignment, I
   a. usually have a good idea of the grade I'll get on it.
   b. am often surprised by the grade I get.
   c. don't think much about the quality of what I've done.
5. When I do exceptionally well on an assignment, I
   a. feel good about my performance and might reward myself in some way.
   b. feel good about my performance but don't do anything special for myself afterward.
   c. don't feel much different than I had before I received my grade.

Regardless of how you answered Item 1, you could probably identify a particular goal toward which you're striving. Your response to Item 2 should give you an idea of how much you monitor and try to control your thoughts when you're studying. Your responses to Items 3 and 4 tell you something about how frequently and accurately you evaluate your performance. And your response to Item 5 indicates whether you're likely to reinforce yourself for desired behaviors. All of these items provide some indication as to how self-regulating you are as a college student.

It can be helpful to categorize the different aspects of self-regulation into those that occur before a learning task (such as reading or studying), during a task, and after a task, as shown in Figure 3.2. The items listed in Figure 3.2 indicate that effective self-regulated learners are very active in their own learning processes as they plan, monitor, and reflect on their learning. Being so involved in the learning process requires learners to have a good understanding of how their mind works so that they can select strategies that allow them to reach their goals efficiently and monitor and evaluate their progress accurately. In other words, they need to think about their thinking, which is called *metacognition* (this is explained further in an upcoming section). In addition, active involvement in a task requires learners to be motivated to stay on task and to regulate their emotions throughout the process. Figure 3.3 shows that both metacognition and motivation play a role in learners' self-regulation.[3]

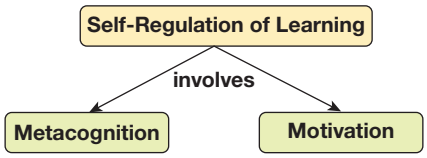
The following general principles provide more explanation about the aspects of self-regulation depicted in Figure 3.2.

Figure 3.2 Effective self-regulated learners plan before they engage in a learning task, monitor their learning during a task, and reflect on their learning after a task



[3] Zimmerman & Labuhn, 2012.

Figure 3.3 Self-regulation of learning involves both metacognition and motivation



Self-regulating learners establish goals for their performance and plan their actions accordingly.

Self-regulating learners know what they want to accomplish when they read and study—perhaps to learn specific facts, gain a good conceptual understanding of a topic, or simply do well on an upcoming test. Often their immediate goals are tied to longer-term goals and aspirations, such as getting a college scholarship, exhibiting their work in a prestigious art show, or becoming a veterinarian. With such short- and long-term goals in mind, they make conscious decisions about how much time and effort to put into a learning task and select strategies that will help them achieve their goals.[4]

To a considerable degree, learners' goals reflect self-imposed general standards for performance, and these standards vary from one learner to the next. For example, one student may perceive high classroom achievement to be very important and may strive for straight As, whereas another might be satisfied with mediocre performance and be content with Cs.[5] Often learners' goals and standards are modeled after those they see other people adopt.[6] For instance, at the high school one of us authors attended, many students wanted to go to the best college or university possible, and such lofty ambitions were contagious. But at a different high school, getting a job after graduation—or perhaps *instead* of graduation—might be the aspiration more commonly modeled by a student's classmates.

Self-regulating learners control and monitor their processes and progress during a learning task.

Self-regulating learners intentionally engage in processes that will enhance their learning.[7] They try to focus their attention on the subject matter at hand and to clear their minds of potentially distracting thoughts. They may also employ **self-instructions** that help them direct their efforts. As an example, one formerly impulsive child has learned to talk himself through matching tasks in which he needs to find two identical pictures among several very similar ones:

> I have to remember to go slowly to get it right. Look carefully at this one, now look at these carefully. Is this one different? Yes, it has an extra leaf. Good, I can eliminate this one. . . . Good, I'm going slow and carefully.[8]

Another important aspect of self-regulation is **self-monitoring**: Self-regulating learners continually check their progress toward their goals, and they change their learning strategies or modify their goals if necessary.[9]

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[4] Bandura, 2008; Gaskins et al., 2007; Heirweg et al., 2020; R. B. Miller & Brickman, 2004; Muis, 2007; Winne & Hadwin, 1998; Zimmerman & Schunk, 2004.

[5] Corker & Donnellan, 2012; Pajares, 2009.

[6] Bandura, 1986; Fitzsimmons & Finkel, 2010.

[7] Harnishfeger, 1995; Heirweg et al., 2020; Winne, 1995; Zimmerman & Moylan, 2009.

[8] Meichenbaum & Goodman, 1971, p. 121.

[9] D. L. Butler & Winne, 1995; Greene & Azevedo, 2009; Schneider, 2010.

Self-regulating learners seek assistance and support when they need it.

Truly self-regulating learners don't necessarily try to do everything on their own. On the contrary, they recognize occasions when they need other people's help and seek it out. They're especially likely to ask for the kind of help that will enable them to work more independently in the future.[10]

Self-regulating learners monitor and try to control their motivation and emotions.

Self-regulating learners use a variety of strategies to keep themselves on task—perhaps embellishing on an assignment to make it more fun, reminding themselves of the importance of doing well, or promising themselves a reward after they finish.[11] For example, a middle school student named Jamaal regularly gives himself a pep talk as he works on math problems:

> I'll be, like, "Come on." I'll be thinking about different ways to solve problems and stuff like that. I'll be saying, "Come on, Jamaal, you can do this," and stuff like that . . . I don't know what it does, but it's just like extra comfort to me.[12]

Self-regulating learners also try to keep in check any emotions (anxiety, anger, etc.) that might interfere with their performance (more about such emotion regulation in Chapter 5).[13]

Self-regulating learners evaluate the final outcomes of their efforts.

Both at home and in school, children's and adolescents' behaviors and achievements are often judged by others—their parents, teachers, classmates, and so on. But as young people become increasingly self-regulating, they also begin to engage in **self-evaluation**, judging their own performance with respect to the goals and standards they've set for themselves. Their ability to evaluate themselves with some degree of objectivity and accuracy will ultimately be critical for their learning and achievement over the long run.[14]

Self-regulating learners self-impose consequences for their performance.

How do you feel when you accomplish a difficult task—for instance, when you earn an A in a challenging course or make a 3-point shot in a basketball game? How do you feel when you fail in your endeavors—for instance, when you get a D on an exam or thoughtlessly hurt a friend's feelings?

When you accomplish a challenging task, you might feel quite proud of yourself and give yourself a mental pat on the back. In contrast, when you fail to accomplish something you've set out to do, you're probably unhappy with your performance, and you might also feel guilty, regretful, or ashamed. Likewise, as children and adolescents become increasingly self-regulating, they begin to reinforce themselves when they accomplish their goals—perhaps by engaging in a favorite activity or perhaps simply by feeling proud or telling themselves they did a good job. And they may punish themselves when they do something that doesn't meet their personal standards—at a minimum, by feeling sorry, guilty, or ashamed.[15] Such self-reinforcement and self-punishment are **self-imposed contingencies**.

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[10] R. Butler, 1998; J. Lee & Shute, 2010; A. M. Ryan et al., 2001; Zusho & Barnett, 2011.
[11] Pajares, 2009; Usher, 2009; Wolters, 2003.
[12] Usher, 2009, p. 295.
[13] Bronson, 2000; Buckley & Saarni, 2009; K. L. Fletcher & Cassady, 2010; Winne, 1995.
[14] Andrade, 2010; Dunning et al., 2004; Gaskins et al., 2007; Pajares, 2009; Schraw & Moshman, 1995.
[15] K. R. Harris et al., 2010; Harter, 1999; R. B. Miller & Brickman, 2004; Zimmerman & Moylan, 2009.

Figure 3.4 In this poem about horseback riding, 16-year-old Melinda reveals two forms of a self-imposed contingency: guilt and pride

"Sit up,
shoulders back,
drop your right shoulder."
Now I feel guilty because I'm making the horse work harder.
"Heels down,
elbows at your sides,
lower leg back,
drop your right shoulder down and back."
Now I feel like I have no talent and like I'm hurting the horse.
"More impulsion from the left hind leg!
Send him into the rein more!"
Now I'm thinking, "This is so complicated!"
"Good job!
Walk when you're ready and give him the rein.
Did you feel that?"
"Yeah!"
"Good! That was really good!
You've accomplished so much with him and your position."
Now I feel warm inside and proud. All this time has paid off
and I realize that's why I love horseback riding so much!

Melinda's poem about horseback riding presented in Figure 3.4 clearly shows both self-punishment ("Now I'm feeling guilty because I'm making the horse work harder") and self-reinforcement ("Good job! . . . Now I feel warm inside and proud").

Students' self-evaluations and self-imposed contingencies can then affect their goals, standards, plans, and motivation when they begin their next task (as depicted by the arrow at the bottom of Figure 3.2 leading from "Reflect After a Task" to "Plan Before a Task").[16] For example, if Melinda has a positive self-evaluation and believes that her time practicing horseback riding has allowed her to meet her goals, she may set similar goals next time and use similar strategies to meet them. But if she is unhappy with her performance or if she doesn't meet her goals, she may readjust her goals and standards or plan to use different strategies to help her achieve her goals in the future.

Most learners become increasingly self-regulating over the course of childhood and adolescence, partly as a result of maturation in key areas of the brain.

Let's return now to the three-component model of memory introduced in Chapter 2 (see Figure 2.7). The mental "headquarters" of self-regulation is in the *central executive*, which is the subcomponent of working memory that oversees executive functions such as focusing attention, monitoring the flow of information throughout the memory system, selecting and controlling complex voluntary behaviors, and inhibiting counterproductive thoughts and actions. Learners' central-executive abilities depend on areas in the prefrontal cortex (see Figure 2.5) that continue to develop throughout childhood, adolescence, and early adulthood.[17] Thus, learners' self-regulation skills are apt to emerge only slowly as they grow older.[18]

[16] Zimmerman & Cleary, 2009.

[17] Two especially important areas are the *prefrontal cortex* and *anterior cingulate cortex*; for example, see Munakata et al., 2012; Posner & Rothbart, 2007; Velanova et al., 2008.

[18] Demetriou et al., 2002; Fischer & Daley, 2007; Luciana et al., 2005; Rothbart, 2011; Steinberg, 2009.

Table 3.1 presents typical advancements in self-regulation in the elementary and secondary school years. As you can see in the table, a few elements of self-regulation (e.g., setting self-chosen goals, self-evaluation of behavior) are evident in the primary grades. Additional aspects (e.g., conscious attempts to focus attention, ability to complete short learning tasks at home) tend to appear in the upper elementary grades. Still others (e.g., planning, self-motivation) emerge in the middle school and high school years. However, one aspect of self-regulation—seeking help when needed—may actually *decline*, especially if students consistently struggle with their academic work but want to hide their difficulties and they perceive their teachers to be aloof and nonsupportive.[19]

When children and adolescents are self-regulating, they set more ambitious academic goals for themselves, learn more effectively, and achieve at higher levels in the classroom.[20] Self-regulation becomes increasingly important in adolescence and adulthood, when many learning activities (e.g., reading, doing homework, finding information on the Internet) occur in isolation from other people and therefore require considerable self-direction.[21] Unfortunately, not all adolescents acquire a high level of self-regulation, perhaps in part because traditional instructional practices do little to foster it.[22] For example, consider a student named Anna, whose grades declined markedly after she left her small neighborhood K–8 school for a large city high school. Anna was overwhelmed by the demands of her ninth-grade classes, and her first-semester final grades included several Ds and an F. Anna explained her low grades this way:

> In geography, "he said the reason why I got a lower grade is 'cause I missed one assignment and I had to do a report, and I forgot that one." In English, "I got a C . . . 'cause we were supposed to keep a journal, and I keep on forgetting it 'cause I don't have a locker. Well I do, but my locker partner she lets her cousins use it, and I lost my two books there. . . . I would forget to buy a notebook, and then I would have them on separate pieces of paper, and I would lose them." And, in biology, "the reason I failed was because I lost my folder . . . it had everything I needed, and I had to do it again, and, by the time I had to turn in the new folder, I did, but he said it was too late . . . ."[23]

To some extent, self-regulated learning probably develops from opportunities to engage in age-appropriate independent learning activities.[24] But self-regulated learning also has roots in socially regulated learning.[25] At first, an adult (e.g., a teacher or parent) might help children learn by setting goals for a learning activity, keeping children's attention focused on the learning task, suggesting effective strategies, monitoring progress, and so on. Then, in **co-regulated learning**, the adult and children share responsibility for directing various aspects of the learning process.[26] The adult initially provides considerable metacognitive support for children's learning efforts but gradually removes it as the children become more self-regulating. Some instructional software programs and apps provide the same kind of support, suggesting learning strategies, assisting with comprehension monitoring, and so forth as needed.[27] Alternatively, several learners of *equal ability* might collectively regulate

[19] Marchand & Skinner, 2007.
[20] D. L. Butler & Winne, 1995; Corno et al., 2002; Duckworth & Seligman, 2005; Valiente et al., 2010; Zimmerman & Kitsantas, 2005.
[21] Azevedo, 2005b; Meltzer et al., 2007; Winne, 1995; Winters et al., 2008.
[22] Meltzer, 2007; Paris & Ayres, 1994; Zimmerman & Risemberg, 1997.
[23] Roderick & Camburn, 1999, p. 305.
[24] Corno & Mandinach, 2004; Paris & Paris, 2001; Vye et al., 1998; Zimmerman, 2004.
[25] Stright et al., 2001; Vygotsky, 1962; Zimmerman, 1998.
[26] McCaslin & Good, 1996; McCaslin & Hickey, 2001; C. Quintana et al., 2005; Zimmerman, 2004.
[27] Azevedo, 2005a.

Developmental Trends

Table 3.1 Self-Regulation at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **Grades K–2**	• Some internalization of adults' standards for behavior • Emerging ability to set self-chosen goals for learning and achievement • Some use of self-instruction to guide behavior • Some self-evaluation of effectiveness and appropriateness of actions; feelings of guilt about wrongdoings • Individual differences in self-control of impulses, emotions, and attention; amount of self-control in these areas affects peer relationships and classroom performance	Most of the children in a kindergarten class can sit quietly and listen when their teacher reads a storybook. But a few of them squirm restlessly and occasionally poke or otherwise distract their classmates.	• Discuss rationales for class rules for behavior. • Show students how some behaviors can help them reach their goals and how other behaviors interfere with goal attainment. • Organize the classroom so that students can carry out some activities on their own (e.g., have reading centers where children can listen to audiobooks). • When students show impulsiveness or poor emotion control, provide guidelines and consistent consequences for behavior.
JohnnyGreig/E+/ Getty images **Grades 3–5**	• Improving ability to self-assess performance and progress • Guilt and shame about unsatisfactory performance and moral transgressions • Emerging self-regulating learning strategies (e.g., conscious attempts to focus attention, ability to do short assignments independently at home) • Increasing ability to allocate study time appropriately for the learning task at hand • Persistent difficulties with self-control for some students	Every Thursday evening, 8-year-old Logan studies for the weekly spelling test his teacher will give his class the following day. Sometimes he asks his father or older brother to test him on especially difficult words.	• Have students set specific, concrete goals for their learning. • Encourage students to assess their own performance; provide criteria they can use to evaluate their work. • Ask students to engage in simple, self-regulated learning tasks (e.g., small-group learning activities, short homework assignments); provide some structure to guide students' efforts. • Encourage students to use their peers as resources when they need help. • If students have continuing difficulty with self-control, teach self-instructions that can help them control their behavior.
Photo by Unsplash **Grades 6–8**	• Increasing ability to plan future actions, due in part to increased capacity for abstract thought • Increasing mastery of some self-regulating learning strategies, especially those that involve overt behaviors (e.g., keeping a calendar of assignments and due dates) • Self-motivational strategies (e.g., minimizing distractions, devising ways to make a boring task more enjoyable, reminding oneself about the importance of doing well) • Decrease in help-seeking behaviors during times of confusion, especially if teachers appear to be aloof and nonsupportive	For fear of appearing to be "stupid" in her math class, 13-year-old Katherine rarely asks questions when she doesn't understand a new concept or procedure.	• Assign homework and other tasks that require independent learning. • Provide concrete strategies for keeping track of learning tasks and assignments (e.g., provide monthly calendars in which students can write due dates). • Provide concrete guidance about how to learn and study effectively (e.g., using self-imposed contingencies, such as not playing a video game until after one has completed an online homework module). • Give students frequent opportunities to assess their own learning; have them compare your evaluations with their own.
Photo by Unsplash **Grades 9–12**	• More long-range goal setting • Increasing ability to accurately self-evaluate learning and achievement • Wide variation in ability to self-regulate learning, especially when out-of-school assignments conflict with attractive leisure activities; few self-regulating learning strategies among many low-achieving high school students • For a small number of older adolescents, persistent difficulties in self-control that can adversely affect classroom behavior and peer relationships	After moving from fairly small middle schools to a much larger, consolidated high school, some students diligently complete their homework each night. But many others are easily enticed into more enjoyable activities with friends—hanging out at a local fast-food restaurant, texting friends, and so on—and their grades decline significantly as a result.	• Relate classroom learning tasks to students' long-range personal and professional goals. • Assign complex independent learning tasks, providing the necessary structure and guidance for students who are not yet self-regulating learners. • Have high-achieving students describe their strategies for resisting attractive alternatives and keeping themselves on task when doing homework.

Sources: Blair, 2002; Bronson, 2000; Damon, 1988; Dunning et al., 2004; Eccles et al., 1998; Fries et al., 2008; Hampson, 2008; M. Hofer, 2010; M. H. Jones et al., 2008; Kochanska et al., 2002; Liew et al., 2008; Marchand & Skinner, 2007; J. S. Matthews et al., 2009; Meichenbaum & Goodman, 1971; Meltzer et al., 2007; S. D. Miller et al., 2003; Paris & Paris, 2001; Posner & Rothbart, 2007; Schneider, 2010; Valiente et al., 2008; Wolters & Rosenthal, 2000.

a learning task, perhaps in a cooperative group activity.[28] In such a situation, different learners can take on different responsibilities and monitor one another's progress.

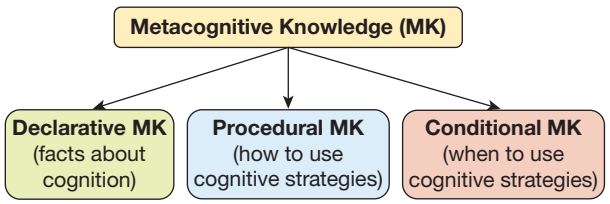
The Roles of Metacognition

As explained previously, self-regulation involves processes related to both metacognition and motivation. In this section, we provide more details about the role of **metacognition** ("thinking about thinking"), which includes learners' knowledge and beliefs about their own cognitive processes, as well as their conscious attempts to engage in behaviors and thought processes that enhance learning and memory.[29] In Chapter 2, we defined *cognition* as a broad term referring to any type of mental process, intellectual activity, or information processing. Metacognition is knowledge about these mental processes.

As an example, let's imagine that you want to be an effective self-regulated learner as you try to learn the material in a textbook. To do so, you stop at the end of each textbook section or chapter and create an outline because you know that you can learn information more quickly and recall it more easily if you organize information. Knowing that organization leads to increased learning is called *declarative metacognitive knowledge* because it's knowledge about your cognition (e.g., learning, recalling). Knowing how to create an outline using information from a textbook is called *procedural metacognitive knowledge* because it's knowledge about how to use a cognitive strategy. And knowing when you need to create an outline to help you learn most effectively (at the end of each section or chapter) is called *conditional metacognitive knowledge* because it involves knowing when to use a cognitive strategy (see Figure 3.5).[30]

The more learners know about thinking and learning—that is, the greater their metacognitive knowledge—the better their learning and academic achievement will be, in part because they can use this knowledge as they engage in self-regulation.[31] Because *strategies* (metacognitive procedural knowledge) are critical to both metacognition and self-regulation, the next two principles relate to effective study strategies. These principles are followed by a third principle about how children and adolescents' metacognition develops over time and a fourth principle related to the important role of learners' *beliefs* in their learning processes.

Figure 3.5 Categories of metacognitive knowledge

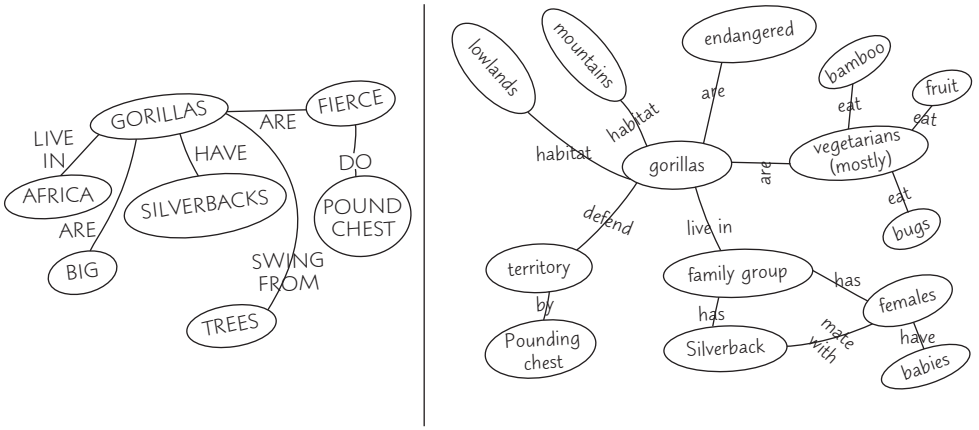


Some effective study strategies are easily seen in learners' behaviors.

Some study strategies are **overt strategies**—strategies that are readily apparent in what learners do in their efforts to master new topics and skills. In Chapter 1, we described many different types of overt strategies, such as taking notes and creating concept maps. Not only can overt strategies help students learn more effectively, they can also help teachers *assess* students' learning.[32] For example, the concept map on the left side of Figure 3.6 reveals only spotty, fragmented knowledge about gorillas. Furthermore, the student who created the map has two ideas that need correction. First, contrary to a common stereotype, gorillas don't regularly swing from trees, although young ones may occasionally climb a tree to escape danger. Second, gorillas aren't especially "fierce" creatures. For the most part, they live a peaceful existence within their family group; they get nasty (e.g., by beating their chests) only when a human being, non-family-member gorilla, or other potential encroacher threatens their territory.

[28] DiDonato, 2011; Hickey, 2011; Volet et al., 2009.
[29] Dimmitt & McCormick, 2012.
[30] Jacobs & Paris, 1987; Moshman, 2018.
[31] Barber et al., 2020; B. K. Hofer & Pintrich, 2002; J. Lee & Shute, 2010; Meltzer, 2007.
[32] Hartmeyer et al., 2018.

Figure 3.6 Two concept maps about gorillas



Study strategies are effective only to the extent that they involve productive cognitive processes.

Strategies such as taking notes and constructing concept maps are helpful, in large part, because they require the kinds of cognitive processes described in Chapter 2. For example, to take notes, learners must *pay attention* to and *encode* information (possibly through organizing information, creating a visual image, and/or rehearsing the information at least once more), thus facilitating effective storage in long-term memory. To construct a concept map, learners must engage in *meaningful learning* by thinking about how key concepts relate to one another and to what they already know. They must also *organize* the information on the map, which results in a physical map that can be encoded as a *visual image*. Thus, class notes and concept maps can provide a means to help learners encode information by requiring them to use **covert strategies**—mental strategies we can't directly see—that are ultimately responsible for successful learning.[33]

Effective learners often engage in study strategies that aren't evident in their observable behaviors. For instance, they may try to identify main ideas in what they're reading.[34] They may also try to relate new material to what they already know, perhaps finding logical connections between the "new" and the "old," or perhaps asking themselves whether new material might contradict their existing beliefs.[35]

One especially powerful covert strategy is **comprehension monitoring**, a process of periodically checking oneself for recall and understanding. Successful learners continually monitor their comprehension both *while* they study something and at one or more times *after* they've studied it.[36] Furthermore, when they realize they don't understand, they take steps to correct the situation, perhaps by rereading a section of a textbook or asking a question in class. In contrast, low achievers rarely check themselves or take appropriate actions when they don't comprehend something—in other words, they aren't effective at self-regulation. For instance, they seldom reread paragraphs they haven't completely understood the first time around.[37]

Sometimes comprehension monitoring takes the form of *self-explanation*, in which learners occasionally stop to describe to themselves what they've just studied.[38] Another

[33] Di Vesta & Gray, 1972; Kardash & Amlund, 1991; Katayama & Robinson, 2000; Kiewra, 1989; Rawson & Kintsch, 2005; Veenman, 2011.
[34] Afflerbach & Cho, 2010; Dole et al., 1991; Eason et al., 2012.
[35] Ausubel et al., 1978; P. K. Murphy & Mason, 2006; Sinatra & Pintrich, 2003.
[36] Hacker et al., 2009.
[37] L. Baker & Brown, 1984; Haller et al., 1988; N. J. Stone, 2000; Veenman, 2011.
[38] Fonseca & Chi, 2011; McNamara & Magliano, 2009; Renkl, 2011; Siegler & Lin, 2010.

similar approach is *self-questioning*, in which learners regularly stop and ask themselves about the material. Ideally, self-questions include not only simple, fact-based questions but also questions that encourage elaboration (e.g., "What might happen if ____?" "How is _____ different from _____?").[39] Yet another comprehension-monitoring strategy is *summarizing* a body of information, either mentally or on paper.[40]

think about it
As you read this text, are you using effective comprehension monitoring strategies? If not, what strategies could you begin using as you continue reading?

Metacognitive knowledge and skills gradually improve with age.

As children grow older, they become increasingly aware of their own thinking and learning processes and increasingly realistic about what they can learn and remember in a given time period (see Table 3.2). With this growing self-awareness come more effective study strategies.

Truly effective strategies emerge quite slowly, however, especially if young learners don't get guidance from teachers, parents, or other adults about how to study.[41] For instance, unless specifically instructed to take notes, many young adolescents take few or no notes to help them remember class material. And even when they do take notes, they're apt to use superficial strategies in choosing what to focus on—perhaps focusing on definitions and formulas in a textbook or writing down only the things their teacher writes on the board—and miss critical ideas as a result.[42]

Furthermore, many children and adolescents engage in little or no comprehension monitoring.[43] When they don't monitor their learning and comprehension, they don't know what they know and what they don't know, and so they may think they've mastered something when they really haven't. This overconfidence leads to an **illusion of learning**, which is seen in learners at all levels, even college students.[44]

Comprehension monitoring isn't just an important study strategy in its own right—it also plays a pivotal role in the development of *other* study strategies.[45] Learners will acquire

Developmental Trends

Table 3.2 Metacognition at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **Grades K–2**	• Awareness of thought in oneself and others, albeit in a simplistic form; limited ability to reflect on the specific nature of one's own thought processes • Considerable overestimation of what has been learned and how much can be remembered • Belief that learning is a relatively passive activity • Belief that the absolute truth about any topic is "out there" somewhere, waiting to be discovered	An adult tells 6-year-old Brent that she will read him a list of 12 words; she then asks him to predict how many he'll be able to remember. Brent predicts "about 8 or 9 . . . maybe all of them," but in fact he recalls only 6. Later, when the adult asks him what he did to try to remember the words, he says only, "Think" and "Holded it, hold it in my brain."	• Talk often about thinking processes (e.g., "I *wonder* if . . . " "How might you *remember* to . . . ?"). • Provide opportunities for students to "experiment" with their memories (e.g., playing "I'm going on a trip and am going to pack _____," in which each student repeats items previously mentioned and then adds another item to the list). • Introduce simple learning strategies (e.g., rehearsal of spelling words, repeated practice of motor skills).

[39] De La Paz, 2005; Dunning et al., 2004; A. King, 1992; Wong, 1985.
[40] A. King, 1992; R. E. Mayer, 2010; Shanahan, 2004; Wade-Stein & Kintsch, 2004.
[41] J. E. Barnett, 2001; Rawson & Kintsch, 2005; Schommer, 1994a; Schneider, 2010; Veenman, 2011.
[42] Dee-Lucas & Larkin, 1991; Dole et al., 1991; R. E. Reynolds & Shirey, 1988.
[43] Dole et al., 1991; McKeown & Beck, 2009; Nokes & Dole, 2004.
[44] L. Baker, 1989; D. L. Butler & Winne, 1995; Carpenter et al., 2020; Dunlosky & Lipko, 2007; Hacker & Bol, 2004; N. J. Stone, 2000.
[45] Kuhn et al., 1995; Lodico et al., 1983; Loranger, 1994.

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
JohnnyGreig/E+/ Getty images **Grades 3–5**	• Increasing ability to reflect on the nature of one's own thought processes • Some overestimation of memory capabilities • Emerging realization that learning is an active, constructive process and that people may misinterpret what they observe • Continuing belief in an absolute truth "out there"	After reading several explanations of how ancient humans migrated from Asia to North America, a cooperative learning group in a combined fifth- and sixth-grade classroom includes the following points in its summary of what the group has learned: "The more that we learn, the more we get confused about which is fact and which is fiction. . . . We have made [our] own theories using information we found and trying to make sense of it."	• Provide simple techniques (e.g., self-test questions) that enable students to monitor their learning progress. • Examine scientific phenomena through hands-on activities and experimentation; ask students to make predictions about what will happen and to debate competing explanations for what they observe.
Photo by Unsplash **Grades 6–8**	• Few and relatively ineffective study strategies (e.g., poor note-taking skills, little or no comprehension monitoring) • Belief that "knowledge" about a topic consists largely of a collection of discrete facts • Increasing realization that knowledge can be subjective and that conflicting perspectives may each have some validity (e.g., "people have a right to form their own opinions") • Increasing differentiation among the underlying natures of various content domains (e.g., thinking that math involves right vs. wrong answers, whereas social studies allows for diverse opinions)	The students in Ms. Gaunt's eighth-grade math class rarely take notes to help them remember new concepts and procedures, and most are more concerned about getting correct answers than about making sense of mathematical operations (see the opening case study).	• Teach and model effective strategies within the context of various subject areas. • Scaffold students' studying efforts (e.g., provide a structure for note taking, give students questions to answer as they study). • Introduce multiple perspectives about topics (e.g., asking whether Christopher Columbus was a brave scientist in search of new knowledge or, instead, an entrepreneur in search of personal wealth). • Explicitly ask students to reflect on their beliefs about the nature of various academic disciplines (e.g., "Can a math problem sometimes have two *different* right answers?").
Photo by Unsplash **Grades 9–12**	• Growing (but incomplete) knowledge of which study strategies are effective in different situations; persistent use of rote memorization by some students • Increasing mastery of covert learning strategies (e.g., intentional elaboration, comprehension monitoring) • Increasing recognition that knowledge involves understanding interrelationships among ideas • Increasing recognition that mastering a topic or skill takes time and practice (rather than happening quickly as a result of innate ability) • Emerging understanding that conflicting perspectives should be evaluated on the basis of evidence and logic (seen in a small minority of high school students)	When 16-year-old Hilary is asked to describe the things she does to help her remember school subject matter, she says, "When I'm trying to study for tests, I try to associate the things I'm trying to learn with familiar things . . . if I have a Spanish vocabulary test, I'll try to . . . with the Spanish words, I'll try to think of the English word that it sounds like . . . sometimes if I can't find any rule, then I just have to memorize it, just try to remember it, just go over it a lot."	• Continue to teach and model effective learning strategies; ask students to describe their strategies to one another. • Develop classroom assignments and assessments that emphasize understanding, integration, and application, rather than recall of discrete facts. • Present various subject areas as dynamic entities that continue to evolve with new discoveries and theories. • Have students weigh pros and cons of various explanations and documents using objective criteria (e.g., hard evidence, logical reasoning processes).

Sources: Andre & Windschitl, 2003; Astington & Pelletier, 1996; J. E. Barnett, 2001; Bendixen & Feucht, 2010; Buehl & Alexander, 2006; Chandler et al., 2002; Elder, 2002; Flavell et al., 1970, 2002; Hatano & Inagaki, 2003; Hewitt et al., 1995, p. 7 (migration example); P. M. King & Kitchener, 2002; Ku et al., 2008; Kuhn, 2009; Kuhn et al., 1995; Kuhn & Park, 2005; Kuhn & Weinstock, 2002; Lovett & Flavell, 1990; McCrudden & Schraw, 2007; Meltzer et al., 2007; Muis et al., 2006; P. A. Ornstein et al., 2010; Schneider, 2010; Schommer, 1994a, 1997; Short et al., 1993; J. W. Thomas, 1993; vanSledright & Limón, 2006; Wellman, 1985, 1990; J. P. Williams et al., 2009.

and use new, more effective strategies only if they realize that their prior strategies have been *in*effective in helping them learn. If, instead, they mistakenly believe that they're successfully mastering school topics, they'll have little reason to abandon ineffective strategies (such as rote memorization) for more sophisticated ones.

Learners' beliefs about the nature of knowledge and learning influence their approaches to learning tasks.

One of us authors (Jeanne) once had a conversation with her son Jeff, then an 11th-grader, about the Canadian Studies program a local university had just added to its curriculum. Jeff's comments revealed a very simplistic view of what "history" is:

> ***Jeff:*** The Canadians don't have as much history as we [Americans] do.
>
> ***Mom:*** Of course they do.
>
> ***Jeff:*** No, they don't. They haven't had as many wars.
>
> ***Mom:*** History's more than wars.
>
> ***Jeff:*** Yeah, but the rest of that stuff is really boring.

Once Jeff reached college, he discovered that history is a lot more than wars and other, "really boring" stuff. In fact, he majored in history and now, as a middle school teacher, actually *teaches* history. But it's unfortunate that he had to wait until college to discover the true nature of knowledge in history.

The following exercise encourages you to reflect on your own beliefs about the nature of knowledge.

See For Yourself

Beliefs About Knowledge

Rate your beliefs for each of the following items on a scale from 1 to 5. A rating of 1 indicates that you strongly agree with the statement to the *left* of the five-point scale and a rating of 5 indicates that you strongly agree with the statement to the *right* of the scale.

A.	Knowledge can be learned quickly and easily.	1	2	3	4	5	Knowledge is acquired gradually with time and effort.
B.	Knowledge is fixed and known.	1	2	3	4	5	Knowledge is fluid and continues to evolve.
C.	Knowledge is simple, discrete bits of information.	1	2	3	4	5	Knowledge is complex and involves interconnected ideas.
D.	Knowledge exists outside the learner and can be transmitted from an authority.	1	2	3	4	5	Knowledge is constructed by the learner in interaction with more knowledgeable people or sources.
E.	Knowledge from an authority can be accepted unquestioned.	1	2	3	4	5	Knowledge must be supported with credible evidence.

Your answers to the items in this exercise tell you something about your beliefs about knowledge and learning, which are collectively known as **epistemic beliefs** (you may also see the term *epistemological beliefs* or *epistemic cognition*). Students' epistemic beliefs are

important because they often influence their studying, learning, and motivation.[46] Higher ratings on the items in the preceding "Beliefs About Knowledge" exercise are generally more productive because learners with those beliefs tend to be more motivated to persist at a task and to use more effective learning strategies. For example, when learners believe that learning happens quickly with little or no effort on their part—as Ms. Gaunt's students apparently do in the opening case study—they're apt to believe they've mastered something before they really have. Furthermore, they tend to give up quickly in the face of failure and express discouragement or dislike regarding the topic they're studying. In contrast, when learners believe that learning is a gradual process that often takes time and effort, they're likely to use a wide variety of learning strategies as they study and to persist until they've made sense of the material.[47]

As another example, some students believe that when they read a textbook, they're passively soaking up many separate pieces of information from the page. Similarly, Ms. Gaunt's students think that mathematics consists simply of a bunch of procedures that yield single right answers but don't necessarily have to make sense.[48] More effective learners recognize that learning requires them to construct their own meanings by actively interpreting, organizing, and applying new information. The latter individuals are more likely to engage in meaningful learning as they read and study and are more likely to undergo conceptual change when they encounter ideas that contradict existing understandings.[49]

Epistemic beliefs tend to evolve over the course of childhood and adolescence, as reflected in some of the entries in Table 3.2.[50] Children in the elementary grades typically believe in the certainty of knowledge: They think that for any topic there's an absolute truth "out there" somewhere. As they reach high school, some of them—and *only* some—begin to realize that knowledge is a subjective entity and that different perspectives on a topic can occasionally be equally valid. Additional changes can occur during the high school grades. For example, 12th-graders are more likely than 9th-graders to believe that knowledge consists of complex interrelationships rather than discrete facts and that learning happens slowly rather than quickly. And throughout adolescence, students' epistemic beliefs become increasingly specific to particular content domains.[51] For instance, students may believe that in math, answers are always either right or wrong (again recall Ms. Gaunt's students) but that in social studies, conflicting perspectives might all have some validity.

Interestingly, people from various cultural groups don't completely agree on what it means to *learn* something. From the perspective of mainstream Western culture, learning is largely a mental enterprise: People learn in order to understand the world and acquire new skills and abilities. But for many Chinese people, learning also has moral and social dimensions: It enables a person to become increasingly virtuous and honorable and to contribute in significant ways to society's general welfare.[52] Furthermore, from a traditional East Asian perspective, true mastery of a topic comes only with a great deal of diligence, concentration, and perseverance—a position that stands in stark contrast to the American students in the chapter's opening case study.[53]

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[46] Bendixen & Feucht, 2010; Greene et al., 2018; B. K. Hofer & Bendixen, 2012; B. K. Hofer & Pintrich, 1997; Muis, 2007.

[47] D. L. Butler & Winne, 1995; Kardash & Howell, 2000; Muis, 2007; Schommer, 1990, 1994b.

[48] Such beliefs about math are common; see Muis, 2004.

[49] Mason, 2010; Muis, 2007; Schommer-Aikins, 2002; Sinatra & Pintrich, 2003.

[50] Kuhn & Park, 2005; Muis et al., 2006; Schommer et al., 1997.

[51] Buehl & Alexander, 2006; Muis et al., 2006.

[52] Spina et al., 2020.

[53] Dahlin & Watkins, 2000; H. Grant & Dweck, 2001; J. Li, 2005; J. Li & Fischer, 2004.

Teaching Strategies: Promoting Self-Regulation Skills and Metacognitive Development

As we've seen, self-regulation skills and metacognitive awareness tend to improve in significant ways throughout the elementary and secondary school years. Yet many students at all grade levels have little knowledge about effective learning strategies—for example, they may think that studying involves memorizing facts—and they aren't always able to keep themselves focused on productive learning activities.[54] With these points and a growing body of research findings in mind, we offer a few recommendations.

Guide and support self-regulated learning and behavior.

If students are to become productive and successful adults who work well independently, they must become increasingly self-regulating over the course of childhood and adolescence. Some students acquire self-regulation skills largely on their own, but many others need considerable guidance and support. For example, students with a history of academic failure acquire better study habits when they're given explicit instruction in self-regulation strategies.[55]

Consistent with the concept of *co-regulation* introduced earlier, teachers can probably best foster self-regulation skills by initially providing considerable support and then gradually giving students more control as they become more self-directed. The right-hand column in Table 3.1, presented earlier in the chapter, offers suggestions that are apt to be appropriate at different grade levels. The Classroom Strategies box "Fostering Self-Regulation" offers several more specific ideas.

Of the many self-regulation strategies students might acquire, some of the most important ones are those with which students can use to monitor and evaluate their own learning and behavior. Following are several things teachers might do to encourage self-monitoring and self-evaluation:[56]

- Have students set specific goals for their learning and then self-reflect on their achievements relative to those goals.
- Provide specific criteria students can use to judge their performance; have them compare their self-evaluations with teacher evaluations (e.g., see Figure 3.7).
- To check for long-term retention of reading material, suggest questions that students can ask themselves to assess their understanding after a significant time delay.
- Ask students to keep ongoing records of their performance and to reflect on their learning in writing assignments, journals, or portfolios.

Even kindergartners and first-graders can be encouraged to reflect on their performance and progress, perhaps through questions such as "What were we doing that we're proud of?" and "What can we do that we didn't do before?"[57] By regularly engaging in self-monitoring and self-evaluation of classroom assignments, students should eventually develop appropriate standards for their performance and routinely apply those standards to the things they accomplish—true hallmarks of a self-regulating learner.

[54] J. E. Barnett, 2001; M. C. Linn & Eylon, 2011; Pintrich & De Groot, 1990; Schommer, 1994a.
[55] Cosden et al., 2001; Eilam, 2001; Graham & Harris, 1996; Meltzer, 2007; N. E. Perry, 1998.
[56] Belfiore & Hornyak, 1998; Brunstein & Glaser, 2011; Dunning et al., 2004; Eilam, 2001; McCaslin & Good, 1996; McMillan, 2010; Meltzer, 2007; Paris & Paris, 2001; N. E. Perry, 1998.
[57] K. D. Allen, 1998; Belfiore & Hornyak, 1998; K. R. Harris, 1986; Reid et al., 2005; Webber et al., 1993.

Classroom Strategies

Fostering Self-Regulation

- **Teach students to remove potential distractions from their immediate environment when they're learning and studying.**
  A high school physics teacher reminds her students that, to complete their homework effectively, they need to turn off their phone, put it out of sight, and place any other tempting electronic devices or objects in another room while working on their homework.
- **Teach students to avoid situations that involve temptations if the situations will prevent them from meeting their goals.**
  The day before a big wrestling match, a wrestling coach says to one of his wrestlers, "Hey, Zane, why don't you get a ride home with your sister after school today instead of walking home with your friends. If you walk with your friends, you'll probably end up buying a pound of candy at the convenience store. Eating candy tonight won't be a healthy way to prepare for your match tomorrow!"
- **Reinforce students' self-regulation strategies until they're able to remember and execute the strategies on their own.**
  A fourth-grade teacher asks students to show her their daily planners every day to make sure they have their assignments and upcoming tests written in the planner. She gives them a sticker on their planner page if they've included everything correctly.
- **Teach students to reinforce themselves for appropriate behavior.**
  A teacher helps students develop more regular study habits by encouraging them to make a favorite activity—for example, practicing basketball, watching a movie, or texting a friend—contingent on completing their homework first.
- **Have students observe and record their own behavior.**
  A student with attention-deficit hyperactivity disorder frequently tips his chair back to the point where he might topple over. Concerned for the student's safety, his teacher asks him to record each instance of chair-tipping behavior on a sheet of graph paper. Both student and teacher notice how quickly the behavior disappears once the student has become aware of his bad habit.
- **Teach students instructions they can give themselves to remember what they need to do.**
  To help students remember the new dance steps they're learning, their teacher instructs them to say such things as "One, two, gallop, gallop" and "One leg, other leg, turn, and turn" while performing the steps.
- **Provide the guidance students need to be able to evaluate their own performance.**
  A science teacher gives students a list of criteria to evaluate the lab report they've just written. In assigning grades, she considers not only what students have written in their reports but also how accurately students have evaluated their own report.
- **Teach students to set specific goals that indicate when, where, and how they intend to achieve the goal by creating "if . . . then" statements.**
  Asher's grades in math are quite low because he's been playing video games at night instead of doing his homework. He explains to his teacher: "Every time I try to do my homework in my room, I pick up my iPad and start playing games instead." His teacher works with him to write this "if . . . then" statement to help him self-regulate his behavior: "IF I go into my room, THEN I start and finish my math homework before I turn on the iPad."
- **Give students age-appropriate opportunities to engage in learning tasks with little or no help from their teacher.**
  A middle school social studies teacher distributes various magazine articles related to current events in the Middle East, making sure that each student receives an article appropriate for his or her reading level. He asks students to read their articles over the weekend and prepare a one-paragraph summary to share with other class members. He also provides guidelines about what inforvmation students should include in their summaries.

Sources: Andrade, 2010; Dignath & Veenman, 2020; Duckworth et al., 2016 (remove distractions example); Ent et al., 2015 (avoid temptations example); Gollwitzer & Sheeran, 2006 ("if . . . then" statements example); Hadley et al., 2020; Hatzigeorgiadis et al., 2011; Mace et al., 2001; McMillan, 2010; Reid et al., 2005; van Gog et al., 2020 (evaluate their own performance); Vintere et al., 2004, p. 309 (dancing self-instructions example); Zimmerman, 2004.

Encourage metacognitive self-reflection.

Metacognition lies at the heart of effective school learning: Students must regularly *think about their thinking*.[58] To encourage metacognitive self-reflection, a teacher might:

- Ask students to explain what they're doing and why they're doing it while they work on a problem.[59]
- Give students questions to ask *themselves* as they work on a problem—questions such as "Am I getting closer to my goal?" and "Why is this strategy most appropriate?"[60]

[58] Dignath & Veenman, 2020.
[59] N. E. Perry et al., 2002, p. 10.
[60] Dominowski, 1998; Johanning et al., 1999; Siegler & Lin, 2010.

Figure 3.7 After a cooperative group activity with three classmates, Rochelle and her teacher used the same criteria to rate Rochelle's performance and that of her group. With the two sets of ratings side by side, Rochelle can evaluate the accuracy of her self-assessments.

Project description *Travel Guide*

Evaluate with a 1 for weak, a 2 for fair, a 3 for good, a 4 for very good, and a 5 for excellent.

Student	Teacher	
4	4	1. The task was a major amount of work in keeping with a whole month of effort.
5	4	2. We used class time quite well.
4	5	3. The workload was quite evenly divided. I did a fair proportion.
4	5	4. I showed commitment to the group and to a quality project.
5	4	5. My report went into depth; it didn't just give the obvious, commonly known information.
5	5	6. The project made a point: a reader (or viewer) could figure out how all of the details fitted together to help form a conclusion.
5	5	7. The project was neat, attractive, well assembled. I was proud of the outcome.
4	5	8. We kept our work organized; we made copies; we didn't lose things or end up having to redo work that was lost.
5	4	9. The work had a lot of original thinking or other creative work.
4	4	10. The project demonstrated mastery of basic language skills—composition, planning, oral communication, writing.
45	45	Total

Comments:

46 group average (A)G (A)T

- Have students keep *learning journals* in which they explain the main ideas of lessons, generate their own examples of new concepts, and identify strategies for overcoming gaps in their understandings.[61]
- Conduct *strategy share* discussions in which various class members explain their techniques for learning and remembering specific classroom topics.[62]

The right-hand column of Table 3.2, presented earlier in the chapter, offers additional suggestions.

Explicitly teach effective learning strategies.

We have previously described numerous learning strategies in this book, most notably in the Chapter 1 section titled "Strategies for Learning and Studying Effectively" and in the Chapter 2 section titled "Teaching Strategies: Encouraging Effective Long-Term Memory

[61] M. Carr, 2010; ; A. King, 1999, p. 101; Kramarski & Mevarech, 2003, p. 286.
[62] Glogger et al., 2012.

Storage Processes." Explicit training in reading and study strategies—preferably integrated into everyday instruction about academic topics—can definitely enhance students' learning and achievement and is especially important for students who have a history of academic difficulties.[63] Ideally, students should learn many different learning strategies and the situations in which each one is appropriate. For instance, trying to *make sense* of new ideas—meaningful learning—is essential for learning general principles within a discipline, whereas mnemonics are often more useful for learning hard-to-remember pairs and lists. And different organizational techniques—outlines, diagrams, concept maps, two-dimensional comparison tables, and so on—are more or less suitable for different situations.[64] Students should have opportunities to practice each new strategy with a variety of learning tasks over a period of time. Effective strategy instruction is clearly *not* a one-time deal.

When teaching learning strategies, teachers must be sure to include covert strategies—elaboration, comprehension monitoring, and so on—as well as overt ones. One effective way to teach covert mental processes is to model them by thinking aloud about classroom topics.[65] For example, in a high school history lesson on Napoleon, a teacher might say, "Hmm . . . it seems to me that Napoleon's military tactics were similar to those of the ancient Assyrians. Let's briefly recall the things the Assyrians did." When assigning a textbook chapter for homework, a teacher might say, "Whenever I read a textbook chapter, I begin by looking at the headings and subheadings in the chapter. I then think about questions that the chapter will probably address, and I try to find the answers as I read. Let me show you how *I* might read the chapter I've asked you to read tonight . . . ."

Yet students are likely to use new study strategies only if they discover for themselves that the strategies are truly helpful.[66] For instance, one of us authors occasionally does little "experiments" in her classes, presenting information that's hard to make sense of and giving about half of the students a specific mnemonic for remembering it. Then, after giving the students a mock "test" on the information, she writes students' "test scores" on the board, putting the scores of the mnemonic and no-mnemonic students in separate columns. The performance of the two groups is usually so dramatically different that the students readily acknowledge the usefulness of the strategy she has taught them.

Students often need considerable support in their early efforts to use new strategies. For example, to help students identify the most important information in a lesson, a teacher might provide a list of objectives for the lesson, write key concepts and principles on the board, or ask questions that focus students' attention on central ideas.[67] To help students elaborate on what they read, teachers can provide examples of questions for students to answer (e.g., "Explain why . . . " or "What is a new example of . . . ?").[68] And to help students in their early note-taking efforts, teachers might provide a structure to fill in during a lesson. An example of such a structure for a lesson on muscles is presented in Figure 3.8. You can find another example in the two sets of notes on Greek mythology presented in Figure 1.10 in Chapter 1.

Some instructional software programs and apps also give guidance in developing and using metacognitive skills—for instance, by occasionally asking students to relate new ideas to things they've previously learned or to self-check their understandings of

[63] Meltzer et al., 2007.
[64] Eason et al., 2012; Hattie et al., 1996; Meltzer & Krishnan, 2007; Nokes & Dole, 2004; Schroeder et al., 2018; Veenman, 2011.
[65] R. K. Atkinson et al., 1999; D. H. Robinson & Kiewra, 1995.
[66] Brophy et al., 2009; A. L. Brown & Palincsar, 1987; Pressley et al., 1992.
[67] Paris & Paris, 2001; Pressley & Hilden, 2006; Veenman, 2011.
[68] Bulgren et al., 2011; Ku et al., 2008; McCrudden & Schraw, 2007; R. E. Reynolds & Shirey, 1988; Veenman, 2011.

Figure 3.8 Example of a partially filled-in outline that can guide students' note taking

MUSCLES

A. Number of Muscles

1. There are approximately _____ muscles in the human body.

B. How Muscles Work

1. Muscles work in two ways:
   a. They _____ , or shorten.
   b. They _____, or lengthen.

C. Kinds of Muscles

1. _____ muscles are attached to the bones by _____ .
   a. These muscles are _____ (voluntary/involuntary).
   b. The purpose of these muscles is to _____
   _____ .
2. _____ muscles line some of the body's _____ .
   a. These muscles are _____ (voluntary/involuntary).
   b. The purpose of these muscles is to _____
   _____ .
3. The _____ muscle is the only one of its kind.
   a. This muscle is _____ (voluntary/involuntary).
   b. The purpose of this muscle is to _____
   _____ .

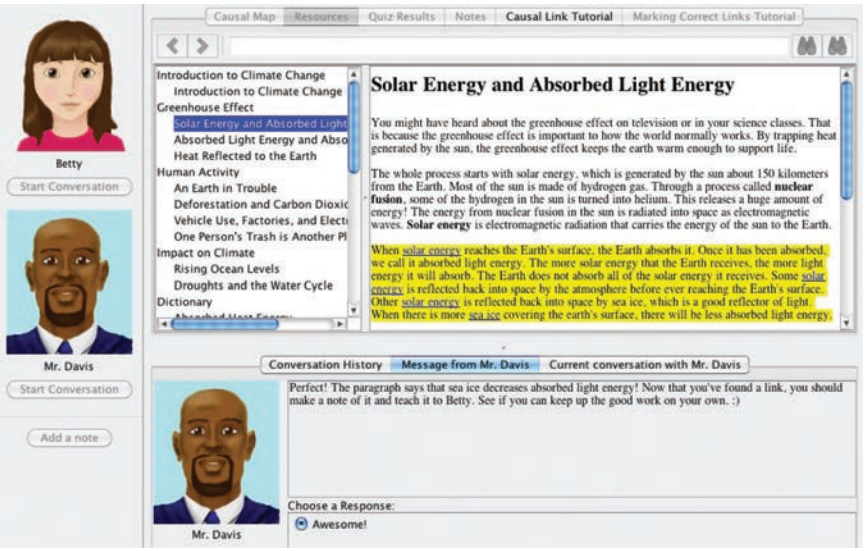
particular concepts they've recently been asked to learn.[69] An example is *Betty's Brain*, a computer-based learning environment in which students read several resources about a topic such as thermodynamics or climate change and then create a concept map representing the cause-and-effect relationships they discover in the resources. Students are told that a "child" named Betty will learn about the topic through the map they create and that, as Betty's "teacher," they should periodically assess her understandings with questions or a quiz. If Betty doesn't perform well, students must work to improve her understandings and, in the process, they learn a great deal about the topic themselves. For example, Figure 3.9 shows an in-progress unit on climate change. The student (who is now Betty's teacher) has made some inappropriate causal links in her concept map, leading computer-based Betty to perform poorly on assessments. A virtual "mentor" (Mr. Davis) has stepped in to provide guidance about how to identify cause-and-effect relationships in a small section of text. Here the student has just correctly identified a relationship between sea ice and absorbed light energy, and Mr. Davis has suggested her next course of action.[70]

Communicate that acquiring knowledge is a dynamic, ongoing process—that one never knows something completely.

Epistemic beliefs about particular academic disciplines, as well as about knowledge and learning more generally, have a significant impact on how students study, what they learn, how readily they apply classroom subject matter, and how often they critically evaluate it. Instruction in study strategies alone won't necessarily change those beliefs.[71]

[69] Questions from A. King, 1992, p. 309.
[70] Azevedo & Witherspoon, 2009; Koedinger et al., 2009.
[71] For more information about *Betty's Brain*, see Leelawong & Biswas, 2008; Segedy et al., 2013; also go to teachableagents.org.

Figure 3.9 In this screenshot from *Betty's Brain*, a student has, so far, created an inadequate concept map of cause-and-effect relationships impacting climate change. "Mr. Davis" has stepped in to provide help and feedback



Source: The *Betty's Brain* system has been developed by the Teachable Agents Group at Vanderbilt University with financial support from the Institute for Educational Sciences and the National Science Foundation.

One possible way to change students' epistemic beliefs is to talk specifically about the nature of knowledge and learning—for instance, to describe learning as an active, ongoing process of finding interconnections among ideas and constructing increasingly complex understandings.[72] But probably a more effective approach is to provide classroom experiences that lead students to discover that knowledge must necessarily be a dynamic, rather than static, entity and to realize that successful learning sometimes occurs only through effort and persistence. For example, teachers can have students address complex issues and problems that have no clear-cut right or wrong answers.[73] They can teach strategies for gathering data and testing competing hypotheses.[74] Teachers can ask students to compare several explanations of a particular phenomenon or event and consider the validity and strength of evidence supporting each one.[75] And they can show students, perhaps by presenting puzzling phenomena, that their own current understandings, and in some cases even those of experts in the field, don't yet adequately explain all of human experience.[76]

3.2 Transfer

Big Idea 3.2 Specific facts don't always have much applicability to the outside world, but many general principles, strategies, and attitudes acquired at school are potentially applicable to a wide variety of situations.

How students think about and study school subject matter has implications not only for how well they can understand and remember it, but also for how effectively they can *use and apply* it later on. Here we're talking about **transfer**—a phenomenon in which

[72] Schraw & Moshman, 1995.
[73] Gaskins & Pressley, 2007; Muis et al., 2006; Schommer, 1994b.
[74] Feucht, 2010; Schommer-Aikins et al., 2010; Yang & Tsai, 2010.
[75] Andre & Windschitl, 2003; P. M. King & Kitchener, 2002; C. L. Smith et al., 2000.
[76] Andre & Windschitl, 2003; Chinn, 2006; P. M. King & Kitchener, 2002; Rule & Bendixen, 2010; vanSledright & Limón, 2006.

something a person has learned at one time affects how the person learns or performs in a later situation. Here are some examples of transfer:

- Elena speaks both English and Spanish fluently. When she begins a French course in high school, she immediately recognizes many similarities between French and Spanish. "Aha," she thinks, "what I know about Spanish will help me learn French."
- In her middle school history class, Stella discovers that she does better on quizzes when she takes more notes. She decides to take more notes in her science class as well and, sure enough, she begins to get higher grades on her science quizzes.
- Ted's fifth-grade class has been working with decimals for several weeks. His teacher asks, "Which number is larger, 4.4 or 4.14?" Ted recalls something he knows about whole numbers: Numbers with three digits are larger than numbers with only two digits. He mistakenly concludes that the larger number is 4.14 because it has three digits and 4.4 only has two digits.

In most cases, prior learning *helps* learning or performance in another situation. Such **positive transfer** takes place when Elena's Spanish helps her learn French and when Stella's practice with note taking in history class improves her performance in science class. In some instances, however, existing knowledge or skills *hinder* later learning. Such **negative transfer** is the case for Ted, who transfers a principle related to whole numbers to a situation in which it doesn't apply: comparing decimals.

think about it
Can you think of a recent situation in which you exhibited positive transfer? Can you think of one in which you exhibited negative transfer?

Factors that Affect Transfer

Positive transfer to real-world tasks and problems should, of course, be a major goal for students at all grade levels. Unfortunately, however, learners often *don't* apply school subject matter to out-of-school situations because they don't retrieve it from long-term memory when it might be useful.[77] The principles in this section capture many research findings regarding when transfer is and isn't likely to occur.

Meaningful learning and conceptual understanding increase the probability of transfer.

Learners are much more likely to apply new knowledge and skills when they engage in meaningful rather than rote learning.[78] Ideally, learners should acquire *conceptual understanding* of a topic, such that many concepts and procedures are interrelated in a cohesive, logical whole. When knowledge and skills are appropriately interconnected in long-term memory, learners are more likely to retrieve them in relevant situations (recall our discussion of this concept in Chapter 2).

In general, then, the *less-is-more* principle introduced in Chapter 2 applies here: Learners are more likely to transfer new knowledge and skills to new situations—including those in the outside world—when they study a few things in depth and learn them *well*, rather than studying many topics superficially.[79] In-depth instruction is especially effective when learners see many examples of concepts and have many opportunities to apply skills to diverse situations. In such cases learners can connect their new knowledge to a wide variety of contexts, increasing the odds that they'll retrieve it later when they need it.[80]

[77] Levstik, 2011; R. E. Mayer & Wittrock, 1996; D. N. Perkins & Salomon, 2012; Renkl et al., 1996.
[78] Bereiter, 1995; Brooks & Dansereau, 1987; R. E. Mayer & Wittrock, 1996; Pugh & Bergin, 2006.
[79] Haskell, 2001; M. C. Linn, 2008; R. A. Schmidt & Bjork, 1992.
[80] Cox, 1997; M. C. Linn, 2008; D. N. Perkins & Salomon, 2012; R. A. Schmidt & Bjork, 1992.

The less-is-more principle is clearly being violated in the opening case study. Ms. Gaunt decides that she must move fairly quickly if she is to cover the entire eighth-grade math curriculum, even if it means that few students will master any particular topic or procedure. Given the upcoming statewide math exam, she may feel that she has few alternatives, but her students are unlikely to *use* what they're learning on future occasions.

Both positive and negative transfer are more common when a new situation appears to be similar to a previous one.

Transfer from one situation to another is more likely to occur when the two situations overlap in some way, in large part because the new situation provides retrieval cues that remind learners of relevant things they learned in the previous situation.[81] Consider Elena, the student fluent in Spanish who is now taking French. When Elena first encounters French number words (*un, deux, trois*), they should quickly trigger recall of similar-sounding Spanish words (*uno, dos, tres*). **Specific transfer** occurs when the original learning task and the transfer task overlap in some way, such as in their content or underlying structure. As examples, consider the following three problems:

1. An automotive engineer has designed a car that can reach a speed of 60 miles per hour within 2 seconds. What is the car's rate of acceleration?
2. A car salesperson tells a customer that a particular model of car can reach a speed of 40 miles per hour within 4 seconds. What is the car's acceleration rate?
3. A zoologist reports that a particular horse can increase its speed by 5 kilometers per hour each second. How long will it take the horse to reach a running speed of 60 kilometers per hour?

Let's pretend that Joey's teacher just taught him how to solve Problem 1 in class by using the formula $a = v / t$ (acceleration = velocity / time elapsed) and then gave him Problem 2 for homework. Would Joey be able to solve Problem 2? Probably, because Problems 1 and 2 have similar content (both involve cars) and similar underlying structures (both involve the relationship among acceleration, velocity, and time). Given that these problems overlap in content and structure, it's likely that specific transfer will occur (see Figure 3.10).

Figure 3.10 Specific transfer is involved in solving Problems 2 and 3 because the underlying structure is the same as Problem 1. However, transfer may be harder for Problem 3 because the content and some of the other factors in the problem are different from Problems 1 and 2.

Problem	Content	Unerlying structure	Types of transfer
#1		a = v / t	original problem
#2		a = v / t	specific transfer (easier)
#3		a = v / t rearranged as t = v / a	specific transfer (harder)

If Joey is also given Problem 3 for homework, will he be able to solve it after he correctly solves Problem 2? Problem 3 involves specific transfer because it has the same general structure as Problems 1 and 2 (the $a = v / t$ formula can be used to solve it). However, several things are different about Problem 3: the content topic switched from cars to horses, the units of measurement switched from miles per hour to kilometers per hour, and the variable that needs to be calculated in the formula changed from acceleration rate to time. Given these differences, solving Problem 3 may be more difficult for Joey than solving Problems 1 or 2. But he should be able to solve it because the underlying structure is similar to that of Problems 1 and 2, even though the content and some other factors have changed.

All three of these problems can be solved if Joey recognizes that they involve the same underlying principle: acceleration = velocity/time elapsed. On average, general principles, rules, and theoretical explanations are more widely applicable than specific facts and information (e.g., knowing that 2 + 3 = 5).[82] For example, in solving computational

[81] Bassok, 2003; Day & Goldstone, 2012; Haskell, 2001; Scherer et al., 2019.
[82] S. M. Barnett & Ceci, 2002; Bransford & Schwartz, 1999; Haskell, 2001; M. Perry, 1991.

problems requiring division, it's helpful to keep in mind that dividing positive numbers leads to a smaller amount *only* when the divisor is a number greater than 1. And in making sense of various historical and current events, it's helpful to know that a country's citizens sometimes revolt when government officials act unjustly. Of course, some facts are indispensable, but by themselves, facts have limited usefulness in new situations.

Some knowledge and skills can be transferred to very different situations.

So far, we've seen that specific transfer occurs when the original learning task and the transfer task overlap in content or structure. But it's also possible for transfer to occur when the original learning task and the transfer task differ in both content and structure—a situation that's called **general transfer**. Remember Stella, who discovered that she does better on her history quizzes when she takes more notes? Well, she also decided to take notes as she watched a YouTube video about how to play her favorite song on the guitar. She believed that taking notes would help her to remember how to play the chords in the song. In this case, her history class and playing the song don't overlap much in content (history versus music) or structure (a formal school class versus an informal video), so it's an instance of general transfer.

Especially as they get older, some learners acquire an ability to apply broad principles to topics quite different from those they've previously studied. For example, in one research study, fifth-graders and college students were asked to develop a plan for increasing the population of bald eagles, an endangered species in their state.[83] None of the students in either age group had previously studied strategies for eagle preservation, and the plans that both groups developed were largely inadequate. Yet in the process of developing their plans, the college students addressed more sophisticated questions than the fifth-graders. The fifth-graders focused on the eagles themselves (e.g., How big are they? What do they eat?), whereas the college students considered broader questions (e.g., What type of ecosystem supports eagles? What about predators of eagles and eagle babies?).[84] Thus, the college students were drawing on an important principle they had acquired in their many years of science study: Living creatures are more likely to survive and thrive when their habitat supports rather than threatens them.

General transfer can also occur between specific abilities and more general thinking skills. For example, researchers found that students who learned computer programming were able to transfer those skills in ways that led to improved computational thinking skills.[85] This finding could be considered *specific transfer* because the content and structure between computer programming and computational thinking overlap. However, *general transfer* also occurred because learning computer programming also positively affected students' skills related to creativity, mathematical thinking, metacognition, reasoning, and spatial abilities. This is a good example of how general transfer can help students use what they learn in one situation in other, fairly different, situations.

Identifying the extent to which the content and structure of problems overlap is not a precise science. Sometimes it can be difficult to determine whether a problem involves mostly specific transfer or mostly general transfer, especially when the content and structure overlap to some extent but not very much. Nonetheless, the distinction between specific and general transfer is a useful one to consider in that, on average, specific transfer is easier for students than general transfer.[86]

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[83] Bransford & Schwartz, 1999.
[84] Bransford & Schwartz, 1999, p. 67.
[85] Scherer et al., 2019.
[86] S. M. Barnett & Ceci, 2002; Bassok, 2003.

Learning strategies, general beliefs, and attitudes can also transfer to new situations.

Many learning and study strategies, such as note taking, have wide applicability: When learners acquire effective strategies within the context of one content domain, they often apply the strategies in a very different domain.[87] In addition, the general beliefs and attitudes that learners acquire about learning and thinking—for instance, confidence in their ability to master school subject matter, recognition that learning often takes hard work, and willingness to consider multiple viewpoints on controversial issues—can have a profound impact on later learning and achievement across multiple domains and so clearly illustrate general transfer at work.[88]

Transfer increases when the learning environment encourages it.

We return once again to the concepts *situated learning* and *situated cognition*, which we previously discussed in Chapter 2. As we noted in those discussions, learners often exhibit a phenomenon known as *situated learning* or *situated cognition*—that is, they associate particular behaviors and ways of thinking only with certain contexts and so they don't use what they've learned in other relevant contexts. Situated learning and cognition, then, can sometimes interfere with positive transfer and general transfer.

In informal, real-world learning activities, learners typically know that they'll need to apply what they're learning to new tasks and problems, the happy result being that they *do* apply it when they need it. In many formal school settings, however, teachers encourage students to learn academic subject matter for mysterious purposes—for example, "You'll need to know this in college" or "It will come in handy later in life." Teachers are more likely to promote transfer when, instead, they create a **culture of transfer**—a learning environment in which applying school subject matter to diverse situations and topics is both the expectation and the norm.[89] In such classrooms, teachers often encourage students to ask themselves *How might I use this information?* as they listen, read, and study. And they regularly present tasks and problems in which students *must* apply what they're learning to real-world contexts.

Rote memorization tasks such as this one have little or no benefit because neither the information to be learned nor the "mental exercise" involved is likely to transfer to future situations. Furthermore, such tasks communicate the message that schoolwork is a waste of time.

Teaching Strategies: Fostering Transfer

Teachers can help students transfer the knowledge and facts they're learning in a variety of ways, as we explain in the following principles.

Pursue topics in depth rather than superficially.

Students can't just study the material on one occasion if they'll be expected to apply classroom subject matter to a variety of real-world situations and problems, use it flexibly and creatively, and think critically about it. Instead, students must *master* the material. Ultimately, students should gain a thorough, conceptual

[87] J. M. Alexander et al., 2008; Bransford et al., 2006; Brooks & Dansereau, 1987; D. N. Perkins, 1995.
[88] Bransford & Schwartz, 1999; Dai & Sternberg, 2004; De Corte, 2003; Pugh et al., 2003.
[89] Engle, 2006; Engle et al., 2012; Gresalfi & Lester, 2009; Haskell, 2001; M. C. Linn, 2008; Pea, 1987.

understanding of topics that can help them make better sense of their world and function more effectively in adult society. This less-is-more principle applies across the board: Teaching a few topics in depth is almost invariably more effective than skimming over the surface of a great many.[90]

Provide numerous and varied opportunities to apply classroom subject matter to new situations and authentic activities.

The more that students practice using what they've learned to complete new tasks and solve new problems—and the more *diverse* those tasks and problems are—the greater the probability that they'll apply school subject matter in future situations, including contexts outside of school.[91] For example, a teacher might show students how human digestion processes have implications for nutrition and physical well-being, how physics concepts apply to automobile engines and home construction, or how principles of economics have an impact on global climate change.

One widely recommended approach is to use **authentic activities**, activities similar or identical to those that students might encounter in real-world contexts. For example, students acquire better writing skills when they write stories and essays for a real audience—perhaps classmates or others online—rather than completing traditional workbook exercises.[92] They gain a more complete understanding of how to use and interpret maps when they construct their *own* maps rather than answering workbook questions about maps (e.g., see Figure 3.11).[93] And they're more likely to check their solutions to math problems—in particular, to make sure their solutions make logical sense—when they use math for real-life tasks.[94]

In addition to fostering learning, authentic activities can be highly motivating.[95] As an example, consider one high school student's recollection of a ninth-grade moon-tracking activity:

> It was the first time I can remember in school doing something that wasn't in the textbook . . . like we were real scientists or something. We had to keep data sheets, measure the time and angle of the moonrise every day for a month. It drove my mom nuts because sometimes we'd be eating dinner, and I'd look at my watch and race out the door! We had to measure the river near us to see how it was affected by the moon . . . I went down to the river more than I have in my whole life, I think. Then we had to do the calculations, that was another step, and we had to chart our findings. The test was to analyze your findings and tell what they meant about the relationship of the tides and the moon. . . . I felt that I did something real, and I could see the benefit of it.[96]

By placing classroom activities in real-world contexts, teachers help students discover the reasons why they're learning academic subject matter. Accordingly, authentic activities may be especially valuable in working with students who are at risk for academic failure.[97]

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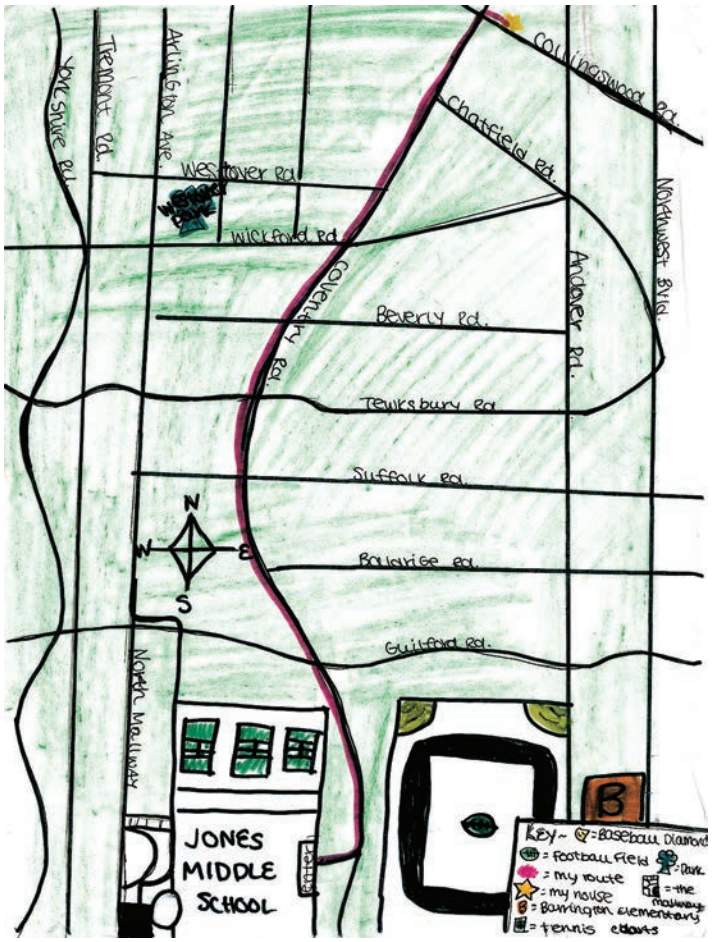
[90] Hattie et al., 1996; Meltzer et al., 2007; Paris & Paris, 2001; Veenman, 2011.
[91] Amabile & Hennessey, 1992; Brophy et al., 2009; N. Frederiksen, 1984; M. C. Linn, 2008; D. N. Perkins, 1990; Prawat, 1989; Rittle-Johnson et al., 2001.
[92] Gijbels et al., 2005; Gresalfi & Lester, 2009; M. C. Linn, 2008; J. R. Stone et al., 2008; J. F. Wagner, 2010.
[93] Benton, 1997; Graham, 2006; E. H. Hiebert & Fisher, 1992.
[94] Gregg & Leinhardt, 1994.
[95] Cognition and Technology Group at Vanderbilt, 1993; J. R. Stone et al., 2008.
[96] M. Barnett, 2005; Marks, 2000; Wirkala & Kuhn, 2011.
[97] Wasley et al., 1997, pp. 117–118.

Figure 3.11 In an authentic mapping activity, 12-year-old Mary Lynn constructed this map of the area between her home and school



Authentic activities can be developed for virtually any area of the curriculum. For example, teachers might have students:

- Write an editorial
- Participate in a debate
- Create a class website
- Converse in a foreign language
- Make a video
- Perform in a concert
- Plan a personal budget
- Design an electrical circuit

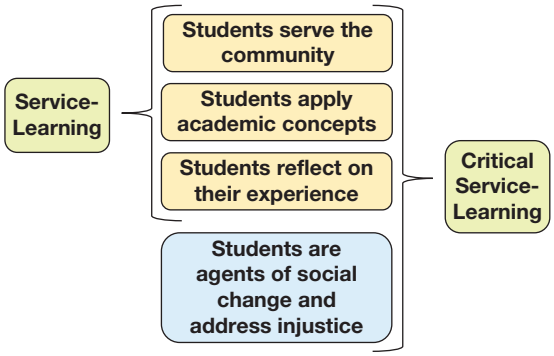
Authentic activities may also involve **service-learning** experiences, which involve students (1) providing service to meet a need in a community; (2) learning by applying academic concepts, content, and/or skills to the service experience; and (3) learning by reflecting on the service experience (see Figure 3.12).[98] Let's consider an example of a service-learning experience that has these attributes.[99] After discussing issues related to

[98] Eyler & Giles, 1999; Furco & Norvell, 2019.

[99] This example service-learning experience is adapted from an example provided by the National Youth Leadership Council, 2004.

viruses in their science class, middle school students decided to try to slow the spread of the virus in their town. They researched ways to prevent the spread of the virus and the teacher connected these ideas to their science curriculum. Students then surveyed community members about their knowledge of how the virus was spread and, based on their results, they created a video that they uploaded to YouTube. They shared the URL to the YouTube video by e-mail and Twitter. Students completed a reflection sheet every few days about how the project was progressing and what they were learning from participating in it. Completing this service project met a community need to reduce the spread of the virus and allowed students to learn about, reflect on, and apply their science knowledge and skills. Having the opportunity to help others also likely met students' need to contribute, which can be important for adolescents.[100]

Figure 3.12 Attributes of service-learning and critical service-learning



In addition to the three attributes of traditional service-learning, *critical service-learning* also includes a social justice orientation that encourages students to view themselves as agents of social change and address injustice in communities (see Figure 3.12).[101] Questions that guide critical service-learning approaches address the root causes of social inequities in order to examine why the service is needed—for example, "Why do we have significant economic gaps between different racial groups? Why do women continue to face economic and social inequities? Why does the richest country on earth have such a serious problem with homelessness?"[102]

think about it
What authentic activities might you use to facilitate students' transfer of the discipline(s) you hope to teach?

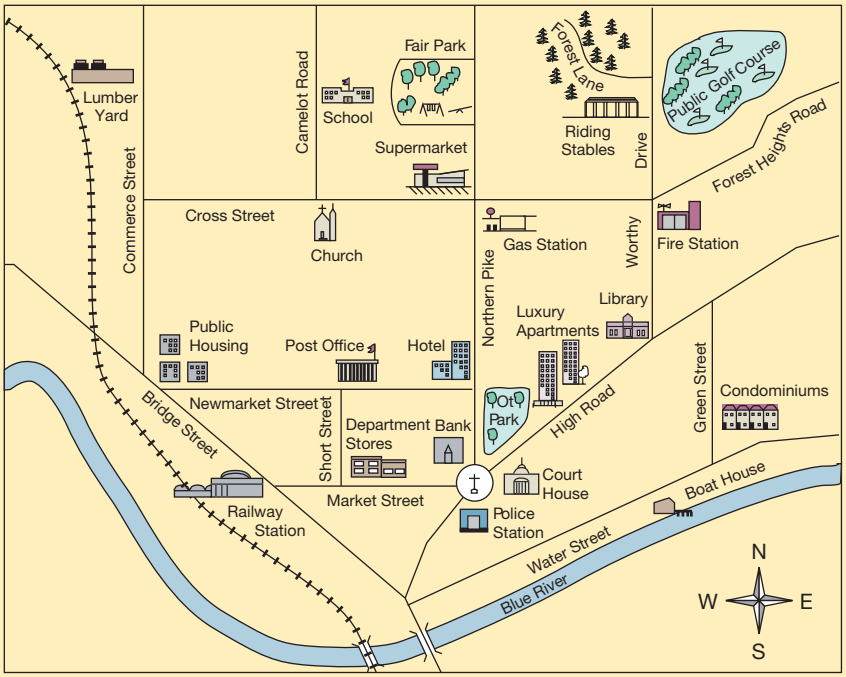
To be truly effective in enhancing students' learning—rather than sources of frustration and failure—authentic activities should be sufficiently simple that they don't impose an unmanageable cognitive load, and teachers need to provide considerable support.[103] It probably isn't a good idea to fill the entire school day with complex, authentic tasks because students can sometimes achieve automaticity for basic skills more quickly when they practice them in relative isolation from other activities (e.g., practicing fingerings on the violin) and some authentic activities may be too expensive and time-consuming to warrant regular use in the classroom.[104] In these cases, after-school programs can provide a time for students to engage in more authentic tasks.[105] Teachers' highest priority should be to encourage learning processes that enhance long-term retention and transfer of classroom subject matter—organization, elaboration, comprehension monitoring, and so on—through whatever kinds of tasks achieve that end.

Construct assessments that require students to apply their knowledge to new situations.

It can be fairly easy to construct assignments and tests that assess knowledge of basic facts and procedures. But it's ultimately more important for teachers to assess what students can *do* with what they've learned.[106] As an illustration, Figure 3.13 presents an assessment task that asks students to apply their knowledge of geographic principles to a new

[100] Fuligni, 2019.
[101] Estes et al., 2018; Forbes et al., 1999; Mitchell, 2008; Rhoads, 1997; Rosenberger, 2000.
[102] Rhodes, 1998, p. 45.
[103] Hmelo-Silver, 2004, Hmelo-Silver, 2006; Hmelo-Silver et al., 2007; Hung et al., 2008; Krajcik & Blumenfeld, 2006; Mergendoller et al., 2006; Polman, 2004; Spiro & DeSchryver, 2009; Wirkala & Kuhn, 2011.
[104] J. R. Anderson et al., 1996; Bransford et al., 2006; Kester et al., 2010; Plass et al., 2010.
[105] Chittum et al., 2017; M. M. Griffin & Griffin, 1994; Schnittka et al., 2012.
[106] A. King, 1999, p. 97. For example, see M. C. Linn & Eylon, 2011; Shepard et al., 2005.

Figure 3.13 Example of an assessment activity that asks students to apply what they have learned in geography to a new situation



Here is a map of a small city named Riverdale. Apply principles of geography to answer the following questions. In each case, explain your reasoning.

1. Where in the city would you be most likely to find a steel mill?
2. Where would you be most likely to find upper-income, single-family homes?
3. Which area of the city appears to be undergoing urban renewal?
4. Where in the city would you expect traffic to be heaviest?

Answer Key: (1) between the river and the railroad tracks, where both water and transportation are easily accessible; (2) near the riding stables and golf course, as horseback riding and golf are popular but expensive forms of recreation; (3) the southeastern part of the city, as evidenced by the luxury apartments and condominiums; (4) in the south central area, which appears to be the central business district.

situation. By consistently incorporating application of classroom topics into assessment tasks and problems, teachers clearly communicate that academic subject matter can and should be flexibly and creatively used in many different contexts.

3.3 Problem Solving and Creativity

Big Idea 3.3 **Learners tend to be more effective problem solvers and more creative thinkers if they have considerable knowledge from which to draw and if they can think flexibly about new tasks and problems.**

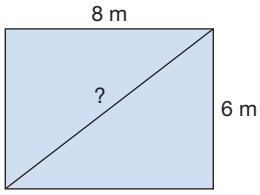
Both problem solving and creativity involve applying—that is, transferring—previously learned knowledge or skills to a new situation. The world presents many, many problems that differ widely in content, scope, and amount of creativity needed, as illustrated in the next exercise.

See For Yourself

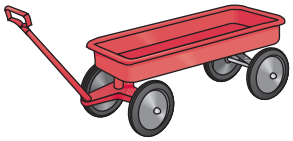
Four Problems

Take a few minutes to solve each of the following problems:

1. You buy two apples for 25¢ each and one pear for 40¢. How much change will you get back from a dollar bill?
2. You have a rectangle with a width of 8 meters and a height of 6 meters, as shown here. How long is the diagonal line?



3. What improvements can be made to the wagon shown here to make it more fun to play with?

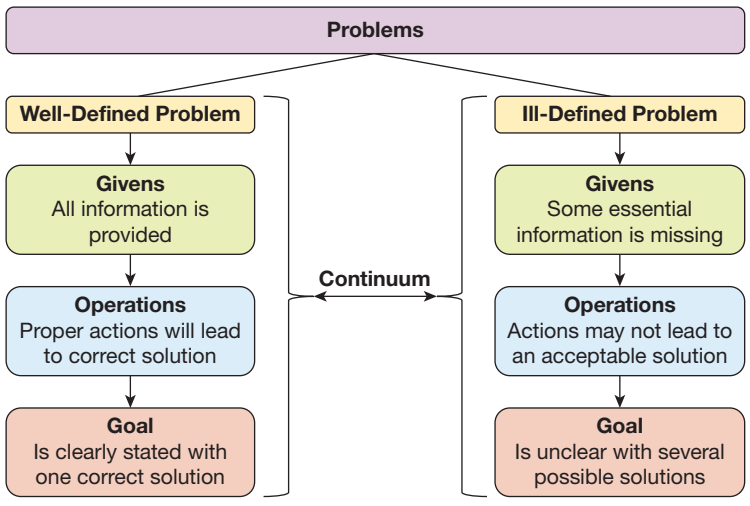


4. What are some possible uses of a brick? Generate as many different and unusual uses as you can.[107]

All of these problems involve **problem solving** because they require you to use your existing knowledge and skills to address an unanswered question or puzzling situation. If you had already solved these exact problems before, then they would no longer be problems for you, although they may be problems for someone else. All problems have at least three components: the givens, the operations, and the goal.[108] The *givens* are pieces of information given when the problem is presented, the *operations* are actions that can be performed to approach or reach the goal, and the *goal* is what the solution to the problem will accomplish. Problems differ considerably in the extent to which they're clearly specified and structured. At one end of this clarity-and-structure continuum is the **well-defined problem**, in which the goal is clearly stated, only one correct solution exists, all the information needed to solve the problem is present, and if the proper actions are followed, they will lead to the correct solution (see Figure 3.14). Calculating correct change after a purchase (Problem 1 in the previous exercise) and determining the length of the diagonal for the rectangle (Problem 2) are well-defined problems.

At the other end of the continuum is the **ill-defined problem**, in which the desired goal is unclear, several possible solutions may exist, some essential information needed to solve the problem is missing, and actions may not lead to an acceptable solution (see Figure 3.14). Improving the design of a wagon (Problem 3) is somewhat ill defined: Many different types of improvements might make it more fun to play with, yet some improvements might make it more fun than others. The brick problem (Problem 4) is even less

Figure 3.14 Problems can be categorized as well defined or ill defined and have three components: the givens, the operations, and the goal



[107] Glass et al., 1979; Wickelgren, 1974.

[108] Problems 3 and 4 modeled after Torrance, 1970.

defined—the goal is simply to identify uses of a brick—so, clearly, there's no single correct solution. Although not all problems can be categorized neatly into either well defined or ill defined (as noted by the continuum in Figure 3.14), on average, ill-defined problems are harder to solve than well-defined ones because they require more sophisticated problem-solving strategies.

Problem solving requires students to engage in varying degrees of creativity, depending on the scope of the problem and on students' existing knowledge and skills. Although psychologists don't always agree on the same definition of creativity, a practical definition for teachers is that **creativity** is the process of generating novel ideas (in the form of responses, solutions, products, concepts, or approaches) that meet the constraints of the task.[109] A key point is that the ideas must be *novel* (i.e., new, original) to be creative. However, it can be difficult to determine whether an idea is novel or not. Some ideas are novel to everyone in the world, such as when an effective vaccine is first developed for a specific virus. Other ideas may not be new to the world because they've been discovered by others previously; yet, these ideas may be new to the individual who "discovered" the idea.[110] Consider the fictitious example of Tiffany who was the only student in her math class to solve a problem correctly by using strategies that had not yet been taught in class. Because this was the first time Tiffany had solved this type of problem in this way, her solution can be considered creative to her even if other mathematicians often use these exact strategies to solve this type of problem. Therefore, to truly know if an idea is creative, it's necessary to determine if it was novel to the person who developed the idea and if others have already had the same idea.

Some people may have personality characteristics or cognitive styles that make them more likely to engage in creative tasks than others. For example, individuals may be more likely to engage in creative activities if they tend to take risks, have a more disciplined work style, have a greater tolerance for ambiguity, or have more skills in generating ideas.[111] However, creativity can vary across activities and domains such that people can be more creative in one domain (e.g., mathematics) and less creative in another (e.g., writing).[112] The good news is that everyone can learn to become more creative in any domain with the proper knowledge and support (as explained in an upcoming section). Consider this statement from Dr. Charles Limb, a neuroscientist and jazz musician who has studied the neural basis of musical improvisation:

> The mistake is the idea that we're born with a fixed amount of creativity that we are stuck with. One thing I learned from every musician that I have studied is that they developed their creativity over time. It's not like they were given this talent and that's it.[113]

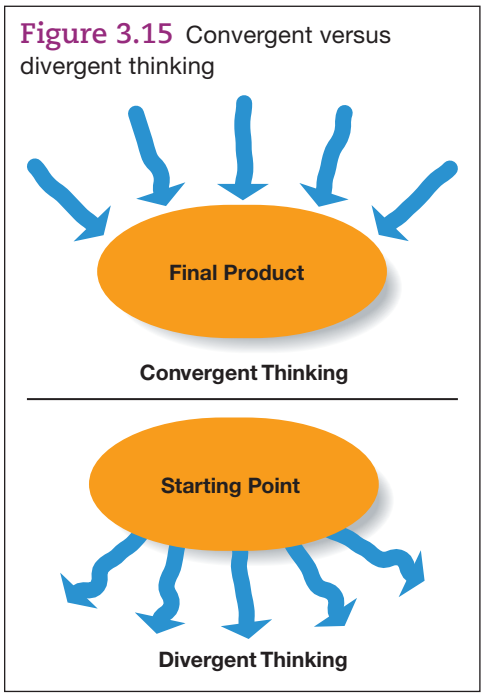


Figure 3.15 Convergent versus divergent thinking

Two types of thinking that involve creativity are convergent and divergent thinking. To successfully tackle a problem, people typically pull together two or more pieces of information into some sort of "whole" that resolves the problem. This combining of information into a single idea or product is known as **convergent thinking**, which may require some creativity in how the information is combined. In contrast, **divergent thinking** is the process of generating many different ideas from a single starting point (see Figure 3.15).

[109] Beghetto, 2019; Beghetto & Kaufman, 2010; Smith & Smith, 2017.
[110] Kaufman & Beghetto, 2009.
[111] Amabile, 2013.
[112] Baer, 2019.
[113] Warr et al., 2018, p. 141.

Divergent thinking involves creativity when students begin with a single idea and take it in a variety of directions, at least one of which leads to something that's novel and potentially useful.

As illustrations of the difference between convergent and divergent thinking, let's return to the "Four Problems" exercise you completed earlier. To answer Problem 1, you must pull together at least four facts $2 \times 25 = 50$,$50 + 40 = 90$, 1 dollar = 100 cents, and $100 - 90 = 10$ to arrive at the solution "10¢." To answer Question 2, you must use the Pythagorean theorem (the square of the hypotenuse equals the sum of the squares of the other two sides) plus at least four number facts $\left(6^2 = 36, 8^2 = 64, 36 + 64 = 100, \sqrt{100} = 10\right)$ to arrive at the solution of 10 meters. Both Problems 1 and 2, then, involve convergent thinking. In contrast, Questions 3 and 4 require you to think in many different ways about a single object—you must consider how different parts of the wagon might be embellished and how a brick might be used in different contexts—with some of your responses being novel and unique. For example, perhaps you thought a brick might make an interesting base for a table lamp, or maybe you fastened a hobby horse to the wagon's handle to make it look like a horse and buggy. Questions 3 and 4, then, involve divergent thinking.

In general, you should think of problem solving and creativity as overlapping processes: Solving problems often involves thinking creatively, and being creative typically requires solving one or more problems. Figure 3.16 shows how these processes can interact by presenting a model of the cognitive processes involved in creatively solving an ill-defined problem.[114] To engage in creatively solving ill-defined problems, one must define the problem, gather and assess information related to the problem, generate a variety of possible solutions, evaluate the possible solutions, select and implement one of the solutions, and then evaluate the effectiveness of the solution. If the final solution is not acceptable, it's necessary to cycle back through one or more of the prior steps. This creative process model demonstrates that creatively solving ill-defined problems is more than simply thinking "outside the box" or quickly coming up with unusual ideas. Instead, it involves many complex cognitive processes that require individuals to use their existing knowledge and metacognitive knowledge and to find new information that can be combined to generate new ideas.

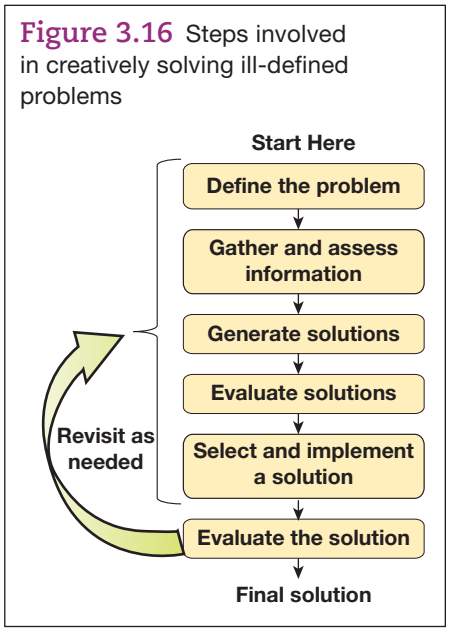


Figure 3.16 Steps involved in creatively solving ill-defined problems

General Principles Related to Problem Solving and Creativity

The general principles in this section apply to both problem solving and creativity.

The depth of learners' knowledge influences their ability to solve problems and think creatively.

Successful problem solvers and creative thinkers usually have considerable knowledge and conceptual understanding of the topic in question.[115] Especially in the case of creativity, such knowledge may also involve mental associations among very different ideas and subject areas.[116]

When learners have limited knowledge about a topic and little conceptual understanding of it, they're apt to choose problem-solving strategies on the basis of superficial

[114] Based on Bransford & Stein, 1984; Gick, 1986; Jonassen, 2014; Mumford & McIntosh, 2017; Mumford et al., 1991; Rubenstein et al., 2020.

[115] M. Carr, 2010; Hecht & Vagi, 2010; Lubart & Mouchiroud, 2003; Mayer, 2013; Mayer & Wittrock, 2006; Simonton, 2000; Sweller, 2009.

[116] Runco & Chand, 1995.

problem characteristics.[117] For example, when one of us authors was in elementary school, one of her teachers suggested that the word *left* in a word problem calls for subtraction. Interpreting a "left" problem as a subtraction problem works well in some instances but not others. Consider these two problems:

- Tim has 7 apples. He gives 3 apples to Sarah. How many apples does he have left?
- At the grocery store, Tim buys some apples for $2.00. When he leaves the store, he has $1.50 left. How much money did Tim have before he bought the apples?

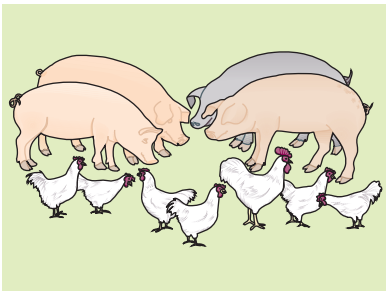
The second problem requires addition, not subtraction, even though it included the word *left*.

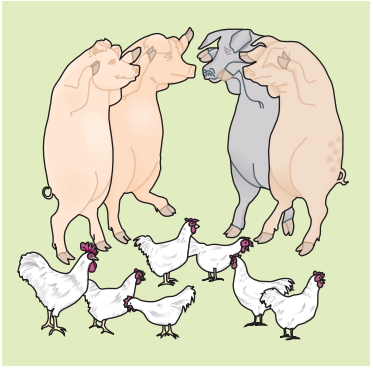
Both convergent and divergent thinking are constrained by working memory capacity.

You may recall from an exercise in Chapter 2 just how difficult it can be to solve a long division problem in your head. Remember, working memory has a limited capacity: It can hold only a few pieces of information and accommodate only so much cognitive processing at a time. If a problem or task requires a person to handle a great deal of information at once, to manipulate information in a very complex way, or to generate a wide variety of new ideas, working memory capacity may be insufficient for arriving at an accurate or creative result.[118]

Learners can overcome the limits of working memory in at least two ways. One obvious approach is to create an external record of needed information—for example, by putting it on paper or on an electronic device. Another approach is to learn some skills to automaticity—in other words, to learn them to a point where they can be retrieved quickly and easily.[119] Yet in the case of automaticity, it's possible to have too much of a good thing, as you'll see shortly.

Figure 3.17 Some ways of representing a problem promote more successful problem solving than others





How learners represent a problem or situation influences their strategies and eventual success.

Any particular problem or situation might be represented in working memory in a variety of ways. As an example, see whether you can solve the problem in the following exercise.

See For Yourself

Pigs and Chickens

Old MacDonald has a barnyard full of pigs and chickens. In total, there are 21 heads and 60 legs in the barnyard (not counting MacDonald's own head and legs). How many pigs and how many chickens are in the barnyard?

Try to solve this problem before you read any further. Did you solve it? If you're having trouble, try thinking about the problem this way:

> Imagine that the pigs are standing upright on their two hind legs, with their front two legs raised over their heads. All the animals, then, are standing on two legs (see Figure 3.17). Figure out how many legs are on the ground and how many must be in the air. From this information, can you determine the number of pigs and chickens in the barnyard?

[117] Chi et al., 1981; Schoenfeld & Hermann, 1982; Walkington et al., 2012.
[118] Hambrick & Engle, 2003; K. Lee et al., 2009; Sweller, 2009.
[119] N. Frederiksen, 1984; R. E. Mayer & Wittrock, 2006; Sweller, 1994.

If you were unable to solve the problem initially, was it helpful to think about the problem with all animals standing on two legs? That is, what is helpful to *represent* the problem in a different way? Because there are 21 heads, there must be 21 animals. Thus, there must be 42 legs on the ground (21×2), which leaves 18 pigs' legs in the air $(60 - 42)$. There must, therefore, be 9 pigs $(18 \div 2)$ and 12 chickens $(21 - 9)$.

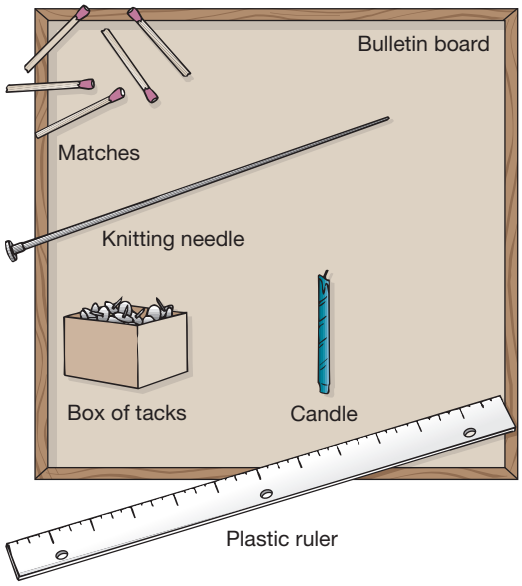
If you're a proficient mathematician, you may simply have used algebra to represent and solve the problem, perhaps using x for the number of pigs and y for the number of chickens and then solving for these variables in the equations $x + y = 21$ and $4x + 2y = 60$. Algebra provides many helpful procedures for solving problems involving unknown quantities. In our own experiences, however, we've found that most college students display *situated cognition* (as we described in Chapter 2) and rarely use algebra to solve problems outside of a math class. At all grade levels, students often have trouble solving word problems because they don't know how to translate the problems into procedures or operations they've learned at school.[120]

Sometimes learners represent a problem or situation in a seemingly logical way that nevertheless fails to yield a workable result. As an example, take a stab at the next problem.

See For Yourself

Candle Problem

How might you stand a candle upright in front of a bulletin board that is attached to the wall? You don't want the candle to touch the bulletin board because the flame might singe the board. Instead, you need to place the candle about a centimeter away from the board. How can you accomplish the task using some or all of the following materials: a small candle (birthday cake size), a metal knitting needle, matches, a box of thumbtacks, and a 12-inch plastic ruler?[121]



As it turns out, the ruler and knitting needle are useless here. Piercing the candle with the knitting needle will probably break the candle, and you're unlikely to have much luck balancing the ruler on a few tacks. (We speak from experience here, as our own students have unsuccessfully tried both strategies.) The easiest solution is to fasten the thumbtack

[120] K. Lee et al., 2009; R. E. Mayer & Wittrock, 2006; L. B. Resnick, 1989; Walkington et al., 2012.
[121] Problem based on one described by Duncker, 1945.

box to the bulletin board with tacks and then attach the candle to the top of the box with either a tack or some melted wax. Many people don't consider this possibility because they represent the box only as a *container of tacks*, and so they overlook its potential use as a candle stand. When people represent a problem or situation in a way that excludes potential solutions, they're victims of a **mental set**.

Mental sets sometimes emerge when learners practice solving a particular kind of problem (e.g., doing subtraction problems in math or applying the formula $E = mc^2$ in physics) without practicing other kinds of problems at the same time.[122] In general, repetitive practice can lead learners to represent problems and situations in a particular way without really thinking about them—that is, it can lead to automaticity in representation. Although automaticity in the basic information and skills needed for problem solving and creative thinking is often an advantage (it frees up working memory capacity), automaticity in mentally *representing* problems and situations can yield incorrect solutions or inappropriate products, in part because it may lead learners down a counterproductive path of associations in long-term memory.[123]

Problem solving and creativity often involve heuristics that facilitate but don't guarantee successful outcomes.

Some problems can be successfully solved with an **algorithm**, a specific sequence of steps that guarantees a correct solution. For example, perhaps you've successfully put together a new bookcase by following the "Directions for Assembly" that came with all the pieces. And in the opening case study, Ms. Gaunt's students can correctly determine that Raj needs 2 hours to type his paper if they use the standard procedure for paper-and-pencil long division.

Yet the world presents many problems for which no algorithms exist. And creativity, by its very nature, requires original, nonalgorithmic approaches to situations. Furthermore, algorithms are few and far between outside the domains of math and science. There are no rules we can follow to design a fun wagon, address ongoing ethnic and religious conflicts in the Middle East, or reduce global climate change (a problem that involves economics, political science, and psychology as much as physics, meteorology, and climate science).

In the absence of an algorithm, learners must instead use a **heuristic**, a general approach that may or may not yield a successful outcome. Some heuristics are specific to particular content domains. Others, such as the following, can be useful in a variety of contexts:[124]

- **Identify subgoals.** Break a large, complex task into two or more specific subtasks that can be more easily addressed.
- **Represent parts of the situation on paper or on an electronic device.** Make a diagram, list a problem's components, or jot down potential solutions or approaches.
- **Draw an analogy.** Identify a situation analogous to the problem situation, and derive potential solutions from the analogy.
- **Brainstorm.** Generate a wide variety of possible approaches or solutions—perhaps including some that seem outlandish or absurd—without initially evaluating any of them. After creating a lengthy list, evaluate each item for its potential relevance and usefulness.
- **"Incubate" the situation.** Let a problem remain unresolved for a few hours or days, thereby allowing mental sets to dissipate and enabling a broad search of long-term memory for potentially productive approaches.

think about it
Can you think of times in your life when you've used these heuristics to solve problems?

[122] E. J. Langer, 2000; Luchins, 1942.
[123] Lubart & Mouchiroud, 2003; Rohrer & Pashler, 2010; D. L. Schwartz et al., 2012.
[124] Baer & Garrett, 2010; J. E. Davidson & Sternberg, 2003; De Corte et al., 2010; Zhong et al., 2008.

Effective problem solving and creativity require self-regulation and metacognition.

Self-regulation and metacognition play an important role not only in effective learning and studying but also in problem solving and creativity. For example, effective problem solvers and creative thinkers tend to use the following self-regulation and metacognitive strategies:[125]

- Identify one or more specific goals toward which to strive.
- Break a complex problem or task into two or more simpler components.
- Plan a systematic, sequential approach to addressing these components.
- Continually monitor and evaluate their progress toward their goal(s).
- Identify and address obstacles that may be impeding their progress.
- Change to new strategies if the current ones aren't working.
- Apply high standards in evaluating final results.

Such self-regulation and metacognitive processes enable learners to use creative problem-solving strategies flexibly, to apply those strategies to more complex situations, and to know when particular strategies are and are not appropriate.

Teaching Strategies: Encouraging Problem Solving and Creativity

Teachers can help students to effectively engage in problem solving and creative processes by implementing the ideas presented in this section.

Create a classroom climate in which problem solving and creativity are both expected and valued.

Teachers can encourage problem solving and creativity by creating an appropriate **classroom climate**—the overall psychological atmosphere of the classroom. For example, the classroom climate should be one in which students believe that they can express conflicting opinions, occasionally think "outside the box," and make mistakes without fear of censure or embarrassment. Specifically, teachers can:[126]

- Conduct some activities in which students know that their work won't be evaluated.
- Welcome unusual ideas, even those that might fly in the face of conventional ways of thinking.
- Insist that all students try to understand and be respectful of diverse perspectives.
- Consistently communicate that mistakes and failures are inevitable in any challenging activity.
- Give students several opportunities to get constructive feedback before turning in a final product.

Pose questions that require students to engage in divergent thinking.

Students are also more likely to think creatively when their teacher poses questions and tasks that require them to use previously learned information in new and unusual

[125] M. Carr, 2010; Csikszentmihalyi, 1996; J. E. Davidson & Sternberg, 1998; De Corte et al., 2010; Dominowski, 1998; Glover et al., 1989; Minsky, 2006; Runco & Chand, 1995.

[126] Baer & Garrett, 2010; Hursh, 2007; Jacob, 2003; Jones et al., 2003; R. M. Ryan & Brown, 2005.

ways—in other words, to engage in divergent thinking.[127] Here are two examples in the domain of history:

- "In the 12th century, the Khmer people in Southeast Asia created Angkor Wat, a huge stone temple more than 200 feet high. The stones were extremely heavy, and the people had no cement. How might they have built the temple?"[128]
- "In the 1860s, Americans used the Pony Express to send messages quickly across the country. In what other ways might people have sent long-distance messages at that time?"[129]

Require students to work on complex problems, projects, and designs.

Because problems in the real world are often difficult and ill defined, teachers should give students practice in solving these types of problems. Asking students to solve ill-defined problems can help them practice using a variety of cognitive processes because students must engage in creative problem solving and design thinking in order to achieve a solution. Some authentic activities take the form of **problem-based learning** or **project-based learning**, in which students acquire new knowledge and skills as they work on an ill-defined problem or project similar to certain real-world problems.[130] When the projects in project-based learning focus on design, the teaching approach is sometimes referred to as *design-based learning*. Within science education and STEM (science, technology, engineering, and mathematics) education, these design-based learning activities are sometimes labeled **engineering design**, which includes devising a system, component, or process that meets a human need.[131] Generally speaking, engineering design involves three broad areas: defining a problem, developing possible solutions, and improving designs. More details about these instructional approaches are provided in Chapter 8.

Use technology to simulate real-world tasks and problems.

When it's not possible or practical to engage students in real-world activities related to the instructional objectives, teachers can use **instructional simulations** that simulate real-world activities to provide learners with experiences that promote learning.[132] Some instructional simulations promote complex cognitive processes within seemingly authentic contexts—in some cases in the form of video or computer games that students play alone or with peers. Here are some examples:

- *Civilization.* Learners begin "living" several thousand years ago and, over many centuries, build an increasingly complex society. In an effort to survive and thrive, they must make decisions about food, natural resources, government, emerging technologies, and interactions with other social and cultural groups (www.civilization.com).
- *StockTrak.* Learners "invest" in various stocks in the stock market and track profits and losses in their virtual "portfolios" over time (www.stocktrak.com).
- *Extreme Event.* During a disaster simulation, learners respond to disasters and build community resilience by working together to make decisions and solve problems (https://www.koshland-science-museum.org/explore-the-science/extreme-event).

Simulations are often both motivating and challenging—thereby keeping students on task for extended periods—and can significantly enhance students' problem-solving and

[127] de Jong, 2011; Kuhn & Pease, 2010; Sarama & Clements, 2009.
[128] Bransford et al., 2009; D. N. Perkins, 1990; Sternberg, 2010.
[129] Question courtesy of Jeff Ormrod.
[130] L. W. Anderson & Pellicer, 1998; Christenson & Thurlow, 2004; Tate, 1995.
[131] ABET Engineering Accreditation Commission, 2017; National Research Council, 2013.
[132] Martin & Betrus, 2019; Vogel-Walcutt et al., 2013.

creativity skills.[133] A particular advantage is that they can be designed in ways that keep students' cognitive load within reasonable bounds and appropriately structure and guide students' efforts.[134]

Help students avoid mental sets when engaging in creative problem solving.

To avoid *mental sets* that exclude potentially effective approaches and solutions, it's helpful to encourage students to encode situations and problems in multiple ways, as demonstrated by these examples:

- Ask students to work in cooperative groups to identify several different ways of representing a single problem on paper—perhaps as a formula, a table, and a graph.[135]
- Have students explore potential ways of solving a problem *before* teaching them the concepts or procedures an expert would use to solve it.[136]
- When engaging in divergent thinking, ask students to take the perspective of others who have a variety of roles. For example, when creating a list of possible novel uses for an umbrella (besides keeping a person dry in the rain), people were asked to think about how an umbrella could be reused by an artist, chef, physician, mechanic, and athlete.[137]
- Take students for a walk around the school or outside while considering creative solutions. The location of the walk doesn't matter, simply the act of walking can help students become more creative.[138]
- Before students engage in a creative activity, show them examples of creative solutions or have them copy examples that include aspects of creativity.[139] For example, students could copy more abstract (and less realistic) drawings before starting their own drawings.
- When providing practice problems, mix the kinds of problems that students tackle in any single practice session—a strategy we referred to in Chapter 2 as *interleaved practice*.[140] Mixing problem types requires students to think carefully about which problem-solving procedures are appropriate for each one so that they don't fall into a particular mental set and simply apply the same procedures over and over again mindlessly.[141]

3.4 Thinking

Big Idea 3.4 Thinking involves a variety of cognitive processes, such as problem solving, critical thinking, and reasoning.

Thinking is a broad term that can be used to describe a variety of conscious cognitive processes, such as problem solving, convergent and divergent thinking, critical thinking, and reasoning. But the term "thinking" is not limited to these processes; thinking can require

[133] J. R. Anderson et al., 1996.
[134] Barab et al., 2010; Black et al., 2014; de Jong, 2011; Kuhn & Pease, 2010; Squire, 2011; Zohar & Aharon-Kraversky, 2005.
[135] Feldhusen & Treffinger, 1980.
[136] Brenner et al., 1997; J. C. Turner, Meyer, et al., 1998.
[137] Chou & Tversky, 2020.
[138] Oppezzo & Schwartz, 2014.
[139] Okada & Ishibashi, 2017; Yi et al., 2015.
[140] Rohrer, 2012; Taylor & Rohrer, 2010.
[141] Niu & Zhou, 2010; D. L. Schwartz et al., 2012.

individuals to use a variety of declarative, procedural, and metacognitive knowledge. It's difficult to precisely define and organize all of the cognitive processes involved in thinking; however, a framework generally referred to as **Bloom's taxonomy** can be used to help us organize some of these processes. Although the purpose of Bloom's taxonomy is to provide an assessment framework for classifying educational goals, objectives, and standards (as we explain in Chapter 8), we present the taxonomy here to help you think about several different types of cognitive processes that are organized into the six categories shown in Figure 3.18: remember, understand, apply, analyze, evaluate, and create.[142]

The first category in Figure 3.18—remember—probably requires little actual thinking, but the other categories of cognitive processes in the figure involve some type of thinking. Although these cognitive processes are generally listed from simpler to more complex, that doesn't mean that some processes are necessarily "better" than others. However, some cognitive processes may be better for meeting certain educational goals and outcomes than others. It's also important to consider that several of these cognitive processes can occur during one activity. For example, when students engage in an activity that requires them to *apply* knowledge, they may also (1) have to *remember* information, (2) gain more *understanding* of concepts, and (3) need to *evaluate* the applications to arrive at a solution.[143]

Some academic fields have created terms to describe the types of thinking involved in their discipline. For example, *design thinking* has emerged as a means to capture what designers do as they find and solve design problems.[144] And *computational thinking* has been defined in the computer science discipline as the thinking involved in formulating problems and their solutions in ways that the solutions can be carried out through the use of algorithms—for example, creating an algorithm that will find the cheapest route from any location in the world to any other location.[145] Computational thinking often involves other types of thinking, such as algorithmic thinking (developing steps that guarantee a correct

Figure 3.18 Categories of cognitive processes

CATEGORY	DEFINITION	COGNITIVE PROCESSES
Remember	Retrieving knowledge from long-term memory	recognizing, recalling
Understand	Constructing meaning from instructional materials and messages	explaining, summarizing, interpreting, exemplifying, classifying, comparing, inferring
Apply	Using knowledge in a familiar or new situation	executing, implementing
Analyze	Dividing information into its constituent parts and identifying how the parts relate to one another and to an overall structure	differentiating, organizing, attributing
Evaluate	Making judgments based on certain criteria or standards	checking, critiquing
Create	Putting together knowledge and/or procedures to form a new coherent whole or make an original product	generating, planning, producing

Note: The categories overlap such that the cognitive processes for some tasks in the simpler categories may be more difficult than those in some more complex categories.

[142] Bloom's original taxonomy (B. S. Bloom et al., 1956) uses nouns rather than verbs for the category labels: *knowledge, comprehension, application, analysis, synthesis, evaluation*. In the revision shown in Figure 3.18 (L. W. Anderson & Krathwohl, 2001), *create* replaces and subsumes *synthesis*, and *evaluate* moves from sixth to fifth place.

[143] Barron et al., 1998.

[144] Plattner et al., 2011; Rowe, 1987.

[145] Curzon et al., 2019; Wing, 2006.

solution), logical thinking (reasoning correctly and avoiding thinking errors), abstraction (getting at the essence of something), generalization (creating more general solutions that apply to a wider set of problems), and decomposition (dividing a problem into smaller parts). As you can see, some types of thinking require learners to use and apply many different types of knowledge and cognitive processes.

Attributes of Critical Thinking

One type of thinking that is often referred to by teachers, parents, and employers is "critical" thinking, which we describe in this section.

Critical thinking can take a variety of forms.

Critical thinking involves evaluating the accuracy, credibility, and worth of information and lines of reasoning—in short, it involves evaluating evidence.[146] It can take a variety of forms, depending on the context. The following exercise presents four possibilities.

See For Yourself

Colds, Cars, Chance, and Cheer

Read and respond to each of the following situations.

1. It's autumn, and the days are becoming increasingly chilly. You see the following advertisement:

   > Aren't you tired of sniffles and runny noses all winter? Tired of always feeling less than your best? Get through a whole winter without colds. Take Eradicold Pills as directed.[147]

   Should you go buy a box of Eradicold Pills?
2. You have a beat-up old car and have invested several thousand dollars to get it in working order. You can sell the car in its present condition for $1,500, or you can invest $2,000 more on repairs and then sell it for $3,000. What should you do?[148]
3. You've been rolling a typical six-sided die (i.e., one member of a pair of dice). You know that the die isn't heavier on one side than another, and yet in the past 30 rolls, you haven't rolled a number 4 even once. What are the odds that you'll get a 4 on the next roll?
4. This research finding was presented by Dr. Edmund Emmer at an annual conference of the American Educational Research Association:

   > Teachers who feel happy when they teach are more likely to have well-behaved students.[149]

   If you're a teacher, do such results indicate that you should try to feel happy when you enter the classroom each morning?

In each of these situations, you had to evaluate information and make some sort of judgment. In Item 1, we hope you weren't tempted to buy Eradicold Pills because the advertisement provided no proof that they reduce cold symptoms. It simply included the suggestion to "Take Eradicold Pills as directed" within the context of a discussion of undesirable symptoms—a common ploy in persuasive advertising.

As for Item 2, it makes more sense to sell the car now. If you sell the car for $3,000 after making $2,000 worth of repairs, you'll make $500 less than you would otherwise. Many people mistakenly believe that their past investments justify making additional ones, when in fact, past investments are irrelevant to the present circumstances.[150]

[146] Beyer, 1985; Heyman, 2008; J. Moon, 2008.
[147] R. J. Harris, 1977, p. 605.
[148] Modeled after Halpern, 1998.
[149] Emmer, 1994.
[150] Halpern, 1998.

In Item 3, the chance of rolling a 4 on an evenly balanced die is—as always—one in six. The outcomes of previous rolls are irrelevant because each roll is independent of the others. But when a 4 hasn't shown up even once in 30 rolls, many people believe that a 4 is long overdue and so greatly overestimate its probability.

Now what about Item 4, making sure you're happy each time you enter the classroom? One common mistake people make in interpreting research results is to think that an association between two things—a *correlation*—means that one of those things must definitely *cause* the other. As noted in Chapter 1, however, correlation doesn't necessarily indicate a cause-and-effect relationship. Perhaps teacher happiness directly influences students' classroom behavior, but there are other possible explanations for the correlation as well. For instance, perhaps good student behavior makes teachers feel happy (rather than vice versa), or maybe teachers who are feeling upbeat use more effective teaching techniques and keep students on task as a result of using those techniques.[151]

The four situations presented in the exercise illustrate several forms that critical thinking might take:[152]

- **Verbal reasoning:** Understanding and evaluating persuasive techniques found in oral and written language (e.g., deductive and inductive logic). You engaged in verbal reasoning when deciding whether to purchase Eradicold Pills.
- **Argument analysis:** Discriminating between reasons that do and don't support a conclusion. You engaged in argument analysis when you considered possible pros and cons of investing an additional $2,000 in car repairs.
- **Probabilistic reasoning:** Determining the likelihood and uncertainties associated with various events. You engaged in probabilistic reasoning when you determined the probability of rolling a 4 on the die.
- **Hypothesis testing:** Judging the value of data and research results in terms of the methods used to obtain them and their potential relevance to certain conclusions. When hypothesis testing includes critical thinking, it involves considering questions such as these:
  - Was an appropriate method used to measure a particular outcome?
  - Have other possible explanations or conclusions been eliminated?
  - Can the results obtained in one situation be reasonably generalized to other situations?

You engaged in hypothesis testing when you evaluated Dr. Emmer's findings about teacher happiness.

The specific cognitive processes involved can differ quite a bit depending on the content domain. In writing, critical thinking might involve reading the first draft of a persuasive essay to look for errors in logical reasoning or for situations in which opinions haven't been sufficiently justified. In science, it may involve revising existing theories or beliefs to account for new evidence; that is, it may involve conceptual change. In history, it might involve drawing inferences from historical documents, attempting to determine whether things *definitely* happened a particular way or only *maybe* happened that way. And in many fields, including educational psychology, it involves evaluating the quality of research findings on which assertions are made—hence the footnoted references we've provided for you throughout this text.

[151] Emmer, 1994.

[152] Halpern, 1997, 1998, 2008; E. M. Nussbaum, 2008.

Students can have difficulties engaging in critical thinking.

As you might guess, critical thinking abilities emerge gradually over the course of childhood and adolescence.[153] Yet all too often, learners at all grade levels—and even many well-educated adults—take the information they see in textbooks, news reports, on the Internet, and elsewhere at face value. In other words, they engage in little or no critical thinking as they consider the accuracy, credibility, and worth of the information they encounter.[154] The following principles can help us understand why students can have difficulties engaging in critical thinking.

Critical thinking requires sophisticated epistemic beliefs.

Learners are more likely to look analytically and critically at new information if they believe that even experts' understandings of a topic continue to evolve as new evidence accumulates. They're *less* likely to engage in critical thinking if they believe that "knowledge" is an absolute, unchanging entity.[155] In other words, learners' *epistemic beliefs* enter into the critical thinking process.

Critical thinking is a disposition as much as a cognitive process.

By **disposition**, we mean a general inclination to approach and think about learning and problem-solving situations in a particular way—perhaps in a thoughtful, analytical, evaluative manner, on the one hand, or in a thought*less*, unquestioning way, on the other. Some learners clearly have a general disposition to think critically about the subject matter they read and study.[156] Those who do show more advanced reasoning capabilities are more likely to undergo conceptual change when it's warranted.[157]

Researchers don't yet have a good understanding of why some learners are more predisposed to think critically than others. The larger culture and society in which learners live certainly have an effect. Some cultures place high value on respecting one's elders or certain religious leaders; in doing so, they may foster the epistemic belief that "truth" is a cut-and-dried entity that is best gained from authority figures.[158] In addition, a cultural emphasis on maintaining group harmony may discourage children from hashing out differences in perspectives, which critical thinking often entails.[159] Perhaps as a result of such factors, critical thinking may be less common in some groups (e.g., in some traditional Asian and Native American communities and in some fundamentalist religious groups) than in others.[160] In some situations, then, teachers must walk a fine line between teaching students to critically evaluate persuasive arguments and scientific evidence, on the one hand, and to show appropriate respect and strive for group harmony in their community and culture, on the other.

Teachers' actions in the classroom—for instance, whether they encourage exploration, risk taking, and critical thinking with respect to classroom topics—can also predispose students to think more critically (or not).[161] In the following classroom interaction, a teacher actually seems to *discourage* any disposition to think analytically and critically about classroom material:

> ***Teacher:*** Write this on your paper . . . it's simply memorizing this pattern. We have meters, centimeters, and millimeters. Let's say . . . write millimeters, centimeters, and meters. We want to make sure that our metric measurement is the same. If I gave

[153] Amsterlaw, 2006; P. M. King & Kitchener, 2002; Kuhn & Franklin, 2006; Pillow, 2002.
[154] Kuhn, 2009; G. Marcus, 2008; M. J. Metzger et al., 2003; Sinatra et al., 2014.
[155] Bråten et al., 2011; Bromme et al., 2010; Kuhn, 2001a; Schommer-Aikis, 2002.
[156] Halpern, 2008; D. N. Perkins et al., 2000; R. F. West et al., 2008.
[157] Southerland & Sinatra, 2003; Stanovich, 1999.
[158] Losh, 2003; Qian & Pan, 2002; Tyler et al., 2008.
[159] Heyman, 2008; Kağitçibaşi, 2007; Kuhn & Park, 2005.
[160] Kuhn et al., 2003; Kuhn & Park, 2005; Tyler et al., 2008.
[161] Flum & Kaplan, 2006; Kuhn, 2001b, 2006; J. Moon, 2008.

you this decimal, let's say .234 m (yes, write that). In order to come up with .234 m in centimeters, the only thing that is necessary is that you move the decimal. How do we move the decimal? You move it to the right two places. (Jason, sit up please.) If I move it to the right two places, what should .234 m look like, Daniel, in centimeters? What does it look like, Ashley?

Ashley: 23.4 cm.

Teacher: 23.4. Simple stuff. In order to find meters, we're still moving that decimal to the right, but this time, boys and girls, we're only going to move it one place. So, if I move this decimal one place, what is my answer for millimeters?[162]

Undoubtedly, this teacher means well: She wants her students to understand how to convert from one unit of measurement to another. But notice the attitude she engenders: "Write this . . . it's simply memorizing this pattern."

Teaching Strategies: Developing Students' Critical Thinking Skills

Critical thinking will obviously enhance learners' long-term success both in school and in the outside world. We now look at various ways in which teachers might encourage critical thinking.

Encourage critical evaluation of information and ideas presented by others and in printed and online materials.

To become effective life-long learners, students must learn that not all sources of information can be trusted—that some messages presented through various media are misleading or blatantly wrong. In other words, they must use evidence to evaluate what is and is not "fake news." In our current era of ever-expanding information technology, taking a critical stance toward new information is now more important than ever (see Figure 3.19). For example, although entries in the popular website Wikipedia are generally accurate, they occasionally include inaccuracies added by nonexperts. Furthermore, virtually anyone can post personal beliefs and opinions somewhere on the Internet (e.g., blogs)—often presenting these things as irrefutable "facts"—and it's quite easy for readers to be fooled. Many students at all grade levels—even many college students—naively assume that almost everything they read on the Internet is fact.[163]

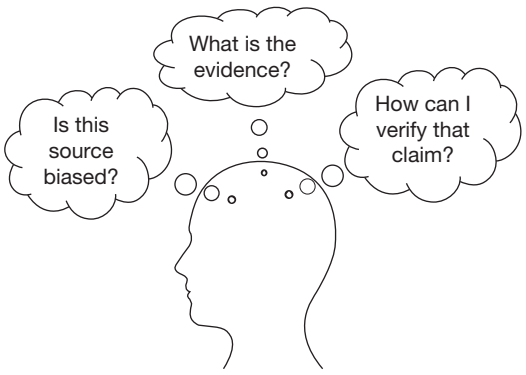


Figure 3.19 Teachers can help students to become good critical thinkers by encouraging them to critically evaluate information and ideas

Critical thinking encompasses a diverse set of skills, and so strategies for encouraging it are many and varied. Here are several suggestions:

- Encourage some intellectual skepticism—for instance, by urging students to question and challenge the ideas they read and hear—and communicate the epistemic belief that people's knowledge and understanding of any single topic might continue to change over time.[164]
- Model critical thinking—for instance, by thinking aloud while analyzing a persuasive argument or scientific report.[165]

[162] Dialogue from J. C. Turner, Meyer, et al., 1998, p. 741.
[163] Dunlosky, 2013; E. J. Langer, 2000; Mayfield & Chase, 2002.
[164] Manning et al., 2011; M. J. Metzger et al., 2003; Wiley et al., 2009.
[165] Afflerbach & Cho, 2010; Kardash & Scholes, 1996; Kuhn, 2001a.

- Give students many opportunities to practice critical thinking—for instance, by identifying flaws in the arguments of persuasive essays, evaluating the quality and usefulness of scientific findings, and using evidence and logic to support particular viewpoints.[166]
- Ask questions such as these to encourage critical thinking:
  - Who produced this document? What biases or predispositions did the author or authors have?
  - What persuasive technique is the author using? Is it valid, or is it designed to mislead the reader?
  - What assumptions underlie the assertions and arguments presented?
  - What information contradicts information in other documents?
  - What reasons support the conclusion? What reasons *don't* support it?
  - What actions might I take to improve the design of this study?[167]
- Have students debate controversial issues from several perspectives, and occasionally ask them to take a perspective quite different from their own.[168]
- Embed critical thinking skills within the context of authentic activities as a way of helping students retrieve those skills later on, both in the workplace and in other aspects of adult life.[169]

The Classroom Strategies box "Fostering Critical Thinking" presents examples of what teachers might do in several subject areas.

Classroom Strategies

Fostering Critical Thinking

- **Teach elements of critical thinking.**
  In a unit on persuasion and argumentation, a middle school language arts teacher explains that a sound argument meets three criteria: (1) The evidence presented to justify the argument is accurate and consistent; (2) the evidence is relevant to and provides sufficient support for the conclusion; and (3) little or no information has been omitted that, if present, would lead to a contradictory conclusion. The teacher then has students practice applying these criteria to a variety of persuasive and argumentative essays.
- **Foster epistemic beliefs that encourage critical thinking.**
  Rather than teach history as a collection of facts to be memorized, a high school teacher portrays the discipline as an attempt by informed but inevitably biased scholars to interpret and make sense of historical events. On several occasions, he asks students to read two or three different historians' accounts of the same incident and to look for evidence of personal bias in each one.
- **Embed critical thinking skills within the context of authentic activities.**
  In a unit on statistical and scientific reasoning, an eighth-grade science class studies concepts related to probability, correlation, and experimental control. Then, as part of a simulated legislative hearing, the students work in small groups to develop arguments for or against a legislative bill concerning the marketing and use of vitamins and other dietary supplements. To find evidence to support their arguments, the students apply what they've learned about statistics and experimentation as they read and analyze journal articles and government reports about the possible benefits and drawbacks of nutritional supplements.
- **Teach students how to evaluate the accuracy of information posted on websites.**
  On a teacher-created educational website called "All About Explorers" (allaboutexplorers.com), elementary students practice distinguishing between credible and questionable information while searching for facts about well-known early explorers. For example, as students look for information about Christopher Columbus, they visit a bogus "website" that describes Columbus as having been born in 1951 but dying in 1906—a timeline that obviously makes no sense—and asserts that the king and queen of Spain called Columbus on his toll-free number.

Sources: Derry et al., 1998 (statistics example based on this study); Halpern, 1997 (criteria for a sound argument); Paxton, 1999 (bias in history example).

[166] J. Moon, 2008; Onosko & Newmann, 1994.

[167] Halpern, 1998; Kuhn & Crowell, 2011; Monte-Sano, 2008; Yang & Tsai, 2010.

[168] Questions based on De La Paz & Felton, 2010, p. 182; Halpern, 1998, p. 454; S. A. Stahl & Shanahan, 2004, pp. 110–111.

[169] E. M. Nussbaum, 2008; E. M. Nussbaum & Edwards, 2011; Reiter, 1994.

Support complex cognitive processes through group discussions and projects.

Group discussions and activities can help students gain a better understanding of a topic and promote complex cognitive processes, especially when structured to some degree.[170] When students talk with one another, they must verbalize—and therefore become more metacognitively aware of—what and how they themselves are thinking. They also hear other (possibly better) study strategies, problem-solving techniques, and critical analyses. And by working together, students can often accomplish more difficult tasks than they would accomplish on their own.

One effective approach is to teach students to ask one another, and then answer, thought-provoking questions about the material they're studying—for instance, *Why is it that such-and-such is true?*[171] In the following dialogue, fifth-graders Katie and Janelle are working together to study class material about tide pools. Katie's job is to ask Janelle questions that encourage elaboration:

> ***Katie:*** How are the upper tide zone and the lower tide zone different?
>
> ***Janelle:*** They have different animals in them. Animals in the upper tide zone and splash zone can handle being exposed—have to be able to use the rain and sand and wind and sun—and they don't need that much water and the lower tide animals do.
>
> ***Katie:*** And they can be softer 'cause they don't have to get hit on the rocks.
>
> ***Janelle:*** Also predators. In the spray zone it's because there's predators like us people and all different kinds of stuff that can kill the animals and they won't survive, but the lower tide zone has not as many predators.
>
> ***Katie:*** But wait! Why do the animals in the splash zone have to survive?[172]

Notice how the two girls are continually relating the animals' characteristics to survival in different tide zones, and eventually, Katie asks why animals in the splash zone even *need* to survive—a question that clearly reflects critical thinking.

Teach complex thinking skills within the context of specific topics and content domains.

Teachers may find packaged curricular programs or courses designed specifically to teach study skills, problem solving, creativity, or critical thinking. As a general rule, however, teachers should teach these types of complex cognitive processes *not* as separate entities but, instead, within the context of day-to-day academic topics. For example, they might teach critical thinking and problem-solving skills during science lessons or teach creative thinking during writing instruction.[173] To do so, science teachers may show students how to solve problems using the scientific method with the following steps: identify the problem/question, form a hypothesis, plan an experiment, predict the result, conduct the experiment, compare the predicted and actual results, and draw conclusions. Teachers who use the scientific method are not only teaching students about science knowledge and skills, but they are also allowing them to practice using complex cognitive processes. In addition, teachers should teach study strategies in *every* academic discipline because the types of strategies that are most effective for learning one subject or topic might be different from those used to learn other subjects and topics.[174]

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[170] Derry et al., 1998; Halpern, 1998; Muis & Duffy, 2013; Sandoval et al., 2014.

[171] Jadallah et al., 2011; E. M. Nussbaum, 2008; A. M. O'Donnell et al., 2006; Vaughn et al., 2011; Wentzel & Watkins, 2011.

[172] Kahl & Woloshyn, 1994; A. King, 1994, 1999; Rosenshine et al., 1996; E. Wood et al., 1999.

[173] Beghetto & Kaufman, 2010; Engle, 2006; Lubart & Mouchiroud, 2003; D. N. Perkins & Ritchhart, 2004; Rule & Bendixen, 2010.

[174] Abrami et al., 2008; Beal et al., 2009; Bonney & Sternberg, 2011; Desoete et al., 2003.

Summary

Complex cognitive processes are those in which learners go far beyond the information they've learned, perhaps to better understand it, apply it to a new situation, use it to solve a problem or create a product, or critically evaluate it. The Big Ideas presented at the beginning of the chapter can help us summarize what researchers and experienced educators have learned about such processes.

3.1 Self-Regulation and Metacognition

Big Idea 3.1 Effective learners regularly plan for their learning, monitor it, reflect on it, and strive to improve it.

Self-regulation—the process of directing, monitoring, and evaluating one's own performance—affects students' learning. Self-regulation includes establishing goals for performance, planning a course of action, giving self-instructions, monitoring progress, actively controlling motivation and emotions, evaluating performance, and self-imposing consequences (either internal or external) for success and failure. Most learners become increasingly self-regulating with age, in part as a result of brain maturation and in part through co-regulated learning activities with adults. Many learners at all grade levels benefit from explicit instruction and support in how to self-regulate their behaviors and cognitive processes. For example, teachers might ask students to set specific goals for their learning or provide concrete criteria by which students can evaluate their accomplishments.

Metacognition—which literally means "thinking about thinking"—includes knowledge and beliefs about one's own cognitive processes, along with conscious attempts to engage in behaviors and cognitive processes that enhance learning and memory. Although metacognitive awareness and effective learning strategies improve with age, even many high school students are quite naive about how they can best study and learn classroom subject matter. To some degree, learners' *epistemic beliefs* regarding the nature of knowledge and learning affect the study strategies they use. For example, students who realize that reading is a constructive process are more likely to engage in meaningful learning as they read and are more likely to undergo conceptual change when they encounter ideas that contradict what they currently believe. Teachers can foster students' metacognitive development by (1) encouraging self-reflection about study techniques and problem-solving strategies, (2) teaching specific strategies for studying and remembering academic subject matter, and (3) providing classroom experiences that reveal the dynamic nature of knowledge and the effortful persistence that true mastery requires.

3.2 Transfer

Big Idea 3.2 Specific facts don't always have much applicability to the outside world, but many general principles, strategies, and attitudes acquired at school are potentially applicable to a wide variety of situations.

When learners apply something they've learned in one context to a new context, *transfer* is occurring. Transfer of specific facts is most common when a new situation appears to be similar to a previous one in which certain knowledge and skills have come into play (e.g., knowing how to count in French can help someone learn how to count in Spanish). In contrast, general study strategies, beliefs, and attitudes (e.g., knowing how to take good notes, realizing that mastering classroom topics takes hard work and persistence) often transfer from one content domain to a very different domain. Learners are most likely to apply school subject matter to outside tasks and problems if they have a meaningful conceptual understanding of it and if their learning environment encourages transfer. Teachers can help students transfer their knowledge by pursuing topics in depth rather than superficially, providing opportunities for students to apply their knowledge to new situations and authentic activities, and creating assessments that require students to transfer their knowledge.

3.3 Problem Solving and Creativity

Big Idea 3.3 Learners tend to be more effective problem solvers and more creative thinkers if they have considerable knowledge from which to draw and if they can think flexibly about new tasks and problems.

Problem solving (addressing and resolving an unanswered question or troubling situation) and *creativity* (developing an original and culturally appropriate product) involve varying degrees of convergent and divergent thinking. Learners can usually solve problems more effectively and think more creatively when they have acquired considerable knowledge about a topic, have automatized basic skills but *not* automatized particular ways of representing challenging problems

and situations, have a variety of problem-solving heuristics at their disposal, and can metacognitively reflect on and monitor their progress. Teachers can encourage problem solving and creativity by creating an appropriate classroom climate; posing questions that require divergent thinking; requiring students to work on complex problems, projects, and designs; simulating real-world tasks and problems; and helping students to avoid mental sets.

3.4 Thinking

Big Idea 3.4 Thinking involves a variety of cognitive processes, such as problem solving, critical thinking, and reasoning.

Thinking is a broad term that encompasses many different cognitive processes. *Critical thinking* involves evaluating the accuracy, credibility, and worth of information and lines of reasoning. It takes a variety of forms, such as analyzing persuasive arguments, identifying statements that do and don't support a particular conclusion, and judging the value of data collected through different research methods. When learners have sophisticated epistemic beliefs (e.g., a realization that one's understanding of a topic continues to evolve over time) and are generally predisposed to question and evaluate new information, they're more likely to think critically about what they read and hear. Teachers can develop students' critical thinking skills by encouraging students to use evidence to evaluate information and ideas, designing opportunities for students to engage in discussions, and teaching complex thinking skills within the context of specific topics and domains.

Case Study Practice Exercises

Interview with Charlie

Seventeen-year-old Charlie has been earning As in his high school classes; now, at the end of his 11th-grade year, he has a 4.0 grade point average. He has particular interests in science and technology; in fact, in addition to challenging coursework at school, Charlie has taken several computer courses at a local community college. His mother says, "He invests a lot of time in projects (writing papers, reports, etc.) but doesn't crack open a book to read or study often."

One afternoon Charlie has the following discussion with an adult:

Adult: Why do you think your grades have been so good?

Charlie: I do the homework, and I do well on the tests. I don't really study—I just make sure to focus on the homework and make sure it makes sense to me. . . . What I do depends on the circumstances. For math and chemistry, just doing homework and going over it with friends during lunch or something helps. That's about all I do for studying.

Adult: What do you mean, "make sure it makes sense"?

Charlie: If I look at the problem and I know the process of how to do it, like in math and chemistry.

Adult: Let's say that a teacher assigns a textbook chapter for you to read sometime in the next 3 days. What things would you do—in your head, that is—when you read the chapter?

Charlie: Depends on the book and the class. Probably just skim it. Is the teacher just telling us to read it, or are there questions with it? I think about those things. We have a textbook in my computer programming class. I go through the chapter, look at examples and the [computer] code. I don't look at the other stuff.

Adult: I haven't heard you talk about trying to memorize anything.

Charlie: We do have to memorize. If I write it down once—a formula or something—and can use it in a few problems, I get it.

Adult: Do you ever use flashcards?

Charlie: Flashcards wouldn't work for what I do.

Adult: How do you know when you've really learned something—I mean, *really* learned it—and will remember it for a long time?

Charlie: When I do a couple of problems and they don't seem as hard . . . when I can get the right answer every time.

Adult: Your teachers probably expect you to do a lot of things outside of class, right? How do you make sure you get them all done?

Charlie: Making lists is really helpful, of everything that's due.

Adult: So what do you do with the lists?

Charlie: I either do things as soon as possible or else procrastinate, do it the night before. Sometimes I have a free block at the end of the day to do it. Or I go home and do my chemistry right away. Or I might wait until the last minute. It depends on whether I'm hanging out with friends.

1. Multiple-choice question

Charlie says, "I don't really study—I just make sure to focus on the homework and make sure it makes sense to me." Which one of the following terms most accurately describes the nature of this statement?

a. Algorithm
b. Metacognition
c. Critical thinking
d. Divergent thinking

2. Multiple-choice question

Which one of the following statements is the best example of *comprehension monitoring*?

a. "Depends on the book and the class. Probably just skim it."
b. "I go through the chapter, look at examples and the [computer] code. I don't look at the other stuff.
c. "When I do a couple of problems and they don't seem as hard . . . when I can get the right answer every time."
d. "I either do things as soon as possible or else procrastinate, do it the night before. Sometimes I have a free block at the end of the day to do it."

3. Constructed-response question

Would you characterize Charlie's learning strategies as involving *rote learning* or *meaningful learning*? Use excerpts from the interview to support your answer.

Chapter 4
Learning in Context

Photo by Unsplash

Big Ideas to Master in this Chapter

4.1 Learners' behaviors and cognitive processes are influenced by the specific stimuli and consequences in their immediate environment.

4.2 Learners co-construct their knowledge with others.

4.3 The cultural and societal contexts in which learners grow up also influence their behaviors and cognitive processes.

4.4 Although various environmental contexts influence learners and their development, so, too, do learners influence the environments in which they live and grow.

Case Study: Why Jack Wasn't in School

Jack, a Native American seventh-grader, lived in the Navajo Nation in the American Southwest. Although he enjoyed school, worked hard in his studies, and got along well with classmates, he'd been absent from school all week. In fact, he'd been absent from home as well, and his family (which didn't have a telephone) wasn't sure exactly where he was. Jack's English teacher described the situation to Donna Deyhle, an educator who had known Jack for many years:

> That seventh-grader was away from home for 5 days, and his parents don't care! . . . Almost one-third of my Navajo students were absent this week. Their parents just don't support their education. How can I teach when they are not in my classes?
>
> A few days later, Jack's sister explained why her parents had eventually begun to look for Jack:
>
> He went to see [the film] *Rambo II* with friends and never came home. If he was in trouble we would know. But now the family needs him to herd sheep tomorrow.

It was spring—time for the family to plant crops and shear the sheep—and all family members needed to help out. Jack's whereabouts were soon discovered, and the family stopped by Donna's house to share the news:

> Jack's dad said, "We found him." His mother turned in his direction and said teasingly, "Now maybe school will look easy!" Jack stayed at home for several days, helping with the irrigation of the corn field, before he decided to return to school.[1]

Before you continue, please answer the following questions:

1. Did you interpret Jack's absence from school in the same way his English teacher did, concluding that "his parents don't care" about his education? If so, how might your own cultural background have influenced your conclusion?
2. Like most parents, Jack's mother and father cared deeply about his school achievement and general well-being. What alternative explanations might account for their behaviors in this situation?

Quite possibly you concluded that Jack and his parents don't place much value on formal education. If so, your conclusion might have been based on two widely held beliefs in your culture: (1) School should take priority over most activities at home and elsewhere and (2) responsible parents insist that their children attend school. In reality, most Navajo children and adults appreciate the importance of a good education. To fully understand what transpired in Jack's family, we need to know a couple of things about Navajo culture. First, Navajo people place high value on individual autonomy: Even children must be self-sufficient and make their own decisions.[2] From this perspective, good parenting doesn't mean demanding that children do certain things or behave in certain ways; instead, Navajo parents offer suggestions and guidance, perhaps in the form of gentle teasing ("Now maybe school will look easy!"), that nudge children toward productive choices. But in addition to individual autonomy, Navajos value cooperation and interdependence, believing that community members should work together for the common good; hence Jack's highest priority was helping his family during planting season. Such respect for both individual decision making and cooperative interdependence is seen in many other Native American communities as well.[3]

As this example demonstrates, learning always takes place within particular *contexts*, not only within the immediate environment but also within families, social

[1] Three excerpts from Deyhle & LeCompte, 1999, pp. 127–128.
[2] Deyhle & LeCompte, 1999.
[3] Chisholm, 1996; M. L. Manning & Baruth, 2009; Rogoff, 2003; Tyler et al., 2008.

Chapter Outline

Case Study: Why Jack Wasn't in School

4.1 Immediate Stimuli as Context
- Stimuli and Consequences Influence Learners' Behaviors and Cognition
- Teaching Strategies: Encouraging Productive Behaviors

4.2 Social Interaction as Context
- Other People Affect Students' Learning
- Teaching Strategies: Providing Opportunities for Students to Learn from Others

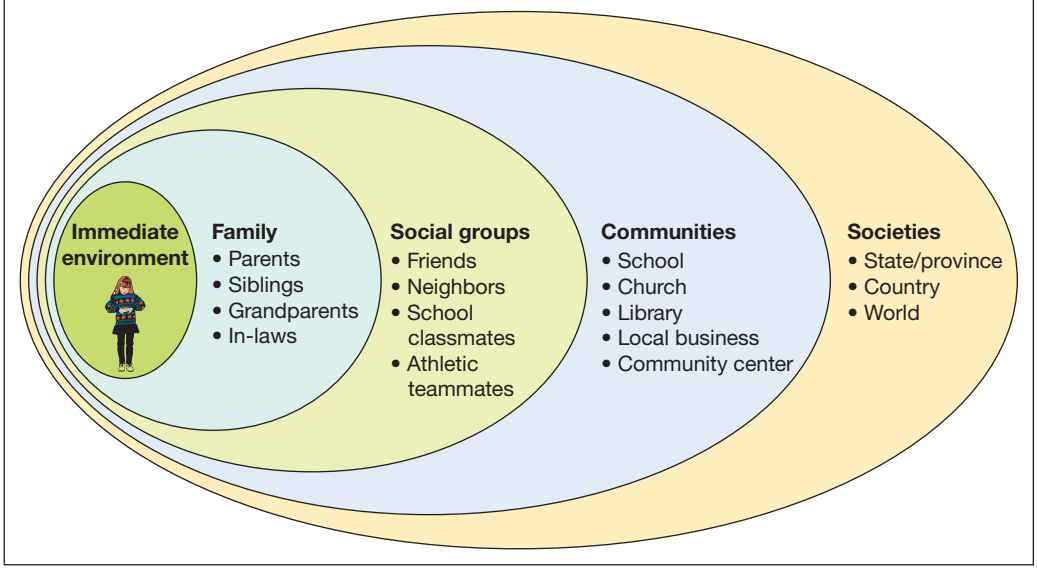
4.3 Culture and Society as Contexts
- Culture as Context
- Society as Context
- Teaching Strategies: Considering Students' Broader Cultural and Societal Contexts

4.4 How Students Modify Their Environments
- How Students Influence Their Environment
- Teaching Strategies: Attending to Students' Behaviors

Summary

Case Study Practice Exercises: Adam

Figure 4.1 Examples of contexts that influence students' learning and development



groups, communities, and societies, as shown in Figure 4.1. **Ecological systems theory** emphasizes the various layers of a learner's social environment (family, community, etc.) and their interactive effects in influencing the learner's development.[4] Ecological systems theorists point out that to fully understand and explain children's learning and development, we must consider the various environmental contexts in which children grow up. These various layers of context interact with and affect one another in myriad ways (e.g., community employment opportunities affect a family's ability to provide nourishing food and stimulating activities for children).

We begin by looking at the effects of learners' immediate surroundings; that is, the objects and events they encounter at any given time. Then, we gradually expand our field of vision to examine the more general contexts in which learners live.

4.1 Immediate Stimuli as Context

Big Idea 4.1 **Learners' behaviors and cognitive processes are influenced by the specific stimuli and consequences in their immediate environment.**

Stimuli and Consequences Influence Learners' Behaviors and Cognition

To some degree, learners' behaviors are influenced by the objects and events in their immediate surroundings. For example, in the opening case study, Jack is enticed to see a movie with his friends and then, later, to help out with his family's farming chores. One theory that can be used to understand how behaviors are affected by objects and events is called behaviorism.

Behaviorism is a theoretical perspective in which learning and behavior are described and explained in terms of stimulus–response relationships.[5] Early behaviorists argued that although thought processes occur, they cannot be directly observed and thus cannot be studied objectively and scientifically. Accordingly, most behaviorists downplay the role of cognitive processes in learning and instead focus on two things researchers *can* observe and measure: people's behaviors (also called **responses**) and the environmental events (called

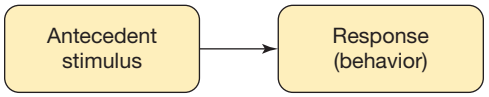
[4] Prominent ecological systems theorists include Urie Bronfenbrenner (1989, 2005) and Carol Lee (2010).
[5] Prominent behaviorists include B. F. Skinner, John Watson, Edward Thorndike, and Ivan Pavlov.

stimuli, which is plural for **stimulus**) that precede and follow those behaviors. Learning is viewed as a process of acquiring and modifying associations among stimuli and responses, largely through learners' direct interactions with the environment. In this section, we provide several general principles that sum up much of what behaviorists have discovered about how stimuli in a learner's immediate environment can influence the learner's behaviors.

Some stimuli tend to elicit certain kinds of responses.

Certain stimuli in our lives naturally lead us to respond in particular ways. A friend's invitation to watch an action-packed adventure film might be hard to pass up. A highly biased newspaper editorial might make us angry and lead us to write a letter to the editor. Different pieces of music evoke different moods and behavioral states, perhaps exciting or agitating us, perhaps provoking us to tap our feet or get on the dance floor, or perhaps helping us relax and "keep calm." A stimulus that precedes and evokes a particular response is known as an **antecedent stimulus** (see Figure 4.2).

Figure 4.2 An antecedent stimulus tends to elicit a particular response (behavior)



In school settings, a variety of environmental conditions have been shown to bring about particular behaviors, sometimes for the better and sometimes for the worse. For example, preschoolers are more likely to interact with their peers if they have a relatively small area in which to play and the available toys (e.g., balls, puppets) encourage cooperation and group activity.[6] The kinds of games older children are asked to play influence their interpersonal behavior: Cooperative games promote cooperative behavior, whereas competitive games promote aggressive behavior.[7] The nature of academic assignments influences students' on-task behavior in the classroom. For instance, students are more likely to behave appropriately in class when they have some confidence that they'll be able to complete assigned tasks successfully.[8]

Learners are more likely to acquire behaviors that lead to desired consequences.

Learners often learn and perform new behaviors specifically because those behaviors lead to certain end results. Following are examples:

- Laura studies hard for her French vocabulary quiz. She gets an A on the quiz.
- Linda copies her answers to the French quiz from Laura's paper. She, too, gets an A.
- Julian changes the way he holds a basketball before shooting it toward the basket. He now makes more baskets than he used to.
- James throws paper clips at the girl beside him and discovers that this is a good way to get her attention.

To get something they want, then, learners can acquire either productive behaviors (e.g., studying, trying a new basketball strategy) or nonproductive ones (e.g., cheating, throwing paper clips).

When we talk about the effects of desired consequences on learners' behaviors, we're talking about **operant conditioning**, a form of learning described by many behaviorists, most notably by B. F. Skinner.[9] The central principle of operant conditioning is a simple one:

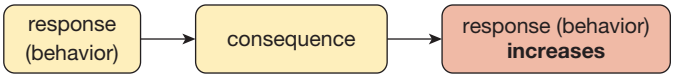
> A response that is followed by a reinforcing stimulus (a reinforcer) is more likely to occur again.

[6] W. H. Brown et al., 1987; Frost et al., 1998; S. S. Martin et al., 1991.
[7] Bay-Hinitz et al., 1994.
[8] Mac Iver et al., 1995; Moore & Edwards, 2003; Mueller et al., 2011; S. L. Robinson & Griesemer, 2006.
[9] For example, see B. F. Skinner, 1953, 1954, 1968. Some behaviorists instead use the term *instrumental conditioning*.

When behaviors are consistently followed by desired consequences, they tend to increase in frequency. When behaviors don't produce results, they usually decrease and may disappear altogether.

Teachers often talk about giving students rewards for academic achievement and appropriate classroom behavior. But as you may have noticed, we haven't used the term *reward* in our description of operant conditioning, and for a very important reason. The word *reward* brings to mind things we'd all agree are pleasant and desirable—perhaps praise, money, or special privileges. But some individuals increase their behavior for consequences that others wouldn't find very appealing. A **reinforcer** is any consequence that increases the frequency of a particular behavior, whether or not other people would find that consequence desirable (see Figure 4.3). The act of following a particular response with a reinforcer is known as **reinforcement**.

Figure 4.3 A response (behavior) may lead to a particular consequence. If the consequence then *increases* the response in the future, it's called a *reinforcer*.

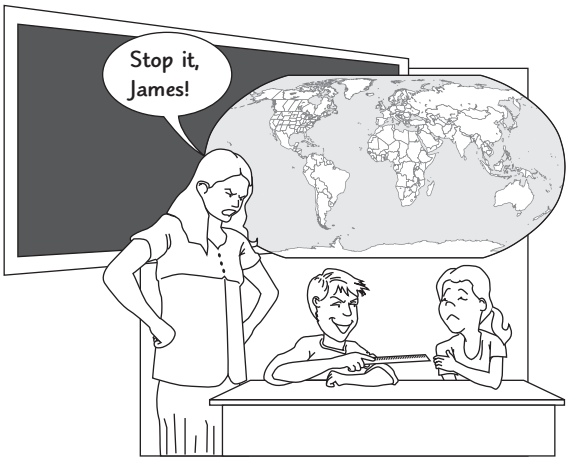


Reinforcers can take various forms, and different ones are effective for different learners. Some are **primary reinforcers**, in that they serve a basic biological or psychological need. Food, water, sources of warmth, and oxygen are all primary reinforcers. To some extent, physical affection and cuddling seem to address built-in needs as well, and for an adolescent addicted to an illegal substance, the next "fix" is also a primary reinforcer.[10]

In contrast, **secondary reinforcers** don't satisfy any biological or psychological need; praise, money, good grades, and trophies are examples. Such stimuli may become reinforcing over time through their association with other stimuli that already have a reinforcing effect. For example, if praise is occasionally associated with a special candy treat from Mom, and if money often comes with a hug from Dad, the praise and money eventually become reinforcing in and of themselves.

All the examples mentioned so far are instances of **positive reinforcement**. Whenever a particular stimulus is *presented* after a behavior and the behavior *increases* as a result, positive reinforcement has occurred. Don't be misled by the word *positive*, which in this case has nothing to do with the pleasantness or general desirability of the stimulus being presented. Positive reinforcement can occur even when the presented stimulus is one that others might think is *un*pleasant or *un*desirable. Instead, *positive* simply means *adding* something to the situation. Although many students will behave in ways that earn teacher praise, others may behave to get themselves *any* form of teacher attention, even a scolding (see Figure 4.4).[11] Most students will work for A-level grades, but a few may actually prefer Cs or even Fs because they lead to certain rewards. As a school psychologist, one of us authors worked with a high school student who used Fs as a way to get revenge on his overly controlling parents. Depending on the individual, any one of these stimuli—praise, a scolding, an A, or an F—can be a positive reinforcer. Following are examples of the forms positive reinforcement might take:

Figure 4.4 Teachers' and peers' attention (such as a teacher saying, "Stop it, James!") is often a *positive* reinforcer—that is, it *increases* the behavior it follows—even if the message being communicated is intended to discourage the behavior.

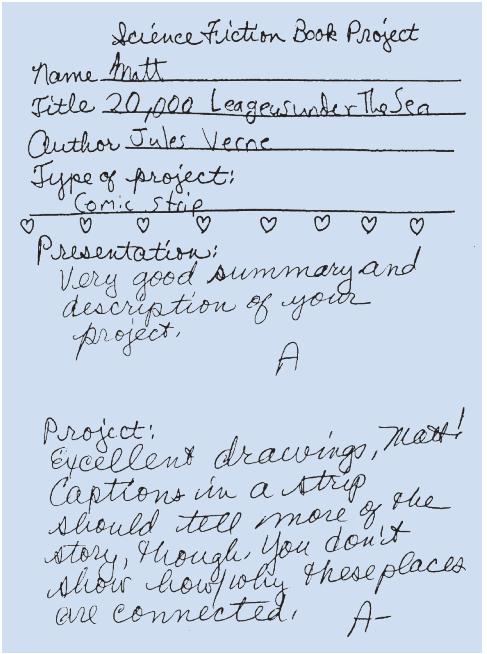


- A *concrete reinforcer* is an actual object—something that can be touched (e.g., a sticker, eraser, or toy).
- A *social reinforcer* is a gesture or sign (e.g., a smile, attention, praise, or "thank you") that one person gives another, usually to communicate positive regard.

[10] Harlow & Zimmerman, 1959; Lejuez et al., 1998; Vollmer & Hackenberg, 2001.
[11] Dolezal & Kurtz, 2010; Mueller et al., 2011.

- An *activity reinforcer* is an opportunity to engage in a desired activity. The **Premack Principle** states that the opportunity to engage in a more valued activity can reinforce someone's engagement in a less valued activity.[12] In other words, students may participate in a less-desired task (even a task they don't like to do) if completing the task enables them to do something they value or enjoy. For example, a high school English teacher could use the Premack Principle by telling students that they can use their phones when they finish writing their essays in class (assuming that using phones is a more valued activity for students than writing an essay).
- Sometimes the simple message that an answer is correct or that a task has been done well—*positive feedback*—is reinforcement enough. Positive feedback is most effective when it tells learners in explicit terms what they're doing well and what they can do to improve their performance even further (see Figure 4.5).[13]

Figure 4.5 In commenting on Matt's book project, a middle school teacher is explicit about what Matt can do to improve but vague about what he has done well. Knowing what *specific* things made his summary and project description "very good" would help Matt repeat these things in the future.


Science Fiction Book Project
Name Matt
Title 20,000 Leagues under The Sea
Author Jules Verne
Type of project:
Comic strip
Presentation:
Very good summary and description of your project.
A
Project:
Excellent drawings, Matt!
Captions in a strip should tell more of the story, though. You don't show how/why these places are connected.
A-

The reinforcers just listed are **extrinsic reinforcers**, those provided by the external environment (often by other people). Yet some positive reinforcers are **intrinsic reinforcers**, those that come from learners themselves or are inherent in tasks being performed. Learners engage in some activities simply because they enjoy the activities or like to feel competent and successful. When people perform certain behaviors in the absence of any external reinforcers—when they read an entire book without putting it down, do extra classwork without being asked, or play video games into the early hours of the morning—they're probably working for the intrinsic reinforcers that such activities yield.[14]

As you can see in Table 4.1, children's preferences for various kinds of reinforcers tend to change over the course of development. A second developmental trend is evident in the table as well: As children grow older, they become better able to handle **delay of gratification**. That is, they can forgo small, immediate reinforcers for the larger reinforcers their long-term efforts may bring down the road.[15] Whereas a preschooler or kindergartner is apt to choose a small reinforcer she can have *now* over a larger and more attractive reinforcer she can't get until tomorrow, an 8-year-old may be willing to wait a day or two for the more appealing item. Delay of gratification appears to peak in late adolescence, and some adolescents can delay gratification for several weeks or even longer.[16]

Learners are also likely to acquire behaviors that help them avoid or escape unpleasant circumstances.

Sometimes learners behave not to *get* something, but instead to *get rid of* something. On such occasions, negative reinforcement rather than positive reinforcement is at work. Whereas positive reinforcement involves the presentation of a stimulus, **negative reinforcement** brings about the increase of a behavior through the *removal* of a stimulus—typically an unpleasant one, at least from the learner's perspective. The word *negative* here isn't a value judgment. It simply refers to the act of *taking away* (rather than adding) a stimulus. To remember this, think of how positive and negative are used in mathematics: a positive sign

[12] Premack, 1959, 1963; Timberlake & Farmer-Dougan, 1991.
[13] Hattie & Gan, 2011; Narciss, 2008; Shute, 2008.
[14] Some researchers refer to these behaviors as *intrinsic motivation*, which is described in Chapter 5.
[15] Atance, 2008; L. Green et al., 1994; Steinberg, Graham, et al., 2009.
[16] Achterberg et al., 2016.

Developmental Trends

Table 4.1 Effective Reinforcers at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES

Photo by Unsplash
Grades K–2
	• Preference for small, immediate reinforcers over larger, delayed ones
	• Examples of effective reinforcers:
	  • Concrete reinforcers (e.g., stickers, crayons, small trinkets)
	  • Teacher approval (e.g., smiles, praise)
	  • Privileges (e.g., going to lunch first)
	  • "Grown-up" responsibilities (e.g., taking absentee forms to the office)
		When a kindergarten teacher asks children to choose between a small snack before morning recess or a larger one after recess, most of them clamor for the smaller, immediate snack.	• Give immediate praise for appropriate behavior.
			• Describe enjoyable consequences that may come later as a result of students' present behaviors.
			• Use colorful stickers to indicate a job well done; choose stickers that match students' interests (e.g., use favorite cartoon characters).
			• Have students line up for recess, lunch, or dismissal based on desired behaviors (e.g., "Table 2 is the quietest and can line up first").
			• Rotate opportunities to perform classroom duties (e.g., feeding the goldfish, watering plants); make such duties contingent on appropriate behavior.

JohnnyGreig/E+/ Getty images
Grades 3–5
	• Increasing ability to delay gratification (i.e., to put off small reinforcers in order to gain larger ones later on)
	• Examples of effective reinforcers:
	  • Concrete reinforcers (e.g., snacks, pencils, small toys)
	  • Teacher approval and positive feedback
	  • "Good citizen" certificates
	  • Free time (e.g., to draw or play games)
		Nine-year-old Li-Mei glows with pride when her teacher praises her for helping a classmate with a challenging writing assignment.	• Use concrete reinforcers only occasionally, perhaps to add novelty to a classroom activity.
			• Award a certificate to a "citizen of the week," explicitly identifying things the recipient has done especially well; be sure that every student gets at least one certificate during the school year.
			• Plan a field trip for students with good attendance records (especially useful for students at risk for academic failure).

Photo by Unsplash
Grades 6–8
	• Increasing desire to have social time with peers
	• Examples of effective reinforcers:
	  • Free time with friends
	  • Acceptance by and approval of peers
	  • Teacher approval and emotional support (especially critical after the transition to middle school or junior high)
	  • Specific positive feedback about academic performance (preferably given in private)
		Students in a sixth-grade science class work diligently on an assigned lab activity, knowing that if they complete it before the end of class, they can have a few minutes to talk with friends.	• Make short periods of free time with peers (e.g., 5 minutes) contingent on accomplishing assigned tasks.
			• Spend one-on-one time with students, especially those who appear to be socially isolated.
			• Provide explicit feedback about what things students have done well (e.g., their use of colorful language in an essay or helping a classmate understand a complex concept).

Photo by Unsplash
Grades 9–12
	• Increasing ability to postpone immediate pleasures in order to gain desired long-term outcomes
	• Concern about getting good grades (especially for students who are applying to selective colleges)
	• Examples of effective reinforcers:
	  • Opportunities to interact with friends
	  • Specific positive feedback about academic performance
	  • Public recognition for group performance (e.g., newspaper articles about a school club's public service work)
	  • Positions of responsibility (e.g., being student representative to Faculty Senate)
		When 16-year-old Deon's friends ask him to go to the movies on a Thursday evening, he declines. "I have to study for tomorrow's history test," he says. "If I keep my grades up, I'll have a better chance of getting a good college scholarship."	• Acknowledge students' concern about earning good grades but focus their attention on the value of learning school subject matter for its own sake (see the discussion of achievement goals in Chapter 5).
			• Take precautions to ensure that cheating and plagiarism are *not* reinforced.
			• Publicize accomplishments of extracurricular groups and athletic teams in local news media.
			• Provide opportunities for independent decision making and responsibility, especially when students show an ability to make wise decisions.

Sources: E. M. Anderman & Mueller, 2010; L. H. Anderman et al., 2002; Atance, 2008; Cizek, 2003; Fowler & Baer, 1981; L. Green et al., 1994; Hine & Fraser, 2002; Krumboltz & Krumboltz, 1972; M. G. Sanders, 1996; Shute, 2008; Steinberg, Graham, et al., 2009; M.-T. Wang & Holcombe, 2010.

is used to add and a negative sign is used to subtract. Following are examples of negative reinforcement, all of which lead to an increase in behavior by removing a stimulus:

- Reuben must read Charles Dickens's *A Tale of Two Cities* for his English literature class. He doesn't like having the assignment hanging over his head—that is, he doesn't like worrying about it—so he finishes the book a week early. After he's done, the annoying *worry* feeling disappears. If he completes more assignments early, then the frequency of his behavior increases because the response takes away the worry feeling.
- Rhonda is in the same literature class as Reuben. Each time she sits down at home to read *A Tale of Two Cities*, she finds it confusing and hard to understand. She quickly ends her study sessions by finding other things she "needs" to do, such as texting or playing basketball with neighbors. In other words, the *unpleasant feelings* disappear, at least for the time being. If she continues to avoid difficult assignments, then the frequency of her behavior increases because the response temporarily removes her unpleasant feelings.
- Some other students in Reuben and Rhonda's class complain loudly and vigorously about having to read a book written by "some dead guy" instead of another novel popular with their peer group. In an emotional response to the students' resistance, their teacher explodes: "Stop it, *STOP IT*, ***STOP IT!***" The students immediately quiet down. Through his action, the teacher terminates a *noisy and unpleasant situation*. If the students continue to quiet down when the teacher yells, then the frequency of his yelling behavior increases because it takes away the noisy and unpleasant situation. In this case, the students are negatively reinforcing the teacher's behavior.

In these examples, notice how negative reinforcement sometimes promotes desirable behaviors (such as Reuben's completing an assignment early and quieting boisterous students) and at other times promotes undesirable behaviors (such as Rhonda's procrastination). Notice, as well, how students aren't the only ones who respond to negative reinforcement in the classroom: the teacher was reinforced for yelling when the class was overly loud. The teacher's emotional outbursts won't necessarily be productive over the long run, however, especially if the reasons why some students are having trouble making sense of Dickens's novel aren't addressed.

Negative reinforcement often comes into play when students face especially difficult academic tasks.[17] The following explanation reveals what one student with a learning disability learned to do:

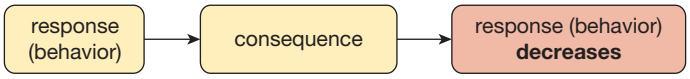
> When it comes time for reading I do everything under the sun I can to get out of it because it's my worst nightmare to read. I'll say I have to go to the bathroom or that I'm sick and I have to go to the nurse right now. My teacher doesn't know that I'll be walking around campus. She thinks I am going to the bathroom or whatever my lame excuse is. All I really want to do is get out of having to read.[18]

Learners tend to avoid behaviors that lead to unpleasant consequences.

Over the years, we authors have heard many people incorrectly use the term *negative reinforcement* when they plan to impose unpleasant consequences to reduce someone's inappropriate behavior. In reality, they're talking about administering punishment, *not* negative reinforcement. Whereas negative reinforcement increases the frequency of a response, **punishment** is a consequence that *decreases* the frequency of the response it follows (see Figure 4.6).

[17] Dolezal & Kurtz, 2010; McComas et al., 2003; Van Camp et al., 2000.
[18] Zambo & Brem, 2004, p. 5.

Figure 4.6 A response (behavior) may lead to a particular consequence. If the consequence then *decreases* the response in the future, it's called a *punishment*.



All punishing consequences fall into one of two categories. **Presentation punishment** involves presenting a new stimulus, presumably something a learner finds unpleasant and doesn't want. Scoldings and teacher scowls, *if* they lead to a reduction in the behavior they follow, are instances of presentation punishment. **Removal punishment** involves removing an existing stimulus that a learner finds desirable and doesn't want to lose. Loss of a privilege, a fine or penalty (involving the loss of money or previously earned points), and "grounding" (when certain pleasurable outside activities are missed) are all examples of removal punishment.

To systematically determine whether a consequence is a reinforcer or punishment, follow these steps: (1) identify the response (behavior) that is being affected, (2) determine whether the response is increasing or decreasing, and (3) determine whether something is presented/added or removed/subtracted. Table 4.2 organizes these ideas and provides examples of each type of reinforcement and punishment.

Certain forms of punishment, especially those that are mild in nature and cause no physical or psychological harm, can be quite effective in reducing inappropriate behaviors. Indirectly, then, they can help children and adolescents acquire more productive behaviors.[19] But without proper precautions, the use of punishment in the classroom—even something as seemingly "minor" as yelling at students, as the English literature teacher

Table 4.2 Distinguishing Among Positive Reinforcement, Negative Reinforcement, and Punishment

CONSEQUENCE		EFFECT	EXAMPLES
Reinforcement (response increases)	Positive reinforcement (stimulus presented)	Response *increases* after a new stimulus (presumably one the learner finds desirable) is *presented*.	• A student *is praised* for writing an assignment in cursive. The student begins to write other assignments in cursive as well. (Cursive writing increases after praise is presented.) • Zhang *gets lunch money* by bullying Stephanie into surrendering hers. Zhang begins bullying his classmates more frequently. (Bullying increases after money is presented/received.)
	Negative reinforcement (stimulus removed)	Response *increases* after a previously existing stimulus (presumably one the learner finds undesirable) is *removed*.	• Dmitry *no longer has to worry* about a research paper because he completes it several days before the due date. He begins to do his assignments ahead of time whenever possible. (Working ahead of time increases after worrying is removed.) • Sophia *escapes the principal's reprimand* by lying about her role in a recent incident of school vandalism. She begins lying to school faculty members whenever she wants to avoid a punishment. (Lying increases after punishment is removed/avoided.)
Punishment (response decreases)	Presentation punishment (stimulus presented)	Response *decreases* after a new stimulus (presumably one the learner finds undesirable) is *presented*.	• Maya *is scolded* for taunting other students. Maya taunts others less frequently after that. (Taunting decreases after scolding is presented.) • Quinn *is laughed at by classmates* for asking a "stupid" question during a lecture. Quinn stops asking questions in class. (Questioning decreases after the laughing is presented.)
	Removal punishment (stimulus removed)	Response *decreases* after a previously existing stimulus (presumably one the learner finds desirable) is *removed*.	• Bella *is not allowed to play on the softball team for three games* for showing poor sportsmanship. Bella rarely shows poor sportsmanship in future games. (Poor sportsmanship decreases after playing time is removed.) • Henry *loses points on a test* for answering a question in a creative but unusual way. Henry takes fewer risks on future tests. (Creative answers decrease after points are removed.)

[19] Conyers et al., 2004; R. V. Hall et al., 1971; Landrum & Kauffman, 2006; Walters & Grusec, 1977.

does in the earlier example—can be counterproductive and is generally less effective than reinforcement.[20] And when parents punish their children by spanking them, it can lead to many negative outcomes for children, such as increased aggression, increased antisocial behavior, increased mental health problems, lower cognitive ability, and lower self-esteem.[21] In our discussion of classroom management strategies in Chapter 9, we look at effective punishments and guidelines for their use.

think about it
After studying Table 4.2, can you explain in your own words how negative reinforcement is *not* the same as punishment?

Learners acquire many behaviors by observing other people's actions.

People learn some new behaviors simply by experimenting with various actions and seeing which ones lead to reinforcement and which ones lead to punishment—largely a trial-and-error approach. But they probably learn many more behaviors by observing and imitating the behaviors of other individuals. In fact, the human brain seems to be specially equipped for imitation. Certain neurons in the brain, appropriately called **mirror neurons**, become active either (1) when learners observe others engaging in a particular behavior or (2) when learners engage in that same behavior themselves. It appears, then, that the brain is prewired to make connections between observing and doing, thus enhancing learners' ability to acquire new skills from their social and cultural surroundings.[22]

Psychologists have developed a theory, called **social cognitive theory**, that focuses on how people learn by observing others.[23] Often people learn through **modeling**: They watch and imitate what others do. Consistent with how the term is used both in everyday speech and in social cognitive theory, we sometimes use *modeling* to describe what the model does (i.e., demonstrate a behavior) and at other times to describe what the observer does (i.e., imitate that behavior). To minimize confusion, we often use the verb *imitate* rather than *model* when referring to what the observer does. In general, a **model** can take one of three forms—live, symbolic, or verbal instructions—as described in Figure 4.7.[24]

Figure 4.7 Models can be organized into three categories

Types of Models

- **Live model:** an actual person demonstrating a behavior
- **Symbolic model:** a person or character portrayed in a book, film, television show, video game, or other media
- **Verbal instructions:** descriptions of how to successfully execute certain behaviors (without another human being, either live or symbolic, being anywhere in sight)

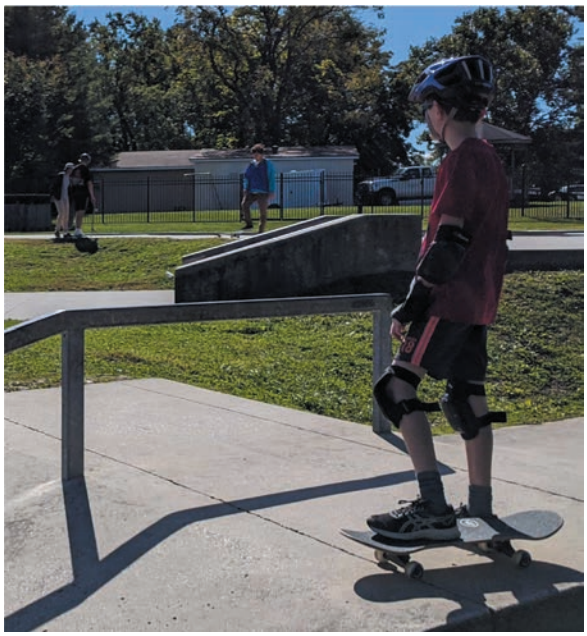
Learners acquire a wide variety of physical skills (e.g., TikTok dances, gymnastic skills) in part by watching other people do them first (see Figure 4.8).[25] They can also gain many academic skills (e.g., in writing, art, and coding) by observing what others do.[26] Modeling of such skills can be especially effective when the model demonstrates not only how to *do* a task but also how to *think about* the task. This type of modeling is called **cognitive modeling** because models verbalize their thoughts and reasons for their actions.[27] As an example, consider how a teacher might model the thinking processes involved in the long-division problem in the margin:

$4\overline{)276}$

> First I have to decide what number to divide 4 into. I take 276, start on the left and move toward the right until I have a number the same as or larger than 4. Is 2 larger than 4? No. Is 27 larger than 4? Yes. So my first division will be 4 into 27. Now I need to multiply 4 by a number that will give an answer the same as or slightly smaller than 27. How about 5? No, too small. Let's try 6. Maybe. Let's try 7. No, too large. So 6 is correct.[28]

[20] For example, see J. Ellis et al., 2010.
[21] Gershoff & Grogan-Kaylor, 2016.
[22] Arbib, 2005; Decety & Cacioppo, 2010; Gallese et al., 2011; Nielsen & Tomaselli, 2010.
[23] Prominent social cognitive theorists include Albert Bandura, Dale Schunk, and Barry Zimmerman; Schunk & DiBenedetto, 2020.
[24] Bandura, 1977, 1986.
[25] Boyer et al., 2009; Magill, 1993; Vintere et al., 2004.
[26] Braaksma et al., 2002; Geiger et al., 2010; K. R. Harris et al., 2010; Schunk & Hanson, 1985; Schunk & Swartz, 1993.
[27] R. J. Sawyer et al., 1992; Schunk, 1981, 2012; Schunk & Swartz, 1993; Zimmerman & Kitsantas, 1999.
[28] Schunk, 2012, p. 129.

Figure 4.8 Kids can learn a lot from modeling in school and out of school. At a skateboarding park, it's common for kids to watch and imitate the moves of other skateboarders in order to learn new tricks



By observing and imitating others, learners acquire many interpersonal behaviors as well. For instance, they often learn **prosocial behaviors**—showing compassion, sharing possessions, and, in general, putting others' needs and well-being before their own—when they see models that exhibit prosocial behavior. In contrast, they're more likely to be aggressive and violent when they witness aggression and violence in their personal lives or in the media.[29] And when they hear a model say one thing and do the opposite, they're more likely to imitate what the model *does* than what the model *says*.[30] To be truly effective, models must practice what they preach.

Under what circumstances are learners most likely to model other people's behaviors? The next exercise should help you discover the answer.

See For Yourself

Five People

Write down the names of five people whom you admire and whose behaviors you'd like to imitate in some way. Then, beside each name, write one or more reasons *why* you admire these people.

Chances are the five people you chose have one or more of the following characteristics:[31]

- **Competence.** Learners typically try to imitate people who do something well, not those who do it poorly.

[29] C. A. Anderson et al., 2003; Carnagey et al., 2007; N. E. Goldstein et al., 2001; Guerra et al., 2003; Hearold, 1986; Rushton, 1980.

[30] Bryan, 1975.

[31] Bandura, 1986; Grace et al., 2008; C. L. Martin & Ruble, 2004; Powers et al., 1995; Sasso & Rude, 1987.

- **Prestige and power.** Learners often imitate people who are famous or powerful, either at a national or international level (e.g., a renowned athlete, a popular YouTuber) or on the local scene (e.g., the captain of the basketball team, a gang leader).
- **"Gender-appropriate" behavior.** Learners are more likely to adopt behaviors they believe are appropriate for their gender (with different learners defining *gender-appropriate* somewhat idiosyncratically).
- **Behavior relevant to one's own situation.** Learners are most likely to imitate behaviors they believe will help them in their own lives and circumstances.

The last of these—behavior relevant to one's own situation—leads us to the next general principle.

Learners learn what behaviors are acceptable and effective by observing what happens to people whom they perceive to be similar to themselves.

When one of us authors was in third grade, she entered a Halloween costume contest dressed as "Happy Tooth," a character in several toothpaste commercials at the time. She didn't win the contest; a "witch" won first prize. So the following year she entered the same contest dressed as a witch, figuring she was a shoo-in for first place. Her dressing-as-a-witch behavior increased not because she was reinforced for such behavior, but rather because she saw someone *else* being reinforced for it.

Learners sometimes experience reinforcement and punishment *vicariously*—that is, by observing the consequences of other people's behaviors.[32] Learners who observe someone else being reinforced for a particular behavior tend to exhibit that behavior more frequently themselves—a phenomenon known as **vicarious reinforcement**. For example, by taking note of consequences their classmates experience, students might learn that studying hard leads to good grades, that being elected to class office brings status and popularity, or that neatness counts.

Conversely, when learners see someone else get punished for a certain behavior, they're *less* likely to behave that way themselves—a phenomenon known as **vicarious punishment**. For example, when a coach benches a soccer player for unsportsmanlike conduct, other players are unlikely to behave similarly. Unfortunately, vicarious punishment can suppress desirable behaviors as well as undesirable ones. For instance, when a teacher belittles a student's question by calling it "silly," other students may be reluctant to ask questions of their own.

By seeing what happens to themselves and others, learners form expectations about the probable outcomes of various actions.

So far we've been focusing largely on what learners *do*. But the consequences of their own and others' behaviors also affect what learners *think*. In particular, learners begin to see patterns in the consequences that follow various responses, leading them to form expectations that certain responses will lead to desirable results and other responses won't. These *expectations* about how certain behaviors lead to desired consequences, in turn, affect what learners do and don't do in future situations.[33]

When learners choose to behave in a way that might bring future reinforcement, they're working for an **incentive**. Incentives are never guaranteed—for instance, people never know for sure that they're going to get an A on a test when they study for it or that they're going to win a Halloween costume contest when they enter it. It will influence learners' behaviors only if they think that, by working hard, they can actually obtain it. For

[32] Bandura, 1965; Engarhos et al., 2020.
[33] Bandura, 1986, 2008.

example, in a classroom of 25 children, a competition in which one prize will be awarded for the highest test score is apt to motivate just a handful of students who regularly achieve at high levels.

What happens when learners' expectations aren't met—for instance, when expected reinforcement never comes? When, as a fourth-grader, one of us authors entered the Halloween costume contest as a witch, she lost once again. (First prize went to a girl wearing a metal colander on her head and claiming to be *Sputnik*, the first satellite launched into space by what was then the Soviet Union.) That was the last time she entered a Halloween contest because she had expected reinforcement and felt cheated because she didn't get it by winning. When learners think that a certain response is going to be reinforced, yet the response *isn't* reinforced, they're less likely to exhibit that response in the future. In other words, the *non*occurrence of expected reinforcement is a form of punishment.[34]

think about it
Can you think of a personal experience in which not receiving an expected reinforcement felt like a punishment?

Just as the nonoccurrence of reinforcement is a form of punishment, the nonoccurrence of punishment is a form of reinforcement.[35] Perhaps you can think of a time when you broke a rule, expecting to be punished, but got away with your crime. Or perhaps you can remember seeing someone else break a rule without being caught. When nothing bad happens after a forbidden behavior, people may actually feel as if they've been reinforced for the behavior.

With the preceding points in mind, let's return to the opening case study. After going to a movie with friends, Jack was gone for 5 days without telling his family where he was. In some families, such behavior would be totally unacceptable, and a child would reasonably expect to be punished for it. But in Jack's family and within the context of his local cultural environment, the behavior was within acceptable bounds. In this situation, the lack of punishment wasn't necessarily reinforcing for Jack because he wasn't *expecting* any punishment.

Teaching Strategies: Encouraging Productive Behaviors

The concepts of *antecedent stimulus*, *reinforcement*, and *modeling* can be quite helpful in promoting productive learner behaviors, as the following recommendations reveal.

Create conditions that elicit desired responses.

Certain stimulus conditions—for instance, cooperative games and classroom assignments appropriate for students' ability levels—tend to evoke productive behaviors. Furthermore, a general classroom climate in which students feel accepted and respected by teachers and classmates alike tends to bring out the best in almost everyone (more on this point in Chapters 5 and 9).

Sometimes teachers provide explicit reminders about desirable and undesirable behaviors—a strategy known as **cueing**. In some instances, cueing involves a nonverbal signal, such as ringing a bell or flicking an overhead light switch to remind children to talk quietly rather than loudly. At other times, it involves a verbal reminder, either direct or indirect, about what children should be doing—for example, "Remember to use your *indoor* voices as you talk" and "I see some art supplies that need to be put away." Such statements are examples of the *retrieval cues* discussed in Chapter 2, although in this case they remind students about appropriate classroom behavior rather than about academic subject matter.

[34] Bandura, 1986.
[35] Bandura, 1986.

Make sure that productive behaviors are reinforced and that unproductive behaviors are *not* reinforced.

Teachers should regularly reinforce desirable behaviors, such as reading frequently, constructing a well-researched science fair poster, and working cooperatively with classmates. This idea is summarized nicely by the phrase "Catch students being good." Reinforcers tailored to students' developmental levels and individual interests—such as praise, stickers, special privileges, and free time to engage in favorite activities—can keep students on task as they work to master important information and skills. A relatively easy way to keep students on task is to use verbal praise as a reinforcer—including praise to the entire class, "Good job class, you all placed your assignments in the box on the way in the classroom," and praise to individual students, "Way to go, Phillipa!" When teachers provide more praise and fewer disapproving comments (such as, "Everyone needs to keep their hands to themselves" and "Xiao, I told you stop getting out of your seat"), students spend more time engaging in the classwork.[36]

Certainly, however, teachers need to provide specific feedback to students about their behavior and classwork, and not all of it will be positive.[37] The Classroom Strategies box "Using Feedback to Improve Learning and Behavior" offers suggestions for maximizing feedback's effectiveness.

Classroom Strategies

Using Feedback to Improve Learning and Behavior

- **Be explicit about what students are doing well—ideally, at the time they are doing it.**
  When praising her students for appropriate classroom behavior, a second-grade teacher is quite specific about the behavior she is praising: "I like the way you're working quietly" and "Thank you, Ricky, for not disturbing the rest of the class."
- **Give concrete guidance about how students can improve their performance.**
  A high school physical education teacher tells a student, "Your time in the 100-meter dash wasn't as fast as it could have been. It's early in the season, though, and if you work on your endurance, I know you'll improve. Also, I think you might get a faster start if you stay low when you first come out of the starting blocks."
- **Communicate optimism that students *can* improve.**
  When a student in a middle school geography class gives an oral report on Mexico, she bores her classmates with a lengthy description of her family's recent trip to Puerto Vallarta. Many students begin to communicate their displeasure through body language and occasional whispers across the aisle. At the end of class, the student is devastated that her report has been so poorly received. Her teacher takes her aside and gently says, "You included many interesting facts in your report, Julie, and your many pictures and artifacts really helped us understand Mexican culture. But you know how young teenagers are—they can have a pretty short attention span at times. I'll be assigning oral reports again in a couple months. Before you give yours, let's sit down and plan it so that your classmates will think, 'Wow, this is really interesting!'"
- **Don't overwhelm students with too much feedback; tell them only what they can reasonably attend to and remember at the time.**
  As a kindergarten teacher watches one of his students practice writing several alphabet letters, he helps the student hold her pencil in a way that gives her better control. He doesn't mention that she's writing her *B*s and *D*s backward; he'll save this information for a later time, after she has mastered her pencil grip.
- **Minimize feedback when students already know exactly what they've done well or poorly.**
  A high school student has been getting poor grades in his math class largely as a result of insufficient effort. When he begins to try harder and do his homework regularly, his quiz scores improve tremendously. As his teacher hands him his first quiz after his newfound diligence—a quiz on which he's earned a score of 96%—she says nothing, but she smiles and gives him a thumbs-up.
- **Teach students strategies for appropriately asking for feedback.**
  A fourth-grade teacher has three students with intellectual disabilities in her class. She knows that these students may need more frequent feedback than their classmates. She teaches them three steps to take when they need her assistance: (1) Raise your hand or walk quietly to my desk; (2) Wait patiently until I have time to speak with you; and (3) Make your needs known (e.g., "How am I doing?" "What do I do next?").

Sources: Boyanton, 2010; D. L. Butler & Winne, 1995; M. A. Craft et al., 1998, p. 402 (fourth-grade example); Feltz et al., 1999; Hattie & Gan, 2011; Hattie & Timperley, 2007; K. A. Meyer, 1999; Shute, 2008; Stokes et al., 2010; Tunstall & Gipps, 1996; Wise & O'Neill, 2009.

[36] Caldarella et al., 2020; Sutherland & Wehby, 2001.

[37] Wullschleger et al., 2020.

In some cases, teachers can let students *choose* their reinforcers and perhaps even choose different reinforcers on different occasions.[38] One useful strategy is a **token economy**, in which students who exhibit desired behaviors receive *tokens* (e.g., poker chips or specially marked pieces of colored paper) that they can later use to "purchase" a variety of *backup reinforcers*—perhaps small treats, free time in the reading center, or a prime position in the lunch line. As another example of a token economy, a primary school in Australia has teamed up with a nonprofit organization (The Immersive Education Initiative; www.immersiveeducation.org) to give students tokens for completing learning objectives.[39] Students then use the tokens to buy a variety of technologies, such as virtual reality (VR) headsets, 360-degree VR cameras, iPhones and iPads, and video games. Mostly, however, teachers should stay away from concrete reinforcers such as small toys and trinkets, which can distract students' attention away from their schoolwork.

Regardless of the form reinforcement takes, *some* kind of reinforcer should follow desired behaviors. Otherwise, those behaviors might decrease and eventually disappear—a phenomenon known as **extinction**. Initially, to increase the frequency of a desired response, reinforcement should be *continuous*, occurring every time the response occurs. Once a student makes the response frequently, reinforcement can be *intermittent*—that is, given on some occasions but not others—so that the response doesn't extinguish.

Meanwhile, teachers must be careful that they don't inadvertently reinforce behaviors that will interfere with learners' success over the long run. For example, if a teacher repeatedly allows Carol to turn in assignments late because she says she forgot her homework, and if that teacher often lets Caleb get his way by bullying classmates, the teacher is reinforcing—and hence increasing—Carol's irresponsibility and Caleb's aggressiveness.

Make response–reinforcement contingencies clear and appropriate.

Whenever teachers use reinforcement in the classroom, they should explicitly describe the cause-and-effect relationships, or **contingencies**, between responses and reinforcers. For example, kindergarten students are more likely to respond appropriately if they're told, "The quietest group can be first in line for lunch." Ninth-graders are more likely to complete their Spanish assignments if they know that by doing so they'll be able to go on a field trip to a local Cinco de Mayo festival at the end of the week. To increase the chances that students will engage in tasks that they may otherwise not want to do, teachers can use the *Premack Principle* (which was explained previously) by (1) identifying activities that students value or enjoy more than others (e.g., students really like to use the math games on the iPads) and (2) allowing students to participate in these more valued activities after they've completed the activity they're less likely to want to do (e.g., students are allowed to use the iPads after they've completed their assignment in math class).[40]

One concrete way of communicating both behavioral expectations and response–reinforcement contingencies is a **contingency contract**. To develop such a contract, the teacher meets with a student to discuss a problem behavior (e.g., talking to friends during independent seatwork or speaking disrespectfully to classmates). The teacher and student then identify and agree on desired behaviors that the student will demonstrate (e.g., completing seatwork assignments within a certain time frame; speaking with classmates in a friendly, respectful manner). The two also agree on one or more reinforcers for those

[38] Berg et al., 2007; Bowman et al., 1997; Fisher & Mazur, 1997; Ulke-Kurcuoglu & Kircaali-Iftar, 2010.
[39] Mikolajczak, 2019.
[40] Dunham, 1977; Timberlake & Farmer-Dougan, 1991.

behaviors (e.g., a certain amount of free time, or points earned toward a particular privilege). Together the teacher and student write and sign a contract that describes the desired behaviors and contingent reinforcers. Contingency contracts can be a highly effective means of improving a wide variety of academic and social behaviors.[41]

As an alternative to punishment, reinforce productive behaviors that are incompatible with unproductive ones.

Some occasions clearly call for punishment, as you'll discover in Chapter 9. But at other times a teacher can reduce the frequency of an unproductive behavior simply by reinforcing a *different* behavior. Ideally, the two behaviors are **incompatible behaviors**, in that they can't be performed at the same time. For example, try the following exercise.

See For Yourself

Asleep on Your Feet

Have you ever tried to sleep while standing up? Horses can do it, but most humans really can't. In fact, there are many pairs of actions that are impossible to perform simultaneously. Take a minute to identify something you can't possibly do when you perform each of these activities:

When you . . .	You can't simultaneously . . .
Sit down	_____
Eat crackers	_____
Take a walk	_____

Obviously, there are many possible right answers. For instance, sitting is incompatible with standing. Eating crackers is incompatible with singing—or at least with singing *well*. Taking a walk is incompatible with taking a nap. In each case it's physically impossible to perform both activities at exactly the same time.

To apply the concept of incompatible behaviors in the classroom, a teacher might, for example, reinforce a hyperactive student for sitting down, because sitting is incompatible with getting-out-of-seat and roaming-around-the-room behaviors. Similarly, a teacher might discourage off-task responses by reinforcing *on*-task responses or discourage verbally aggressive behavior by reinforcing socially appropriate actions. And consider how one school dealt with a chronic litterbug:

> Walt often leaves banana peels, sunflower seed shells, and other garbage in and outside the school building. When the school faculty establishes an Anti-Litter Committee, it puts Walt on the committee, and the committee eventually elects him as its chairman. Under Walt's leadership, the committee institutes an anti-litter campaign, complete with posters and lunchroom monitors, and Walt receives considerable recognition for the campaign's success. Subsequently, school personnel no longer find Walt's garbage littering the building and school grounds.[42]

Model desired behaviors.

Teachers teach not only by what they say, but also by what they do, so it's critical that teachers model appropriate behaviors and *not* model inappropriate ones. Do they model enthusiasm and excitement about the subject matter or merely tolerance for a dreary topic

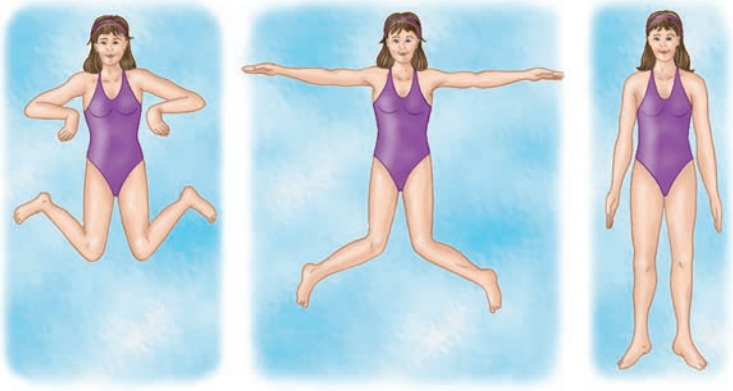
[41] K. L. Lane et al., 2011; D. L. Miller & Kelley, 1994.
[42] Krumboltz & Krumboltz, 1972.

the class must somehow muddle through? Do they model fairness to all students or favoritism to a small few? Do they expound on the virtues of innovation and creativity yet use the same curriculum materials year after year? Their actions often speak louder than their words.

Four conditions help students learn effectively from models:[43]

- **Attention.** Attention is critical for getting information into working memory (see Chapter 2). To learn effectively, then, students must pay attention to the model and especially to critical aspects of the modeled behavior.
- **Retention.** The learner must remember what the model does—in particular, by storing it in long-term memory. Students are more likely to remember information if they encode it in more than one way, perhaps as both a visual image and a verbal message (again see Chapter 2). For instance, teachers might describe what they're doing while they demonstrate a particular skill. They might also attach descriptive labels to complex behaviors that would otherwise be difficult to remember.[44] For example, when teaching swimming, an easy way to help students remember the sequence of arm positions in the elementary backstroke is to teach them the labels *chicken*, *airplane*, and *soldier* (see Figure 4.9).
- **Motor reproduction.** The learner must be physically capable of reproducing the behavior being demonstrated. When students lack this ability, motor reproduction obviously can't occur; for example, 6-year-olds who watch an adult throw a softball don't have the muscular coordination to mimic a good throw. It's often useful to have students imitate a desired behavior immediately after they see it, enabling their teacher to give individually tailored suggestions for improvement. Yet teachers must keep in mind that some students may prefer to practice new behaviors in private at first and to demonstrate what they've learned only after they've achieved some degree of competence.
- **Motivation.** Finally, the learner must be motivated to demonstrate the modeled behavior. The next principle can be helpful in enhancing learners' motivation to imitate productive behaviors.

Figure 4.9 Students can often more easily remember a complex behavior, such as the arm movements for the elementary backstroke, when those behaviors have verbal labels



[43] Bandura, 1986.

[44] Gerst, 1971; T. L. Rosenthal et al., 1972; Vintere et al., 2004.

Provide a variety of role models.

In addition to modeling desired behaviors themselves, teachers should expose students to other models whom students are likely to perceive as competent and prestigious. For example, teachers might invite respected professionals (e.g., police officers, nurses, journalists) to demonstrate skills within particular areas of expertise. They might also have students read about or observe positive role models in books, videos, and other media.

Furthermore, students can benefit from observing the final products of a model's efforts. Art students might gain useful strategies by studying the works of masters such as Vincent Van Gogh and Pablo Picasso, and music students can acquire new strategies by listening to skillful musicians with diverse musical styles. In one seventh-grade language arts class, students found examples of figurative writing in favorite books (see Figure 4.10), and such examples served as models for their own writing efforts.

Figure 4.10 Students in Barbara Dee's seventh-grade language arts class chose these models of effective figurative writing from books they were reading

"The blackness of the night came in, like snakes around the ankles."
—Caroline Cooney, *Wanted*, p. 176

"Flirtatious waves made passes at the primly pebbled beach."
—Lilian Jackson Braun, *The Cat Who Saw Stars*, p. 120

"Water boiled up white and frothy, like a milkshake."
—Lurlene McDaniel, *For Better, for Worse, Forever*, p. 60

"I try to swallow the snowball in my throat."
—Laurie Halse Anderson, *Speak*, p. 72

Recall that one of the characteristics of effective models listed earlier is *behavior relevant to one's own situation*. Students are more likely to perceive a model's behaviors as relevant to their own circumstances if the model is similar to them in some obvious way—for example, they may be of a similar age, have similar physical characteristics (e.g., similar height, skin color), or have a similar background (e.g., from the same neighborhood). As an example, 4-foot-tall third-graders are more likely to believe that they can imitate the basketball moves of one of their classmates than of their 6-foot-tall physical education teacher who is 30 years old. Similarly, students with disabilities may believe they're incapable of accomplishing the things a nondisabled teacher demonstrates. So it's important that teachers present students with models that have a variety of characteristics, backgrounds, and disabilities. Such models can give students cause for optimism that they, too, can achieve lofty goals.[45]

Shape complex behaviors gradually over time.

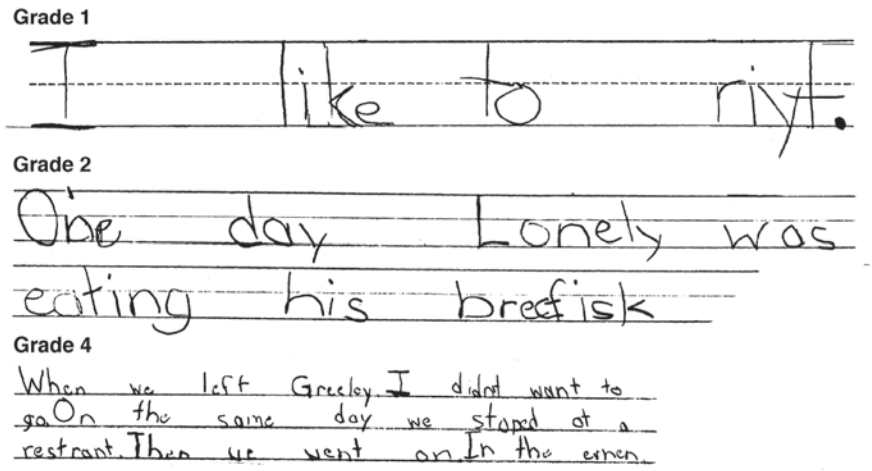
When dramatic changes are necessary, it's unreasonable to expect students to make them overnight. In such a situation, a process known as **shaping** can be effective. To shape a desired behavior, a teacher takes the following steps:

1. First reinforce any response that in some way resembles the desired behavior.
2. Then reinforce a response that more closely approximates the desired behavior (while no longer reinforcing the previously reinforced response).
3. Then reinforce a response that resembles the desired behavior even more closely.
4. Continue reinforcing closer and closer approximations to the desired behavior.
5. Finally, reinforce only the desired behavior.

Each response in the sequence is reinforced every time it occurs until the student exhibits it regularly; only at that point does the teacher increase the expectation for performance. For example, imagine that a student, Miranda, can't seem to sit still long enough to get much of anything done. Her teacher would ultimately like her to sit still for 20-minute periods. However, the teacher may first have to reinforce her for staying in her seat for just 2 minutes. As Miranda makes progress, her teacher can gradually increase the sitting time required for reinforcement.

[45] Evans-Winters & Ivie, 2009; Kincheloe, 2009; Powers et al., 1995.

Figure 4.11 As Jeff moved through the elementary grades, gradual changes in his writing paper required him to write smaller and, eventually, with only a single line to guide him



Teachers can often use shaping to help students acquire complex physical and psychomotor skills. As an example, in the early elementary grades teachers gradually shape students' handwriting skills—for instance, expecting increasingly small and well-shaped letters (see Figure 4.11). And in secondary schools, physical education teachers and coaches teach and expect increasingly proficient athletic skills.[46]

In much the same way, teachers can (and often do) gradually shape students' ability to work independently on assignments. They begin by giving first-graders structured tasks that may take only 5 to 10 minutes to complete. As students move through the elementary school years, their teachers expect them to work independently for longer periods and give them increasingly complex assignments to do at home. By the time students reach high school, they have extended study halls and complete lengthy tasks on their own after school hours. In the college years, student assignments require a great deal of independence and self-direction.

4.2 Social Interaction as Context

Big Idea 4.2 **Learners co-construct their knowledge with others.**

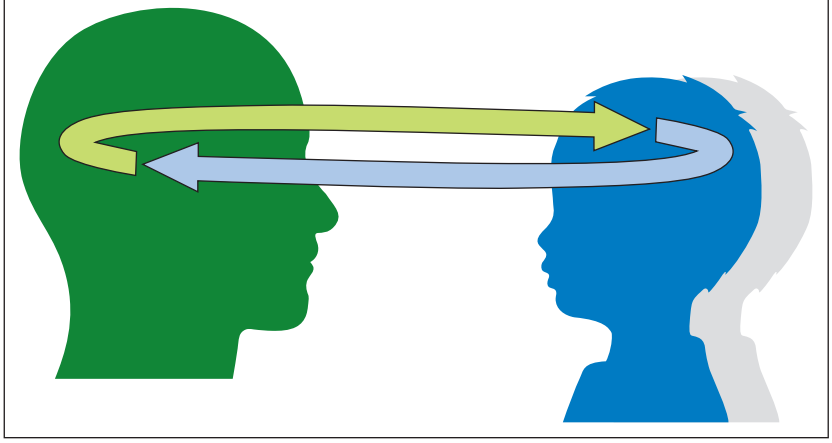
Other People Affect Students' Learning

In the preceding section, we discussed things that other people might do *to* or *for* a learner, including providing consequences and modeling behavior. Yet contemporary contextual theories alert us to the fact that many effective learning contexts involve ongoing *interaction* among two or more individuals (see Figure 4.12). For example, **social constructivism** is a theoretical perspective that focuses on how learners construct their knowledge through their interactions with another person or a group of people. Similarly, **sociocultural theory** is a theoretical perspective that emphasizes the importance of society and culture in promoting learning and development.[47] The principles in this section reflect some of the ideas within these theories.

[46] Harrison & Pyles, 2013; Stokes et al., 2010.

[47] Prominent sociocultural theorists include Mary Gauvain, Jean Lave, Barbara Rogoff, and Lev Vygotsky.

Figure 4.12 Learning can occur when two or more people interact



Learners sometimes co-construct new understandings with more experienced individuals.

Adults and other, more experienced individuals often help children and adolescents make sense of the world through joint discussion and *co-construction of meaning* regarding a phenomenon or event they are experiencing or have recently experienced together.[48] Such an interaction, sometimes called a **mediated learning experience**, encourages a young learner to think about the phenomenon or event in particular ways: to attach labels to it, recognize concepts and principles that underlie it, draw certain inferences and conclusions from it, and so on.

As an example, consider the following exchange, in which a 5-year-old boy and his mother are talking about a prehistoric animal exhibit at a natural history museum:

> ***Boy:*** Cool. Wow, look. Look giant teeth. Mom, look at his giant teeth.
>
> ***Mom:*** He looks like a saber tooth. Do you think he eats meat or plants?
>
> ***Boy:*** Mom, look at his giant little tooth, look at his teeth in his mouth, so big.
>
> ***Mom:*** He looks like a saber tooth, doesn't he? Do you think he eats plants or meat?
>
> ***Boy:*** Ouch, ouch, ouch, ouch. (referring to sharp tooth)
>
> ***Mom:*** Do you think he eats plants or meat?
>
> ***Boy:*** Meat.
>
> ***Mom:*** How come?
>
> ***Boy:*** Because he has sharp teeth. (growling noises)[49]

Even without his mother's assistance, the boy would probably learn something about the characteristics of saber-toothed tigers from his museum visit. Yet his mom helps him make better sense of the experience than he might have done on his own—for instance, by using the label *saber tooth* and helping him connect tooth characteristics to eating preferences. Notice how persistent his mom is in asking him to make the tooth–food connection. She continues to ask her question about meat versus plants until he finally infers, correctly, that saber-toothed tigers must have been meat eaters.

When children talk with parents, teachers, and other adults about past and present experiences, their memory for those experiences is better as a result.[50] Furthermore,

[48] Costa, 2008; Feuerstein et al., 2010; John-Steiner & Mahn, 1996; P. K. Murphy et al., 2011.
[49] Ash, 2002, p. 378.
[50] Haden et al., 2001; Hemphill & Snow, 1996; K. Nelson, 1993; Tessler & Nelson, 1994.

through such discussions, children gradually incorporate into their own thinking the ways in which the people around them talk about and interpret the world.[51]

Learners co-construct knowledge and understandings with peers.

Learners often talk with one another to help them make better sense of their experiences—for instance, by exploring, discussing, explaining, and debating certain topics in study groups or classroom discussions. When learners work together in such a manner, they are, in essence, engaging in **distributed cognition**: They spread the learning task across many minds and can draw on multiple knowledge bases and ideas.[52] In Chapter 2, we noted that distributed cognition occurs when students shift the cognitive load elsewhere, such as to physical objects (e.g., paper, app, calculator). Here, we see that the cognitive load can also be shared with others in order to facilitate thinking and problem solving. There's certainly some truth to the adage "Two heads are better than one."

As an example of distributed cognition, let's look in on Ms. Lombard's fourth-grade class, which has been studying fractions. The students have learned how to add and subtract fractions but have not yet studied how to divide by fractions. Nevertheless, they're working in small groups to tackle the following problem, which requires dividing 20 by ¾.[53]

> Mom makes small apple tarts, using three-quarters of an apple for each small tart. She has 20 apples. How many small apple tarts can she make?[54]

One group has already agreed that Mom can use three-fourths of each apple to make 20 tarts, with one-fourth of each apple being left to make additional tarts.

> ***Liz:*** So you've got 20 quarters *left*.
>
> ***Jeanette:*** Yes, . . . and 20 quarters is equal to five apples, . . . so five apples divided by—
>
> ***Liz:*** Six, seven, eight.
>
> ***Jeanette:*** But three-quarters equals three.
>
> ***Kerri:*** But she can't make only three apple tarts!
>
> ***Jeanette:*** No, you've still got 20.
>
> ***Liz:*** But you've got 20 quarters, if you've got 20 quarters you might be right.
>
> ***Jeanette:*** I'll show you.
>
> ***Liz:*** No, I've drawn them all here.
>
> ***Kerri:*** How many quarters have you got? Twenty?
>
> ***Liz:*** Yes, one quarter makes five apples and out of five apples she can make five tarts, which will make that 25 tarts, and then she will have, wait, one, two, three, four, five quarters, she'll have one, two, three, four, five quarters. . . .[55]

Eventually, the group arrives at the correct answer: Mom can make 26 tarts and will have half an apple left over.

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[51] Liben & Myers, 2007; Markus & Hamedani, 2007; K. Nelson, 1996; Vygotsky, 1962, 1978.

[52] Fonseca & Chi, 2011; Hewitt & Scardamalia, 1998; Palincsar & Herrenkohl, 1999; Salomon, 1993; Wiley & Bailey, 2006.

[53] In case your memory of how to divide by a fraction is rusty, you can approach the problem $20 \div \frac{3}{4}$ by inverting the fraction and multiplying, like so: $20 \times \frac{4}{3} = \frac{80}{3} = 26\frac{2}{3}$. In the problem Ms. Lombard presents, Mom can make 26 tarts and have enough apple to make two-thirds of another tart. If Mom has two-thirds of the three-fourths of an apple she needs to make another whole tart, then she has half an apple left over ($\frac{2}{3} \times \frac{3}{4} = 2\frac{1}{2}$).

[54] J. Hiebert et al., 1997, p. 118.

[55] J. Hiebert et al., 1997, p. 121.

When learners share their ideas and perspectives with one another, they can enhance their understanding of a topic in numerous ways:

- They must clarify and organize their thoughts well enough to explain and justify them to others.
- They tend to elaborate on what they've learned—for example, by drawing inferences, generating hypotheses, and formulating new questions.
- They're exposed to the views of others, who may have more accurate understandings or culturally different—yet equally valid—perspectives.
- They may discover flaws and inconsistencies in their own thinking.
- They can model effective ways of thinking about and studying academic subject matter for one another.
- They gain practice in the argumentation skills that experts in various disciplines use to advance the frontiers of knowledge—for instance, presenting evidence in support of conclusions and examining the strengths and weaknesses of various explanations.
- In the process of debating controversial material, they may gain a more sophisticated view of the nature of knowledge and learning. For example, they may begin to realize that (1) acquiring "knowledge" involves acquiring an integrated set of ideas about a topic and (2) such knowledge is likely to evolve only gradually over time (this point should remind you of the discussion of *epistemic beliefs* in Chapter 3).[56]

It's important to keep in mind, too, that as our 21st-century world becomes more and more complex—with research and knowledge about various topics expanding at a mind-boggling rate—such collaborative sense-making efforts are increasingly becoming the norm rather than the exception in the adult world.

Joint meaning making with peers doesn't necessarily have to occur in a single learning session, however. Social construction of meaning may proceed gradually over the course of several days or weeks or even longer. For example, teenagers who share an interest in coding may communicate regularly in order to help one another acquire sophisticated computer programming skills.[57] And if we look at human beings' interpretations of their experiences on a much grander scale, the evolution of such diverse academic disciplines as mathematics, science, history, and psychology reflects co-construction of knowledge and understandings stretched out over the course of many decades or centuries.

Other people sometimes provide the support learners need to take on challenging new tasks.

The world presents many complex, challenging tasks that young learners can't tackle on their own, especially at first. Often, however, learners *can* tackle these tasks when others guide and support them in some way; that is, when others provide scaffolding.[58] **Scaffolding** is a support mechanism that helps a learner successfully perform a challenging task. For example, a parent or teacher might provide helpful *hints* on how to fix the code in a computer program; divide a multifaceted physics problem into several smaller, more accomplishable ones; or make physical changes to a basketball court by lowering the basketball hoop to a level more appropriate for a child's height (see Figure 4.13). Also, when learners collaborate in a group activity, they often provide scaffolding for one

Figure 4.13 Scaffolding can take the form of altering the learner's environment or providing physical cues. Here, scaffolding is provided by lowering the height of the basketball hoop and drawing a blue circle on the pavement to help a 6-year-old practice layup shots; the circle indicates the spot from which the boy should jump and shoot.

[56] Andriessen, 2006; Bendixen & Rule, 2004; Chinn, 2006; Hatano & Inagaki, 2003; K. Hogan et al., 2000; D. W. Johnson & Johnson, 2009; A. King, 1999; Kuhn, 2015; Kuhn & Crowell, 2011; E. M. Nussbaum, 2008; Reznitskaya & Gregory, 2013; Schwarz et al., 2000; Sinatra & Pintrich, 2003; N. M. Webb & Palincsar, 1996; Wentzel & Watkins, 2011.

[57] Barron, 2006.

[58] The classic reference for this concept is D. Wood et al., 1976.

another by divvying up various aspects of the activity and giving one another suggestions and guidance based on their individual talents and areas of expertise. We explore the concept of scaffolding in greater depth in the discussion of cognitive development in Chapter 6.

Teaching Strategies: Providing Opportunities for Students to Learn from Others

The following are strategies for creating environments in which students can learn from their peers and others.

Encourage student dialogue and collaboration.

We've previously identified many advantages to having learners talk with one another about classroom topics. Accordingly, many theorists recommend that group discussions should be a regular feature of classroom instruction. For example, in a lesson on Nathaniel Hawthorne's *The Scarlet Letter*, high school English teacher Sue Southam wants students to construct an understanding of the character Arthur Dimmesdale. She reads a description of Dimmesdale in the novel and says:

> Jot down some of the important characteristics of that description. What's the diction that strikes you as being essential to understanding Dimmesdale's character? How do you see him? If you were going to draw a portrait of him, what would you make sure he had? . . . Just write some things, or draw a picture if you'd like.

Ms. Southam walks around the room, monitoring what students are doing until they appear to have finished writing. She then initiates a class discussion of Dimmesdale's nature:

> ***Ms. Southam:*** What pictures do you have in your minds of this man . . . if you were directing a film of *The Scarlet Letter*?
>
> ***Mike:*** I don't have a person in mind, just characteristics. About five-foot-ten, short, well-groomed hair, well dressed. He looks really nervous and inexperienced. Guilty look on his face. Always nervous, shaking a lot.
>
> ***Ms. Southam:*** He's got a guilty look on his face. His lips always trembling, always shaking.
>
> ***Mike:*** He's very unsure about himself.
>
> ***Matt:*** Sweating really bad. Always going like this. (He shows how Dimmesdale might be wiping his forehead.) He does . . . he has his hanky. . . .
>
> ***Ms. Southam:*** Actually, we don't see him mopping his brow, but we do see him doing what? What's the action? Do you remember? If you go to the text, he's holding his hand over his heart, as though he's somehow suffering some pain.
>
> ***Another student:*** Wire-framed glasses. . . . I don't know why. He's like. . . .
>
> ***Mike:*** He's kind of like a nerd-type guy. . . . Short pants. . . .
>
> ***Ms. Southam:*** But at the same time . . . I don't know if it was somebody in this class or somebody in another class . . . he said, "Well, she was sure *worth* it." Worth risking your immortal soul for, you know? . . . Obviously she's sinned, but so has he, right? And if she was worth it, don't we also have to see him as somehow having been worthy of her risking *her* soul for this?

In the lesson just presented, the teacher is actively involved in facilitating student discussion. Yet students can also co-construct understandings without teacher assistance, as we saw earlier in a small-group discussion of a math problem involving apple tarts.

With or without teacher assistance, classroom dialogues can help students master classroom subject matter, perhaps by helping them acquire more sophisticated interpretations of literature or a greater conceptual understanding of what it means to divide by a fraction.[59] Classroom dialogues have an important benefit for teachers as well: By carefully monitoring students' comments and questions, teachers can identify and address any misconceptions that might interfere with students' ability to acquire new knowledge and skills.

Use computer technology to support both within-class and across-class communication.

Computer technology can certainly enhance students' communication and collaboration within a single classroom. For example, course management systems such as Google Classroom and Moodle provide discussion and chat features through which students can interact at school and elsewhere. And thanks to the Internet, individual students or entire classes can also communicate and collaborate with students or classes in other locations—even in other nations (e.g., see www.iearn.org). In Chapter 8, we discuss some of these approaches to instruction in which students communicate and collaborate via computer technologies.

Create a community of learners.

Imagine a class that's studying the theme *changing populations*. Students are divided into small groups to study one of five different subtopics: *extinct*, *endangered*, *artificial*, *assisted*, and *urbanized*. Each group conducts research and prepares teaching materials related to its subtopic. The class then reassembles into new groups that include at least one representative from each of the previous groups. Within these new groups, students teach one another what they've learned.[60]

The scenario just described illustrates one way in which teachers can encourage student dialogue and thereby facilitate co-construction of meaning. In particular, the scenario is an example of a **community of learners**, a class in which teachers and students collaborate to build a body of knowledge and help one another learn about it.[61] Following are other characteristics of a typical community of learners:

- All students are active participants in class activities.
- The primary goal is to acquire a body of knowledge on a specific topic, with students contributing to and building on one another's efforts.
- Students draw on many resources—textbooks, the school library, the Internet, and one another—in their efforts to learn about the topic.
- Discussion and collaboration among two or more students are common occurrences and play a key role in learning.
- Diversity in students' interests and rates of progress is expected and respected.
- Students and teacher coordinate their efforts in helping one another learn; no one has exclusive responsibility for teaching others.
- Everyone is a potential resource for others; different individuals are likely to serve as resources on different occasions, depending on the topics and tasks at hand.

[59] E. H. Hiebert & Raphael, 1996; J. Hiebert et al., 1997; Lampert et al., 1996; P. K. Murphy et al., 2009; Schank & Abelson, 1995; C. L. Smith, 2007; Walshaw & Anthony, 2008.

[60] A. L. Brown & Campione, 1994; this approach, in which students learn about various topics in small groups and then teach what they've learned to a few peers in a second round of small groups, is known as a *jigsaw technique*.

[61] Bielaczyc & Collins, 2006; A. L. Brown & Campione, 1994; Campione et al., 1995; A. Collins, 2006; Engle, 2006; Rogoff et al., 1996.

In some cases, individual students focus on particular topics and become local experts on them. Occasionally people outside the classroom share their expertise as well.

- The teacher provides some guidance and direction for activities, but students also offer guidance and direction.
- Mechanisms are in place through which students can share what they've learned with others; students regularly critique one another's work.
- The process of learning is emphasized as much as, and sometimes more than, the finished product.

Online activities can also be used to promote a community of learners.[62] In online environments such as Google Docs, students can create a variety of documents—perhaps brief notes, lengthy reports, problem solutions, diagrams, or short stories—and post their work as online files that their classmates can read, react to, and possibly modify or build on. *Wikis*—websites on which teachers and students can add to, edit, or rearrange material previously contributed by other members—can also be used for this purpose (popular wiki-creation websites include pbworks.com, wikisineducation.wikifoundry-mobile.com, and wikispaces.com). Students can also interact in an ongoing online chat room or forum in which they present questions or issues to which their classmates respond. For example, students might jointly wrestle with the fact that heat melts some solids but burns others, or they might critique various theories about how human beings first migrated to and then spread throughout North and South America.[63]

A class organized as a community of learners tends to be highly motivating for students and can promote fairly complex thinking processes for extended time periods.[64] It can also give students a sense of the strategies scientists and other scholars use to advance the frontiers of knowledge: conducting individual and collaborative research, sharing ideas, building on one another's findings, and the like. A community of learners can also foster productive peer relationships and create a *sense of community* in the classroom—a sense that teachers and students have shared goals, are mutually respectful and supportive of one another's efforts, and believe that everyone makes an important contribution to classroom learning.

A community of learners can be especially worthwhile when a classroom includes students from diverse cultural and socioeconomic backgrounds.[65] Such a community values the contributions of all students and draws on everyone's individual backgrounds, cultural perspectives, and unique abilities to enhance the overall performance of the class. It also provides a context in which students can form friendships across the lines of ethnicity, gender, socioeconomic status, and disability.

However, you should also keep in mind some potential weaknesses of communities of learners, as well as of group discussions in general.[66] Some students may dominate interactions, and others—such as recent immigrants who have limited proficiency in English—may participate little or not at all. Furthermore, what students learn is inevitably limited to the knowledge they personally acquire and share with one another, and students may occasionally pass along their biases, misconceptions, and ineffective strategies. Obviously, then, when teachers conduct classroom discussions or structure classrooms as communities of learners, they must carefully monitor student conversations to make sure that students ultimately acquire *accurate* understandings of the topics they're studying.

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[62] Bereiter & Scardamalia, 2006; Scardamalia & Bereiter, 2006; G. Stahl et al., 2006; J. Zhang et al., 2009.
[63] Hewitt et al., 1995; Hewitt & Scardamalia, 1998.
[64] A. L. Brown & Campione, 1994; Engle, 2006; Engle & Conant, 2002; Rogoff, 1994; Scardamalia & Bereiter, 2006; Turkanis, 2001.
[65] Kincheloe, 2009; Ladson-Billings, 1995b; Rothstein-Fisch & Trumbull, 2008.
[66] A. L. Brown & Campione, 1994; Hynd, 1998; E. R. Smith & Conrey, 2009; Walshaw & Anthony, 2008; T. White & Pea, 2011.

4.3 Culture and Society as Contexts

Big Idea 4.3 **The cultural and societal contexts in which learners grow up also influence their behaviors and cognitive processes.**

Culture as Context

Almost any long-standing social group develops some sort of **culture**, which includes both behaviors and beliefs that are passed from old members to new ones, from generation to generation. Through its culture, a human social group ensures that each new generation acquires and benefits from the wisdom that preceding generations have accumulated. By passing along this collective knowledge base, a cultural group increases the chances that it will survive and thrive over the long run.

Culture is a pervasive part of any learning environment—it permeates people's social interactions, as well as the books, toys, websites, and other human-made objects and media that people encounter. But culture is an inside-the-head thing as well as an out-there-in-the-world thing, in that it provides an overall framework by which people determine what things are normal and abnormal, true and not true, rational and irrational, good and bad (see Figure 4.14).[67] A learner's cultural background influences the perspectives and values the learner acquires, the skills the learner masters and finds important, and the long-term goals toward which the learner strives. For example, in the opening case study, Jack stayed home from school for several days so that he could help out with spring planting activities. Such a cooperative, *everyone-pitches-in* attitude would be essential for any family whose livelihood depends on a good harvest.

Figure 4.14 As an assignment for his Spanish class, 14-year-old Bernie created a burlap-and-yarn eagle inspired by Mexican designs. But the true essence of a cultural group isn't found in its art, music, clothing, holiday celebrations, and other observable customs. Rather, it comprises the assumptions, beliefs, and values that underlie its members' behaviors and interpretations of the world, as revealed in excerpts from 13-year-old Melinda's essay about Shinto gods.

Shinto gods are called Kami. It is believed that these spirits are found in the basic forces of fire, wind, and water. Most influence agriculture and this of course was how the earliest people survived. They relied on what they grew to live. So the gods had to help them grow their crops or they died. It seems natural for people to worship things that will help them survive, and worshiping forces that affect what you grow was the common practice in early history. These basic forces even affect the survival of modern people. We all still need agriculture to live and forces of nature really determine whether crops grow or not.

Shintoists never developed strong doctrines, such as the belief in life after death that many other religions have. However they have developed some moral standards such as devotion, sincerity, and purity. . . .

All Shintoists have a very good and simple set of rules or practice. They want to be honorable, have feelings for others, support the government, and keep their families safe and healthy. I think these are good principles for all people, whether they practice a religion or not. . . .

[67] M. Cole, 2006; Goodnow, 2010; Kağitçibaşi, 2007.

Cultures aren't static entities. Instead, they continue to change over time as they incorporate new ideas, practices, and ways of thinking, and especially as they come into contact with other cultural groups.[68] Furthermore, considerable variation exists in people's beliefs and behaviors within a particular culture, in that individual members may adopt some cultural values and practices but reject others.[69]

Sometimes the word *culture* is used to refer to behaviors and beliefs that are widely shared over a large geographic area. As an example, *mainstream Western culture* encompasses behaviors, beliefs, and values shared by many people in North American and western European societies. Among other things, members of this culture generally value self-reliance, democratic decision making, and academic achievement.[70] Other cultures are more local and self-contained. For instance, a culture might be specific to a particular island in the South Pacific. Still others may be *subcultures* that reside within but are in some ways different from a more widespread and dominant culture.

Although countries in North America and western Europe share a common mainstream culture, most also have many distinct cultural groups within them. For example, the United States is a nation comprised largely of immigrants and their descendants; only Native Americans lived on U.S. soil before the 1500s. People with a heritage from a particular country or region often form an **ethnic group**—a group of individuals with a common culture and the following characteristics:[71]

- Its roots either precede the creation of or are external to the country in which it currently resides. For example, it may be composed of people of the same race, national origin, or religious background.
- Its members share a sense of interdependence—a sense that their lives are intertwined.

However, we can't determine people's ethnicity strictly based on physical characteristics (e.g., race) or birthplace. For instance, one of us authors has a daughter who was born in Colombia and has Hispanic and Native American biological ancestors, but because she was raised by two European American parents, ethnically she is more European American than anything else. In general, we can get the best sense of students' cultural backgrounds and ethnic group memberships by learning the extent to which they have participated and continue to participate in various cultural and ethnic-group activities.[72] Furthermore, some individuals participate actively in two or more cultures or ethnic groups, perhaps because their parents came from distinctly different racial or ethnic backgrounds or perhaps because they encounter new perspectives and ways of doing things as they move from one community or country to another.[73]

Any cultural group encourages and models certain behaviors and actively discourages certain other behaviors.

Most members of a cultural group work hard to help growing children adopt the behaviors and beliefs that the group holds dear. Beginning early in life, children learn that there are some things they can or should do and other things they definitely should *not* do. They also acquire a cultural "lens" for viewing social situations and tasks. This process of molding behavior and beliefs so that children fit in with their cultural group is called **socialization**.

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[68] Kitayama et al., 2007; Legare, 2019; Oyserman & Lee, 2008; Rogoff, 2003.
[69] A. B. Cohen, 2009; Goodnow, 2010; Matute-Bianchi, 2008.
[70] Hollins, 1996; Tamis-Lemonda & McFadden, 2010.
[71] NCSS Task Force on Ethnic Studies Curriculum Guidelines, 1992.
[72] Gutiérrez & Rogoff, 2003.
[73] A. M. Lopez, 2003; Mohan, 2009; Root, 1999.

Sometimes adults' socialization efforts are obvious. For instance, when an adult tells Jenna, "It's not nice to hit other children," and puts Jenna in a time-out situation for her aggressive behavior, the message is crystal clear. At other times socialization is more subtle. For example, adults communicate cultural values and beliefs by encouraging and modeling certain activities ("Let's give some of our clothes and toys to the homeless shelter") and discouraging others ("Stay away from that neighborhood; there are drug dealers on every corner"). In the opening case study, note the subtle, teasing approach Jack's mother used to convey the importance of school: "Now maybe school will look easy!"

Children typically learn their earliest lessons about their culture's standards and expectations from parents and other family members, who teach them such things as personal hygiene and rudimentary interpersonal skills (e.g., saying "please" and "thank you"). Yet once children begin school, teachers become equally important socialization agents.[74] For instance, many first-grade teachers ask their students to sit quietly rather than interrupt when an adult is speaking, middle school teachers engage students in cooperative learning activities, and high school teachers expect students to turn in homework assignments on time. In doing such things, these teachers communicate important cultural beliefs: that children should defer to and show respect for adults, that cooperation with peers can enhance learning and productivity, and that punctuality is essential for succeeding in life.

To the extent that a society includes a variety of cultures and ethnic groups, different families socialize different behaviors and ways of looking at the world, as demonstrated in the following examples. As you read them, be careful not to form hard-and-fast stereotypes about any of the groups mentioned here because considerable variation exists in the beliefs and behaviors found within a single cultural group.[75]

- **Individual versus cooperative efforts.** In a traditional classroom in mainstream Western culture, learning is often a solitary, individual endeavor: Students receive praise, colorful stickers, or good grades when they personally perform at high levels. Sometimes teachers add a competitive element to personal achievement; for instance, they may grade exams "on a curve" or post "best" papers on the bulletin board. Yet many African, East Asian, Mexican American, Native American, and Pacific Islander cultural groups value *group* achievement over individual success. Students from such cultures are often more accustomed to working cooperatively and for the benefit of the community, rather than for themselves.[76] The Zulu word *ubuntu*, reflecting the belief that people attain their "humanness" largely through relationships with others and have a responsibility to work for the common good, epitomizes this cooperative spirit.[77]
- **Eye contact.** In many African American, Mexican American, Native American, and Puerto Rican communities, a child who looks an adult in the eye is showing disrespect.[78] In these communities, children are taught to look *down* in the presence

[74] Helton & Oakland, 1977; Hess & Holloway, 1984; Wentzel & Looney, 2007.

[75] Markus and Hamedani (2007) point out that it's easier to use a label such as "East Asians" than to say "people participating in the ideas and practices that are pervasive in East Asian cultural contexts" (p. 11). If we're not careful, however, such simple labels can lead us to inaccurately overgeneralize about people from any geographic location or cultural background.

[76] X. Chen & Wang, 2010; Mejía-Arauz et al., 2007; Paradise & Robles, 2016; Tyler et al., 2008; Varnum et al., 2010.

[77] On a professional trip to South Africa in 2005, one of us authors was struck by how often the word *ubuntu* was used in daily conversation.

[78] Jiang, 2010; McCarthy et al., 2006; Tyler et al., 2008.

of adults. However, in other cultures, looking someone in the eye is a way to show that you're trying to communicate or listen to what the person is saying.

- **Personal space.** People in some cultures (e.g., African American and Hispanic communities) stand close together when they talk, and they may touch one another frequently.[79] In contrast, European Americans and Japanese Americans tend to keep a fair distance from one another—they maintain some *personal space*—especially if they don't know one another very well.[80]
- **Public versus private performance.** Learning is a public enterprise in many classrooms: Individual students are often expected to answer questions or demonstrate skills in full view of their classmates, and they're encouraged to ask questions themselves when they don't understand. Such practices, which many teachers take for granted, may confuse or even alienate students of some ethnic groups.[81] For example, many Native American children are accustomed to practicing a skill privately at first, performing in front of a group only after they've attained a reasonable level of mastery.[82] And children in some Native American and Hawaiian communities may feel more comfortable responding to an adult's questions as a group rather than interacting with an adult one-on-one.[83]
- **Family relationships and expectations.** In some groups—for example, in many Arab American, Asian, Hispanic, and Native American groups (as well as in some rural European American communities)—family bonds and relationships are especially important, and extended family members often live nearby. Children growing up in these cultural groups are likely to feel responsibility for their family's well-being, to have a strong sense of loyalty to other family members, and to go to great lengths to please their elders. It isn't unusual for students in such cultures to leave school when their help is needed at home, as Jack does in the opening case study.[84] And although school achievement is highly valued and parents encourage their children to do well in school in most cultures, some cultural groups place even higher priority on other accomplishments.[85] For example, when preparing young children for school, many Hispanic families place particular emphasis on instilling appropriate social behaviors—for instance, showing respect for adults and cooperating with peers.[86]
- **Conceptions of time.** Many people regulate their lives by the clock: Being on time to appointments, social engagements, and the dinner table is important. This emphasis on punctuality isn't characteristic of all cultures, however. For example, many Native American cultures and some Hispanic cultures don't observe strict schedules and timelines.[87] Not surprisingly, children from these cultural backgrounds may sometimes be late for school and may have trouble understanding the need to complete school tasks within a certain time frame.

[79] Slonim, 1991; Trawick-Smith, 2003; Ward et al., 2001.
[80] Irujo, 1988; Trawick-Smith, 2003.
[81] Eriks-Brophy & Crago, 1994; Garcia, 1994; Lomawaima, 1995; Tyler et al., 2008.
[82] Castagno & Brayboy, 2008; Suina & Smolkin, 1994.
[83] K. H. Au, 1980; L. S. Miller, 1995.
[84] Banks & Banks, 1995; Deyhle & LeCompte, 1999; Fuligni, 1998; Kağitçibaşi, 2007; McIntyre, 2010; Tyler et al., 2008.
[85] Monzó, 2010; Pearce, 2006; Pinquart & Ebeling, 2020; Spera, 2005.
[86] Greenfield et al., 2006; Tyler et al., 2008.
[87] Tyler et al., 2008; Ward et al., 2001.

Every culture passes along many cognitive tools that enhance learners' thinking capabilities.

We see obvious effects of culture in many of children's everyday activities; for example, in the books they read, the jokes they tell, the roles they enact in pretend play, and the extracurricular activities they pursue. Yet culture permeates children's thinking processes as well, for instance by providing a variety of **cognitive tools**—including concepts, symbols, and problem-solving strategies—that make the "raw data" of any complex situation more manageable and thus help children effectively deal with many of the tasks and problems they face.[88]

One of the most universal and basic cultural creations—language—provides many cognitive tools that shape growing children's thinking processes. For instance, preschoolers learn to categorize some people as "girls" and others as "boys," and they begin to associate certain behaviors with one sex or the other. Over time, the many words and concepts children acquire—for instance, *snow*, *yucky*, *birthday party*, *bully*—help them make sense of and respond to their physical and social experiences in generally adaptive ways.

Some cognitive tools are almost entirely mental and symbolic in nature. For example, members of most cultures use a systematic counting system (1, 2, 3. . .) and certain units of measurement (e.g., inches, kilograms) to help them organize and make sense of the various quantities—the *amounts* of things—they encounter in their environment. Other cognitive tools must, by nature, have both physical and symbolic components. For example, a student might use a *calendar* to keep track of upcoming due dates or draw a *line graph* to see if the average annual rainfall has increased or decreased over time. But it's important to remember that all these tools are *cultural creations*—hence they're part of the particular social and cultural contexts in which learners grow up—and so not all learners are familiar with them.

Every culture instills certain worldviews that color people's interpretations of events.

Recall that our definition of culture includes *beliefs* as well as behaviors. When people's beliefs are related to specific physical, biological, social, or mental phenomena, they're known as *theories* (see Chapter 2). In contrast, a **worldview** is a general set of beliefs and assumptions about reality—about "how things are and should be"—that influences learners' interpretations and understandings of a wide variety of phenomena.

The following exercise should enable you to reflect on some beliefs and assumptions that your own worldview might encompass.[89]

See For Yourself

Considering the Big Picture

For each of the following six general topics, choose the option that best matches your personal beliefs and assumptions.

1. Life and the universe came into being
   a. through random acts of nature.
   b. as part of a divine plan and purpose.

[88] Pea, 1993; Salomon, 1993; E. R. Smith & Conrey, 2009.

[89] M. Cole & Hatano, 2007; E. M. Evans, 2008; Furnham, 2003; Keil & Newman, 2008; Kelemen, 2004; Koltko-Rivera, 2004; Medin, 2005.

2. Objects in nature (rocks, trees, etc.)
   a. have some degree of consciousness.
   b. are incapable of conscious thought.
3. People are most likely to enhance their well-being by
   a. relying on scientific principles and logical reasoning processes.
   b. seeking guidance from authority figures.
4. The human world is
   a. fair and just—good deeds ultimately bring rewards, and misdeeds are eventually punished.
   b. not necessarily fair and just.
5. Human beings
   a. are at the mercy of the forces of nature.
   b. should strive to master the forces of nature.
   c. must learn to live in harmony with nature.
6. People's successes and failures in life are the result of
   a. their own actions.
   b. divine intervention.
   c. fate.
   d. random occurrences.

Have you ever explicitly thought about such issues before? Quite possibly you haven't. Worldviews are often such an integral part of everyday thinking that learners take them for granted and usually aren't consciously aware of them. To a considerable degree, the beliefs and assumptions they encompass are culturally transmitted, with different cultures communicating somewhat different beliefs and assumptions either explicitly through their words or implicitly through their actions.[90] As a result, worldviews are not always acquired consciously; thus, they reflect *implicit* rather than explicit learning. Nevertheless, they influence learners' interpretations of current events and classroom subject matter. For example, if students believe that the world and its inhabitants are guided and protected by an omniscient and benevolent Greater Being, they're not as likely to believe that global climate change is real or poses a significant threat to human society.[91] And if students' culture consistently emphasizes the importance of accepting and living in harmony with nature as it is, they might struggle with a science curriculum that explores how human beings might manipulate and gain control over natural events.[92]

Every culture has certain ways of doing things, and these, too, are passed from generation to generation.

Any cultural group passes along not only certain ways of interpreting the world but also certain ways of *doing things*. In other words, different cultures foster somewhat different kinds of *procedural knowledge* (see Chapter 2). Some procedural knowledge is task- or topic-specific and is conveyed directly and explicitly; for example, "Here's how to write a cursive *A*" and "Let me show you how to do long division." But cultures also pass along a good deal of procedural knowledge within the context of **communities of practice**—groups of people who share common interests and goals and regularly interact and coordinate their efforts in pursuit of those interests and goals.[93] Communities of practice tend

[90] Astuti et al., 2004; Berti et al., 2010; M. Cole & Hatano, 2007; Kitayama, 2002; Losh, 2003.
[91] Feinberg & Willer, 2011.
[92] Atran et al., 2005; Medin, 2005.
[93] Barab & Dodge, 2008; Lave, 1991; Nolen, 2011; R. K. Sawyer & Greeno, 2009; Wenger, 1998.

to adhere to certain standards for action and interaction, and these standards are often unwritten understandings rather than explicitly stated rules. For example, in the adult world of mainstream Western culture, people in various professions (e.g., medicine, law, education, scientific research) tend to communicate regularly with one another and to support one another in particular ways. In most cases, new members of a community of practice learn the acceptable ways of doing things primarily by actively participating in the group. Often a learner begins by participating only at the fringe of the group, perhaps by doing menial chores or by assisting or apprenticing with a more experienced group member. In other words, a novice is gradually introduced to the ways of the group through **legitimate peripheral participation**.[94] Participation is *legitimate* in the sense that the novice contributes in genuine, authentic ways to the group's overall effort. It's *peripheral* in that it involves only small tasks at the outer edge, or periphery, of the action. This type of participation in a community of practice is consistent with the ideas in *situated learning* and *situated cognition* because the learning occurs within an authentic context (see Chapter 2).

Communities of practice are hardly limited to adult professional groups. For example, volunteer organizations (e.g., the American Red Cross) and organized youth groups (e.g., Scouts, 4-H) are essentially communities of practice as well. Schools, too, are communities of practice, in that they have certain prescribed ways of doing things in order to accomplish particular goals (e.g., following schedules, completing assignments, meeting deadlines).

Inconsistencies between home and school cultures can interfere with school learning and performance.

For most children, expectations for behavior are different at school than at home. For instance, at home, some children may be accustomed to speaking whenever they have something to say, but at school, there are times when silence is golden. Or at home, children may be able to choose what they want to do and when to do it, but the school day typically involves a series of tasks that all children must complete at certain times. To the extent that behaviors expected at school differ from those allowed or expected at home, children may experience some confusion, or **culture shock**, when they begin school.

Culture shock is more intense for some children than for others. Most schools in North America and western Europe are based largely on mainstream Western culture, and so children with this cultural background often adjust easily to the school environment. But students who come from other cultural backgrounds, especially those with very different views about acceptable behavior, may initially find school a confusing and unsettling place. For example, recent immigrants in the United States may not know what to expect from other people in their new country or what behaviors other people expect of them. Children raised in a culture where gender roles are clearly differentiated—where males and females are socialized to behave very differently—may have difficulty adjusting to a school in which similar expectations are held for both sexes.[95] Any such **cultural mismatch** between home and school cultures can interfere with students' adjustment to the school setting and ultimately with their academic achievement as well.[96]

[94] Lave & Wenger, 1991.
[95] Kirschenbaum, 1989; Sirin & Ryce, 2010; Vasquez, 1988.
[96] Phalet et al., 2004; S. J. Schwartz et al., 2010; Tyler et al., 2008; Ward et al., 2001.

Often children from diverse cultural backgrounds try desperately to fit in at school yet find the inconsistencies between home and school hard to resolve. For instance, children from devout Muslim families frequently have trouble finding the time and place they need to pray during the school day, and they may have little energy for school activities during the month-long fasting period of Ramadan. And thoughtless classmates might ask Muslim girls who wear headscarves, "Are you bald? Is there something wrong with your hair?" or taunt them by calling them names.[97]

As students gain experience with the culture of their school, they become increasingly aware of their teachers' and peers' expectations for behavior and ways of thinking. Many eventually become adept at switching their cultural vantage point as they move from home to school and back again.[98] One Mexican American student's recollection provides an example:

> At home with my parents and grandparents the only acceptable language was Spanish; actually that's all they really understood. Everything was really Mexican, but at the same time they wanted me to speak good English. . . . But at school, I felt really different because everyone was American, including me. Then I would go home in the afternoon and be Mexican again.[99]

think about it
Can you think of ways in which your own school environment was mismatched with the culture in which you were raised?

But not all students make such an easy adjustment. Some actively resist adapting to the existing school culture, perhaps because they view it as being inconsistent with—even contradictory to—their own cultural background and identity.[100] And let's face it: Traditional classrooms don't always encourage behaviors that are in students' long-term best interests. For example, a classroom that encourages students to compete with one another for grades—rather than fostering the cooperation that many cultural groups value—may engender an unhealthy one-upmanship that interferes with congenial peer relationships both in and outside the classroom.

Society as Context

A concept related to culture, but also somewhat distinct from it, is **society**—a very large, enduring social group that is socially and economically organized and has collective institutions and activities. For instance, virtually any nation is a society, in that it has a government that regulates some of its activities, a set of laws that identify permissible and unacceptable behaviors, a monetary system that allows members to exchange goods and services, and so on.

A society influences its members' learning in a variety of ways, including through the resources it provides, the activities it supports, and the general messages it communicates. For example, a society's infrastructure—such as its roads, power plants, and telephone and cable lines—enables the movement of people and goods over great distances and regular collaboration among its residents. Various media (newspapers, television, the Internet, etc.) convey information, ideas, opinions, and messages (often subtle ones) about desired behaviors and group stereotypes. And, of course, schools provide formal structures through which children and adults alike acquire knowledge and skills that will presumably enhance their personal and professional success.

The next three principles reflect characteristics of societies that are especially relevant to learners' classroom performance and long-term social and professional success.

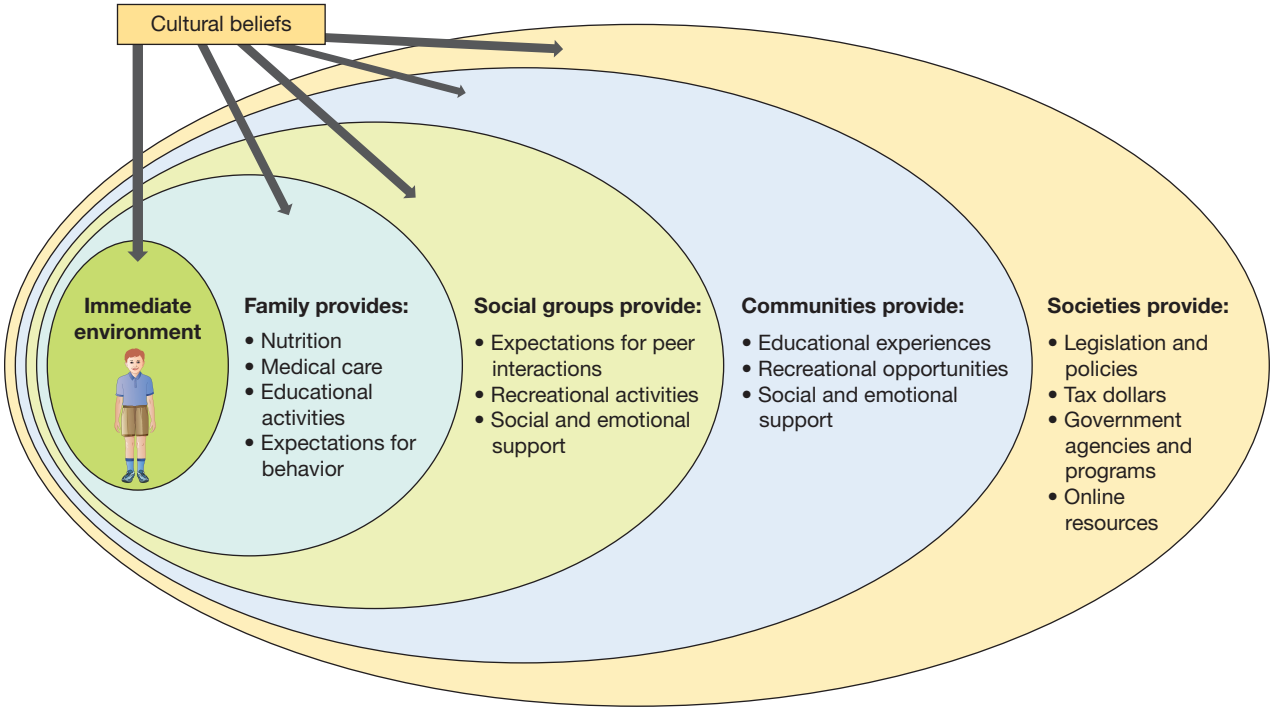
[97] Igoa, 1995; McBrien, 2005, p. 86; Sirin & Ryce, 2010.
[98] Y. Hong et al., 2000; LaFromboise et al., 1993; Phalet et al., 2004; Phelan et al., 1991.
[99] Padilla, 1994, p. 30.
[100] Cross et al., 1999; Kumar et al., 2002; Ogbu, 2008; S. J. Schwartz et al., 2010.

Any large society has multiple layers that all affect children's learning and development either directly or indirectly.

As explained in ecological systems theory, a key characteristic of any society is that it has small organized structures nested within other, larger ones (see Figure 4.15).[101] For many children, the most basic level is the *family*, which can potentially support learning in a number of ways—for example, by providing good nutrition and medical care, engaging children in stimulating educational activities, setting certain expectations for behavior, and providing social and emotional support. Surrounding the family is another layer, the *social groups* in which children learn how to interact with peers, engage in fun recreational activities (e.g., games, playing with toys), and receive social and emotional support. Another layer, the *community*, can offer educational experiences (e.g., school education, preschool and after-school programs, library and museum programs, local business internships), recreational opportunities (e.g., playgrounds, sports clubs), and social and emotional support (e.g., helpful neighbors, church and synagogue resources). At a still broader level, the *societies* (e.g., state, province, country) in which children reside influence children's development through legislation that governs school policy, tax dollars that flow back to local schools, agencies and professional groups that offer information and training in new teaching strategies, online resources, and so on. Permeating all of these layers are general *cultural beliefs* about how people should think and behave.

A society's various layers interact with one another and with children's existing characteristics as they influence children's development; in the process, they also *change* one another. For example, a temperamentally hyperactive child might initially elicit stringent disciplinary actions at school (within the communities layer), but concerned parents

Figure 4.15 Students' learning and development are affected by multiple layers



[101] Much of the discussion in this paragraph is based on Urie Bronfenbrenner's *ecological systems theory* and *bioecological model*; for instance, see Bronfenbrenner, 1989, 2005; Bronfenbrenner & Morris, 1998; C. D. Lee, 2010.

(within the family layer) might seek out teachers and suggest alternative strategies that effectively channel the child's behavior into productive activities. And government agencies (within the societies layer) might provide websites that help both parents and teachers better foster children's cognitive development. In general, societies are *dynamic systems* encompassing mutually influencing variables that are constantly in flux.[102]

In the United States, the **Individuals with Disabilities Education Act (IDEA)** provides an example of how national policy can indirectly affect learning.[103] This legislation guarantees that children with disabilities have access to appropriate interventions and services designed to enhance their physical and cognitive development. It also mandates that once these children reach school age, they must be educated in neighborhood schools with nondisabled peers to the fullest extent possible—a practice known as *inclusion*. Early intervention clearly *is* effective in enhancing the development of children with a wide variety of special educational needs.[104] Furthermore, many children with mild disabilities achieve at higher levels if they remain in general education classrooms rather than being segregated into "special" classes or schools—something that often happened prior to IDEA's initial enactment in 1975. Placement in general education classes is most successful when instructional materials and practices are tailored to students' specific educational needs and academic levels.[105]

Different members of a society have different specialties, and they call on one another's areas of expertise as needed.

In an earlier discussion of distributed cognition, we noted that people sometimes work together to tackle a challenging task, with each of them potentially contributing unique ideas and talents to the project. We can apply this notion of *distribution* on a much larger scale as well. In particular, a society is characterized by **distributed knowledge**: Different people have different areas of expertise, and so society members must rely on one another in order to maximize both their individual success and the success of the overall group. To be personally and professionally successful over the long run, then, children and adolescents must gain the knowledge and skills that will enable them to (1) seek out the expertise they may occasionally need to tackle difficult tasks and (2) distinguish between true experts, on the one hand, and individuals who only *claim* to be experts, on the other.[106] Identifying true experts can be especially difficult on the Internet, where anyone can claim anything without any verification.

In most situations, some society members have greater access to the society's resources than other members do.

In virtually any society, different people have access to different resources, and this differential access can have a significant impact on younger members' learning and long-term success. For example, some children, but not all, have a quiet place at home to study and parents who can help them with challenging homework assignments. Some, but not all, have a home computer that provides Internet access, word processing programs, and other tools that enhance classroom performance. Some, but not all, live near or can easily travel to public libraries, museums, and zoos.

One important factor affecting learners' access to resources is their **socioeconomic status (SES)**. This concept encompasses a number of variables, including family income,

[102] C. D. Lee, 2010; Thelen & Smith, 1998.

[103] This legislation was most recently reauthorized in 2004, at which point it was renamed the Individuals with Disabilities Education Improvement Act. However, most people still refer to it by its original name.

[104] J. M. Fletcher et al., 2007; Kağitçibaşi, 2007; Pelphrey & Carter, 2007.

[105] P. Hunt & Goetz, 1997; Scruggs & Mastropieri, 1994; Slavin, 1987; Soodak & McCarthy, 2006; Stainback & Stainback, 1992.

[106] Bromme et al., 2010.

parents' education levels, and parents' occupations—all of which either directly or indirectly influence a variety of factors, including the type of neighborhood a family lives in and the educational opportunities that are readily available.

Children's and adolescents' SES is correlated with their school performance: Higher-SES students tend to have higher academic achievement, and lower-SES students tend to be at greater risk for dropping out of school. As students from lower-SES families move through the grade levels, many of them fall further and further behind their higher-SES peers. When researchers find achievement differences among students from different ethnic groups, the differences in the students' SES, *not* their cultural differences per se, seem to be largely to blame.[107]

Children and adolescents from low-SES families are a diverse group. Some live in rural areas, others live in inner-city neighborhoods, and some live in modest apartments or homes in wealthy suburban towns. Regardless of where they live, some of these learners may face one or more of the following challenges:

- **Poor nutrition and health care.** Poor nutrition in early childhood is associated with poorer attention and memory and impaired learning ability. Poor nutrition can influence school achievement both directly—for instance, by hampering early brain development—and indirectly—for instance, by leaving children listless and inattentive in class. And inadequate health care means that some conditions that interfere with school attendance and performance, such as asthma and hearing problems, go unaddressed.[108]
- **Inadequate housing and frequent moves.** Many low-SES families live in tight quarters, perhaps sharing only one or two rooms with other family members. In old, poorly maintained apartment buildings, children may be exposed to lead in the dust from deteriorating paint, and such lead can cause brain damage. In addition, if children move frequently from one rental apartment to another, they must often change schools as well. In the process, they lose existing social support networks and may miss lessons on important academic skills.[109]
- **Unhealthy social environments.** On average, low-SES neighborhoods and communities have higher frequencies of violence and vandalism, greater prevalence of alcoholism and drug abuse, and greater numbers of antisocial peers. Furthermore, there are fewer productive outlets for leisure time—for instance, libraries, recreation centers, and sports leagues—and fewer positive adult role models. Such factors appear to be partly responsible for the lower academic achievement of students who live in poverty.[110]
- **Lower-quality schools.** Unfortunately, children who most need good schools are often least likely to have them. On average, schools in low-SES neighborhoods and communities tend to receive less funding and, as a result, are often poorly equipped and maintained. Teacher turnover rates are high. Furthermore, some teachers at these schools have low expectations for students, offer a less challenging curriculum, assign less homework, and provide fewer opportunities to develop advanced thinking skills than do teachers in wealthier school districts.[111]

[107] Byrnes, 2003; Farkas, 2008; N. E. Hill et al., 2003; J.-S. Lee & Bowen, 2006; McLoyd, 1998; Murdock, 2000; Rumberger, 2011; Sirin, 2005.

[108] Ashiabi & O'Neal, 2008; Benton, 2008; Berliner, 2005; Noble et al., 2005; Sigman & Whaley, 1998; R. A. Thompson & Nelson, 2001.

[109] Croninger & Valli, 2009; Dilworth & Moore, 2006; Gruman et al., 2008; Hattie, 2009; Hernandez et al., 2008; Hubbs-Tait et al., 2005; Mantzicopoulos & Knutson, 2000; P. M. Miller, 2011.

[110] Aikens & Barbarin, 2008; Duncan & Magnuson, 2005; Nettles et al., 2008; Tamis-Lemonda & McFadden, 2010; Yoshikawa et al., 2012.

[111] G. W. Evans, 2004; McLoyd, 1998; Pianta & Hamre, 2009; Raudenbush, 2009.

Children who face only one or two of these challenges often do quite well in school, but those who face most or all of them are at high risk for academic failure.[112] Especially when poverty is an ongoing way of life rather than a temporary situation, children may feel considerable emotional stress about their life circumstances[113] and, as you'll discover in Chapter 5, students learn and perform less effectively when they're highly anxious. Not all low-SES children live in chronically stressful conditions, of course, and those whose families provide consistent support, guidance, and discipline generally enjoy good mental health.[114]

Teaching Strategies: Considering Students' Broader Cultural and Societal Contexts

Although students' learning and classroom achievement are influenced by what goes on inside the classroom, they are also influenced by what goes on *outside* the classroom by students' cultural groups, neighborhoods, and so on. Our recommendations in this section take this fact into account.

Remember that membership in a particular cultural or ethnic group is not an either–or situation but, instead, a more-or-less phenomenon.

As noted earlier in the chapter, individuals vary considerably in how much they *participate* in various cultural and ethnic-group activities. The extent of their participation inevitably affects the strengths of their culture-specific behaviors and beliefs. For example, some Mexican American students live in small, close-knit communities where Spanish is spoken and traditional Mexican practices and beliefs permeate everyday life, but others live in more culturally heterogeneous communities in which Mexican traditions are often cast aside. Likewise, some students who have recently emigrated from another country hold steadfastly to the customs and values of their homeland, whereas others eagerly adopt many customs and habits of their new school and community.[115]

Come to understand your own cultural lens and learn as much as you can about students' cultural backgrounds.

In the opening case study, Jack's English teacher complained that "his parents don't care" and that, in general, the parents of Navajo students "just don't support their [children's] education."[116] When people act in accordance with beliefs, values, and social conventions very different from our own, it's all too easy for us to write them off as being "odd," "unmotivated," or "negligent." The assumptions and worldviews we've acquired in our own culture—perhaps including an assumption that good parents actively direct and control their children's behaviors—are often so pervasive in our lives that we tend to treat them as common sense, or even as facts, rather than as the beliefs they really are. These beliefs become a *cultural lens* through which we view events—a lens that may lead us to perceive other cultures' practices as somehow irrational and inferior to our own.[117]

As an example of how a cultural lens can affect a student's view, consider this real-world story about how a high school biology teacher's lesson on climate change was so

[112] Becker & Luthar, 2002; Gerard & Buehler, 2004; Grissmer et al., 1998.
[113] Brooks-Gunn et al., 2005; G. W. Evans & Kim, 2007; Gershoff et al., 2007; Yoshikawa et al., 2012.
[114] N. E. Hill et al., 2003; M. O. Wright & Masten, 2006.
[115] Bornstein & Cote, 2010; S. M. Quintana et al., 2006.
[116] Deyhle & LeCompte, 1999, p. 127.
[117] Gollnick & Chinn, 2009; van den Bergh et al., 2010.

agitating to a 17-year-old student that the student ran out of the school building during the lesson.[118] The school was located in the rural southeastern corner of Appalachian Ohio in a former coal and manufacturing town. The teacher was from an urban area in northern Ohio and had been teaching a lesson about how the earth was warming due to gases released by burning fossil fuels. This lesson didn't sit well with the student, especially given that her father used to be a coal miner and her family doubted that global warming was real. The teacher provided scientific evidence to back his claims about global warming, but the student was unconvinced. She said that she ran out of the school that day because the video they were watching depicted "all these people that I pretty much am like [as being] wrong and stupid." In this case, maybe the teacher didn't fully consider how students' cultural lenses would affect their reactions. Or maybe he did, and he was trying his best to engage students in critical thinking about the topic. But either way, it shows how it can be difficult for students—and people of all ages—to deal with situations that are inconsistent with their cultural lens.

Teachers can most effectively work with students from diverse backgrounds and cultural lenses when they understand the fundamental assumptions and beliefs that underlie students' and families' behaviors—not only by reading about various cultures in books, in journals, and online, but also by participating in local community activities and conversing regularly with community members.[119] In addition, effective teachers are keenly aware that their own cultural beliefs are just that—*beliefs*. And they make a concerted effort *not* to pass judgment on cultural practices and beliefs very different from their own, but rather to try to understand why people of other cultural groups think and act as they do.[120]

Be aware of how your beliefs about race affect your behaviors and communications with students and others.

Some beliefs—such as those about race—can have a strong influence on people's behaviors, and for that reason, the topic of racism has been in the spotlight recently, especially in the United States, as social movements work to eliminate racism. **Racial ideology** is a worldview that includes someone's views about race, including how race functions in society and how racial information is interpreted.[121] Racial ideologies affect everyone, including teachers' perceptions and the decisions they make.[122] For example, racial ideology can affect teachers' decisions about which schools they decide to teach in, which policies they implement in their classes, and which knowledge is valued in their classes.

One especially important racial ideology in educational contexts is a color-blind racial ideology. Two dimensions of a **color-blind racial ideology (CBRI)** have been identified: (1) denying potential racial differences by emphasizing the sameness among races and (2) denying that racism exists because everyone in the society has the same opportunities.[123] Although researchers have found that many teachers have adopted a CBRI,[124] doing so can be problematic for a variety of reasons:[125]

- CBRI can reinforce racial prejudices, stereotypes, and discrimination. For example, when researchers have compared color-blind approaches ("We are all the same") to multicultural approaches ("We appreciate and celebrate our differences"), multicultural

[118] Harmon, 2017.
[119] Castagno & Brayboy, 2008; Moje & Hinchman, 2004; H. L. Smith, 1998.
[120] Banks et al., 2005; Brophy et al., 2009; Rogoff, 2003.
[121] DeCuir-Gunby et al., 2020; Neville et al., 2013.
[122] Starck et al., 2020.
[123] Neville et al., 2013.
[124] Blaisdell, 2005; Han, 2009.
[125] For a more detailed discussion, see American Psychological Association, 2012; Castro-Atwater, 2016; Neville et al., 2013.

approaches have led to less prejudice toward ethnic minorities and to a greater awareness of racial discrimination.[126]

- Teachers with a CBRI may be more likely to avoid racial questions and comments from students, thus limiting students' opportunities to participate in constructive discussions and think critically about racism and related topics. For White students, avoiding racial discussions can reinforce the idea that "White" is "normal" and anything else is less than that. For non-White students, not acknowledging racial differences may dismiss or trivialize the discrimination they face on a regular basis and create a class climate in which students don't feel safe to talk about personal issues or concerns.[127]
- Teachers with a CBRI may be less likely to present or discuss racial problems in history or social studies curricula because they are seen as a thing of the past and thus no longer important. Consequently, students may not learn as much about the contributions of people of color or their struggles and oppression. In fact, the absence of curricula related to particular minority racial/ethnic groups may teach students that these groups are unimportant or insignificant.[128]
- CBRI can lead to an "invisible" culture of Whiteness in which White Americans don't see themselves as having a culture. As a result, it becomes difficult for White Americans to see "White privilege," which can create barriers toward social justice.[129]
- CBRI can lead teachers to communicate **racial microaggressions**, which are brief, everyday, subtle insults that may be conveyed intentionally or unintentionally to individuals because they are members of a racial/ethnic minority group.[130] For example, when White teachers say to students, "I see students, I don't see color" or "There is only one race, the human race," they may be denying a non-White student's racial/ethnic experiences or denying the student as a racial/cultural being (see Figure 4.16 for more examples).[131] Over time, racial microaggressions can lead students to perceive their environment as extremely stressful and exhausting, which can lead to **racial battle fatigue**—the physiological and psychological strain and energy lost by individuals in racial/ethnic minority groups who cope with racial microaggressions and racism.[132] Physiological symptoms of racial battle fatigue can include tension headaches, upset stomach, and extreme fatigue, among others, while the psychological symptoms can include constant anxiety and worrying, difficulty in thinking, loss of confidence, and depression, to name a few.[133] Needless to say, these symptoms could have a negative effect on students' school experiences and schoolwork.

Figure 4.16 Racial microaggressions can take many different forms.

Examples of Racial Microaggressions

- A White teacher saying, "You're a credit to your race" to a racial minority student. It can send the message that people of the student's race are generally not as intelligent as Whites.
- A White teacher saying, "You speak English well" to an Asian-American student who was born in the U.S. It can send the message that the student is not American.
- A White woman saying, "I'm a woman, so I know what you go through as a racial minority." It can send the message that the student's racial oppression is the same as the woman's gender oppression and that the woman can't be racist because she is like the student.
- A Black teacher telling a Latino student, "You shouldn't be so quiet, you should be more verbal and speak up more." It can send the message that the student should assimilate to the dominant culture.

Source: Sue, Capodilupo, Torino, Bucceri, Holder, Nadal, & Esquilin, 2007.

[126] Apfelbaum et al., 2008; Correll et al., 2008; Lewis, 2001; Schofield, 1982.
[127] Han, 2009; Marx & Larson, 2012; Ullucci & Battey, 2011.
[128] Blum, 2002; Castro-Atwater, 2016; Milner, 2012.
[129] Lewis, 2001; Ullucci & Battey, 2011.
[130] Pierce et al., 1978; Solórzano et al., 2000; Sue et al., 2007.
[131] Sue et al., 2007.
[132] Brown et al., 1999; Smith et al., 2007, 2012.
[133] Smith et al., 2007.

To address the potential problems associated with CBRI, researchers recommend a variety of multicultural approaches that have been found to be successful. Several of the remaining principles in this section describe how teachers can implement these approaches in educational contexts.

Incorporate the perspectives and traditions of many cultures into the curriculum.

True **multicultural education** isn't limited to cooking ethnic foods, celebrating Cinco de Mayo, or studying famous African Americans during Black History Month. Rather, it integrates the perspectives and experiences of numerous cultural groups throughout the curriculum and gives all students reasons for pride in their cultural heritages. Students from diverse backgrounds are more likely to be motivated to do well in school—and to *actually* do well there—when they perceive the school curriculum to be relevant to their own cultures.[134]

Teachers can incorporate content from diverse cultures into many aspects of the school curriculum. Following are examples:[135]

- In language arts, study the work of authors and poets from a variety of ethnic groups (e.g., study the lyrics of popular hip-hop songs).
- In math and science, draw on students' experiences with their community's farming, hunting, cooking, and building construction practices.
- In history, look at wars and other major events from diverse perspectives (e.g., the Native American perspective on European settlers' westward migration, the Spanish perspective on the Spanish–American War, the Japanese perspective on World War II).
- In both history and current events, consider such issues as discrimination and oppression.

Multicultural education involves learning about commonalities as well as differences. For example, in the elementary grades, students might learn that many cultural groups formally celebrate children's transition to adulthood—perhaps with *bar mitzvahs* and *bat mitzvahs* (for Jewish boys and girls), *quinceañeras* (for girls in certain Latin American cultures), or *Seijin no hi* (for 20-year-old Japanese youth). In the secondary grades, students might examine issues that adolescents of all cultures face: gaining the respect of elders, forming trusting relationships with peers, and finding a meaningful place in society.

Students should be encouraged to contribute to the multicultural curriculum—for example, by bringing in photographs and favorite foods from home and by expressing their varying experiences and perspectives without fear of ridicule or censure.[136] Teachers can also lead by example by sharing aspects of their own culture. Ultimately, teachers must help students realize that diverse cultural groups have much to learn from one another. For example, students may be surprised to learn that several key practices underlying many democratic governments—such as sending delegates to represent particular groups at a central location, allowing only one person in a governing council to speak at a time, and keeping government and military bodies separate—were adopted from Native American governing practices (those of the Iroquois League) in the 1700s.[137]

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[134] Banks & Banks, 1995; Brayboy & Searle, 2007; Moje & Hinchman, 2004; Paradise & Robles, 2016; Tatum, 1997; Tyler et al., 2008.

[135] J. M. Hughes et al., 2007; J. Kim, 2011; Lipka et al., 2009; McIntyre, 2010; NCSS Task Force on Ethnic Studies Curriculum Guidelines, 1992; K. Schultz et al., 2000.

[136] Gollnick & Chinn, 2009; Jiang, 2010.

[137] Rogoff, 2003; Weatherford, 1988.

Fostering appreciation for diverse perspectives doesn't necessarily mean portraying all cultural practices as equally acceptable, however. Rather, it means that teachers and students should try to understand another cultural group's behaviors within the context of that group's beliefs and assumptions. Teachers certainly must *not* embrace a culture that blatantly violates some people's basic human rights.

Be sensitive to cultural differences in behaviors and beliefs and, when appropriate, adapt instructional methods to students' accustomed ways of learning and behaving.

If students are to be successful at school and in mainstream Western culture, their teachers must gently and patiently encourage certain behaviors—such as being punctual and working independently—that will make such success possible. Yet many cultural differences in behavior are simply that—*differences*—and have no adverse effect on students' short- and long-term achievement. In working with students from diverse backgrounds, effective teachers engage in **culturally responsive teaching**: They use strategies that build on students' existing knowledge and skills and accommodate students' accustomed ways of behaving and learning.[138] For example, if students' cultures stress the importance of cooperation with others, teachers can enhance their learning by making frequent use of cooperative group activities. And if students' home environments are high-energy ones in which several activities may take place simultaneously—as is sometimes true in African American and Hispanic families—teachers might create a similarly high-energy, multiactivity classroom environment.[139] Even the simple act of looking students in the eye (or not) can make a significant difference, as one teacher revealed in the following anecdote:

> A teacher [described a Native American] student who would never say a word, nor even answer when she greeted him. Then one day when he came in she looked in the other direction and said, "Hello, Jimmy." He answered enthusiastically, "Why hello Miss Jacobs." She found that he would always talk if she looked at a book or at the wall, but when she looked at him, he appeared frightened.[140]

Culturally responsive teaching means taking students' worldviews into account as well. For example, when discussing topics such as ecology and global climate change with Native American students, science teachers can build on a widely shared Native American conviction that people should live in harmony with nature rather than try to control it.[141] In some cases, academic subject matter may conflict with students' core beliefs; occasionally it may conflict with the very essence of who they are as individuals. For instance, students who strongly believe in the divine creation of human beings may readily dismiss any suggestion that the human race has evolved from more primitive species.[142] As another example, students whose cultures view certain historical battles as involving good triumphing over evil—or vice versa—may disregard perspectives in which each side of a controversy had legitimate needs and concerns.[143] And previously we described a student who had difficulty in accepting the teacher's explanation of global warming. Under such circumstances, a more achievable goal may be to help students *understand* (rather than *accept*) academic scholars' explanations and lines of reasoning.[144]

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[138] Castagno & Brayboy, 2008; Ladson-Billings, 1995a, 1995b, 2014.
[139] Tyler et al., 2008.
[140] Gilliland, 1988, p. 26.
[141] Atran et al., 2005.
[142] E. M. Evans, 2008; Southerland & Sinatra, 2003.
[143] Levstik, 2011; Porat, 2004.
[144] Feinberg & Willer, 2011; Southerland & Sinatra, 2003.

Be sensitive to the culture shock that recent immigrants might be experiencing.

In recent years, immigration has become a highly politicized topic in the United States and elsewhere. Whatever teachers' own political views might be on the topic, they must realize that *all* children deserve guidance and support in their efforts to acquire the knowledge and skills they will need to be successful in the adult world. For recent immigrants, such guidance and support might include not only extra academic assistance but also explicit instruction in the typical practices and customs—"how things are done"—of their new culture.[145] Also, some students may require accommodations for their religious beliefs; for instance, teachers might discreetly give devout Muslim students a private place for early afternoon prayer and might excuse them from vigorous physical exercise when they're fasting during Ramadan.[146]

Work hard to break down rigid stereotypes of particular cultural and ethnic groups.

Although teachers and students should certainly be sensitive to real differences among people from various backgrounds, it's counterproductive to hold a **stereotype**—a rigid, simplistic, and inevitably inaccurate caricature—of any particular group. Sometimes people acquire stereotypes from the prejudicial remarks and practices of friends or family members.[147] In other cases, a history of conflict and animosity between two groups may lead people to conclude that people in the opposing group have undesirable qualities.[148] At a minimum, unflattering stereotypes lead to misunderstandings among members of diverse cultural groups. When left uncorrected, they can also lead to overtly discriminatory and malicious behaviors—including ethnic jokes, racial taunts, and social exclusion—that can affect the victims' physical and mental health.[149] Occasionally stereotypes appear in curriculum materials and classroom instruction—as happens, for instance, when American children role-play the first Thanksgiving by dressing in paper-bag "animal skins," painting their faces, and wearing feathers on their heads.[150]

As noted previously, teachers need to continually reflect on their beliefs and cultural lenses—which includes reflecting on any stereotypes they may hold for groups of students—to try to understand why people think and act as they do.[151] When a teacher's stereotypes go unchecked, they can have negative effects on students, who may be well aware of the teacher's stereotypes. Consider this statement from a self-identified Black girl in a high school class:

> "[Mrs. Thompson] always thinks like something's wrong with me because I'm not loud, and that's a stereotype that all we want to do is be loud. So it . . . gets on my nerves when like she's like, "Oh you're not like the other girls" or whoop de whoop. It makes me think that there's like only one way she can even process a Black girl in her classroom."[152]

In this case, the student believes that the White teacher (Mrs. Thompson) holds the stereotype that Black girls are loud in class. Shy and introverted, this student resents the fact that the teacher perceives that there's something wrong with her because she's not loud, which can affect her motivation and learning in Mrs. Thompson's class.

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[145] Vang, 2010; Ward et al., 2001.
[146] Sirin & Ryce, 2010.
[147] Branch, 1999; Nesdale et al., 2005; Theobald & Herley, 2009.
[148] Pitner et al., 2003.
[149] Allison, 1998; G. H. Brody et al., 2006; Killen, 2007; J. H. Pfeifer et al., 2007; Sirin & Ryce, 2010.
[150] Bigler & Liben, 2007; Brayboy & Searle, 2007.
[151] Banks et al., 2005; Brophy et al., 2009; Rogoff, 2003.
[152] Woodson, 2020, p. 575.

Classroom Strategies

Addressing Students' Stereotypes and Prejudices

- **Use curriculum materials that represent all cultures and ethnic groups as competent, legitimate participants in mainstream society, rather than as exotic curiosities who live in a separate world.**
  A history teacher peruses a history textbook to make sure that it portrays members of all ethnic groups in a non-stereotypical manner. He supplements the text with readings that highlight the important roles that members of various ethnic groups have played in history.

- **Assign literature depicting peers from diverse cultural backgrounds.**
  As part of a research project in England, several elementary school teachers read to students a series of stories involving close friendships between English children and refugees from other countries. Following this experimental intervention, the students express more positive attitudes toward refugee children than do control-group students who haven't heard the stories.

- **Conduct class discussions about prejudice and racism that exist in the school and local community.**
  A middle school in a suburban community creates a number of mixed-race focus groups in which students regularly convene to share their views about interracial relations at the school. Although some students of European American ancestry initially feel uncomfortable talking about this topic with their minority-group peers, once the ice has been broken, greater cross-cultural understanding and communication result.

- **Expose students to successful role models from various ethnic backgrounds.**
  A teacher invites several successful professionals from minority groups to speak with her class about their careers. When some students seem especially interested in one or more of these careers, she arranges for the students to spend time with the professionals in their workplaces.

- **Ask students to draw a picture of a professional in a particular job setting and use the drawings to discuss stereotypes students may have about particular professions.**
  A teacher asks students to draw a scientist and to list some characteristics of a scientist; one drawing by a fifth-grade student is shown to the right. Then, students place their drawing on a large table in the classroom. As the students look at the drawings, the teacher asks them to identify patterns among the drawings. Based on students' responses, the teacher asks them further questions, such as: "Why do you think that many of you drew the scientist as a man?" and "Are all scientists men?" Through her questioning, the teacher forces students to confront some of their stereotypes. She hopes that by raising students' awareness of their stereotypes, they will be more likely to question and change their own inaccurate beliefs.

- **Ask students to identify biases against particular cultural groups in TV show clips, commercials, and film trailers.**
  A high school social studies teacher organizes students into groups of four and asks them to identify biases against cultural groups in a few preselected YouTube videos of TV show clips, commercials, or film trailers. For example, students look for biases against Latina women in TV show clips from *Modern Family* and *Family Guy*. The teacher also asks students to identify perspectives that are not included in the ways in which the biased groups are represented.

- **Assign small-group cooperative projects in which students from diverse backgrounds must combine their unique talents to achieve a common goal.**
  A fourth-grade teacher has small cooperative groups design and conduct schoolwide surveys soliciting other students' opinions on various topics (e.g., ideas for school fundraisers, preferences for cafeteria menu items). The teacher intentionally creates groups that are culturally heterogeneous, knowing that the group members will draw on diverse friendship networks in seeking volunteers to take the surveys. In addition, he makes sure that every group member has something unique to offer in survey design or data analysis—perhaps knowledge of word processing software, artistic talent, or math skills.

- **Emphasize that some people affiliate with two or more cultural groups and that individual members of any single group are often very different from one another in behaviors, beliefs, and values.**
  In a geography unit on major world religions, a middle school teacher regularly points out that members of any single religion often have very different customs. "For example," he says, "some Muslim women dress in much the same way that women in this country do; others wear headscarves in addition to regular, modern clothes; and still others dress in a burqa that covers everything except their hands and shoes. Usually, the women wear a scarf or burqa to show modesty about their bodies. In fact, some Jewish women also wear headscarves as a sign of modesty, but many others don't."

When asked to draw a scientist and list some characteristics of scientists, a fifth-grade girl produced this drawing.

Sources: Adger et al., 2007; Barbarin et al., 2010; Bondy & Pennington, 2016 (example of students identifying biases in videos); Boutte & McCormick, 1992; L. Cameron et al., 2006 (refugee stories example); Dovidio & Gaertner, 1999; Gutiérrez & Rogoff, 2003; Mohan, 2009; Oskamp, 2000; J. H. Pfeifer et al., 2007; Schultz et al., 2000 (focus groups example); Tatum, 1997.

In addition to considering their own stereotypes, teachers must work hard (sometimes *very* hard) to correct *students'* inaccurate and demeaning cultural and ethnic stereotypes, and they must vigorously address any acts of prejudice and discrimination witnessed in the classroom and elsewhere. In some instances, students may simply have little or no experience with a cultural group very different from their own. The Classroom Strategies box "Addressing Students' Stereotypes and Prejudices" on the previous page offers several concrete strategies teachers can use in their classes.

Provide opportunities for students to interact regularly and productively with people from diverse cultural, ethnic, and racial groups.

Multicultural understanding also comes from interacting regularly and productively with people from diverse cultural, ethnic, and racial groups. When students from diverse groups interact regularly—and especially when they come together as equals, work toward common goals, and see themselves as members of the same "team"—they're more apt to accept and, better still, *value* one another's differences.[153] In the discussion of peer relationships in Chapter 7, we offer several strategies for promoting productive interactions and friendships among students from diverse backgrounds. By learning to appreciate multicultural differences within a single classroom, students take an important step toward appreciating the multicultural nature of the world at large.

Identify and, if possible, provide missing resources and experiences important for successful learning.

Some students from very poor families lack basic essentials that will be important for their school success, such as nutritious meals, adequate health care, warm clothes, and school supplies. Many government programs and community agencies can help to provide these things. School districts offer free and reduced-cost meal programs for children from low-income families. Many communities have low-cost health clinics. Some charitable organizations distribute warm winter jackets, and some office supply stores donate school supplies to children who need them. Indeed, most communities can provide a variety of resources for students who have limited financial means.

In addition to connecting low-income students and families with community resources, teachers should identify basic experiences that students haven't had and try to provide some of them, such as field trips to zoos, aquariums, natural history museums, farms, the mountains, or the ocean. And, of course, teachers should identify and teach any basic skills that most of their classmates have acquired at home. When teachers do so, they're likely to see significant improvements in students' classroom performance.[154]

Yet teachers must also remember that students who have grown up in poverty may, in some respects, have more knowledge and skills than their economically more advantaged peers (see Chapter 2). Such knowledge and skills can often provide a basis for teaching classroom subject matter. Furthermore, students who are willing to talk about the challenges they've faced can sensitize classmates to the serious inequities that currently exist in society. In general, research gives us cause for optimism that students from low-income backgrounds can achieve at high levels if their teachers are committed to helping them do so and give them a strong academic program that supports their learning efforts.[155]

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[153] Dovidio & Gaertner, 1999; Oskamp, 2000; J. H. Pfeifer et al., 2007.

[154] S. A. Griffin et al., 1995; Jordan et al., 2012; G. Phillips et al., 2004; Siegler, 2009; Warschauer, 2011.

[155] Becker & Luthar, 2002; Goldenberg, 2001; Long et al., 2012; G. Phillips et al., 2004.

4.4 How Students Modify Their Environments

Big Idea 4.4 **Although various environmental contexts influence learners and their development, so, too, do learners influence the environments in which they live and grow.**

How Students Influence Their Environment

In the preceding sections, we've seen various ways in which people's environments—especially their social and cultural ones—affect their behavior and learning. But the reverse is true as well: Learners influence their environments, sometimes unintentionally and sometimes quite deliberately, as the next two principles reveal.

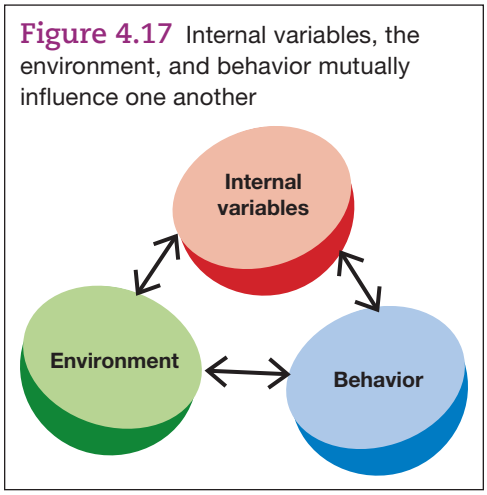


Figure 4.17 Internal variables, the environment, and behavior mutually influence one another

Learners alter their current environment through both their behaviors and such internal variables as beliefs, mental processes, feelings, and personality traits.

To some degree, learners' specific behaviors change their environments. For example, a student who misbehaves while participating in a classroom activity might be removed from the activity and told to just sit on the side and watch. Personal, internal variables—beliefs, mental processes, feelings, personality traits, knowledge, and so on—can also affect learners' environments. For instance, as we discussed in Chapter 2, learners can pay attention (an internal variable) to only a few aspects of their environment because of the limited capacity of attention and working memory. In fact, all three of the items just described—*internal variables*, *the environment*, and *behavior*—influence one another. This interdependence among internal variables, the environment, and behavior is known as **reciprocal causation** in social cognitive theory because one item can affect the others and vice versa (see Figure 4.17).[156]

think about it
Can you provide an example of reciprocal causation from your own experience?

As a concrete illustration of how internal variables, the environment, and behavior are continually intertwined, let's consider Scene 1 in the case of a student named Lori:

> **Scene 1**
> Lori often comes late to Mr. Broderick's seventh-grade social studies class, and she's usually not prepared for the day's activities. In class, she spends more time interacting with friends (e.g., whispering, passing notes) than engaging in assigned tasks. Lori's performance on most exams and assignments is unsatisfactory—when she turns in her work at all.
>
> In mid-October, Mr. Broderick takes Lori aside to express concern about her lack of classroom effort. He suggests that she could do better if she paid more attention in class. He also offers to work with her after school twice a week to help her understand class material. Lori isn't optimistic, describing herself as "not smart enough to learn this stuff."
>
> Over the next few days Lori exerts more effort, but she never stays after school for extra help. And before long she's back to her old habits. Mr. Broderick eventually concludes that Lori is a lost cause and decides to devote his time and effort to helping more motivated students.

Lori's low expectations for academic achievement (an internal variable) may partly explain why she spends so much time in task-irrelevant activities (behaviors). The fact that she devotes her attention (an internal variable) to her classmates, rather than to her teacher,

[156] Bandura, 1989, 2006, 2008; T. Williams & Williams, 2010.

affects the particular stimuli she experiences (her environment). Lori's poor study habits and resulting poor performance on assignments and exams (her behaviors) adversely affect both her expectations for future academic success (an internal variable) and Mr. Broderick's treatment of her (her environment). By eventually concluding that Lori is a lost cause, Mr. Broderick begins to ignore Lori (which changes her environment), contributing to her further failure (her behavior) and even lower self-confidence (an internal variable). Clearly, Lori is showing signs of being at risk for long-term academic failure.

But now imagine that after reading several research articles about how to work with students at risk, Mr. Broderick develops greater optimism that he can break the vicious cycle of reciprocal causation for students such as Lori. Midway through the school year, he makes several changes in his teaching:

- He communicates clearly and consistently that he expects all students to succeed in his classroom.
- He incorporates students' personal experiences and interests into the study of social studies.
- He identifies specific, concrete goals that students will accomplish each week and provides the structure and guidance students need to meet them.
- After consulting with the school's reading specialist and school psychologist, he helps students develop more effective reading and learning strategies.
- He gives a quiz each Friday so that students can see that they're making regular progress.

Let's see what happens next, as we consider Scene 2:

> **Scene 2**
> By incorporating students' personal experiences and interests into daily lessons, Mr. Broderick begins to capture Lori's attention. She starts to realize that social studies has implications for her own life and so she becomes more involved in class activities. With the more structured assignments, increased guidance about how to study, and frequent quizzes, Lori finds herself succeeding in a subject at which she previously experienced only failure. Mr. Broderick frequently communicates his pleasure about her progress through his facial expressions, verbal feedback, and willingness to provide help whenever she needs it.
>
> By the end of the school year, Lori is studying course material more effectively and completing her assignments regularly. She's looking forward to next year's social studies class, confident that she'll continue to do well.

Once again, we see the interplay among environment, behavior, and internal variables. Mr. Broderick's new instructional methods (Lori's environment) engage Lori's attention (an internal variable), and they foster better study habits and enhance academic performance (her behaviors). Lori's improved classroom performance, in turn, influences Mr. Broderick's treatment of her (her environment) and her own self-confidence (an internal variable). And her improved self-confidence, her greater attention to classroom activities, and her increased motivation to succeed (all internal variables) affect her ability to benefit from Mr. Broderick's instruction (her environment) and thus also affect her classroom success (her behavior).

Learners actively seek out environments that are a good fit with their existing behaviors and internal variables.

As children get older, they have greater autonomy to make choices, and thereby control their environments. With such choices and control, they're apt to seek out situations in which they feel comfortable—situations that match their existing abilities, interests, and

needs and that allow them to engage in preferred activities. This tendency to seek out environmental conditions that are a good match with existing behaviors and internal variables—a phenomenon known as **niche-picking**—can significantly increase existing differences among learners.[157]

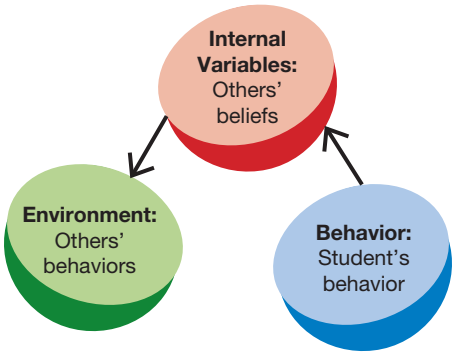
For example, as children move through the grade levels, they gain a wider choice of peers with whom they can spend time, and they increasingly affiliate with peers who share their interests and activities. As they reach middle school or junior high school, and even more so as they reach high school, they select some of the courses they take—thus, they begin to focus on the subject matter they enjoy and may steer clear of the subject matter they've consistently found to be frustrating. As they master public transportation systems or learn how to drive, they have increasing access to environments beyond home and the immediate neighborhood. Some of these environments, such as a library, gymnasium, or music studio, can help them acquire valuable new knowledge and skills. Other environments, such as a gathering place for antisocial peers or an all-night party where illegal drugs are readily available, can be harmful to their cognitive and social development.

Teaching Strategies: Attending to Students' Behaviors

Students' behaviors affect how they are perceived by other students and teachers. The suggestions in this section demonstrate why teachers need to attend to how students' behaviors are affecting other students' perceptions, as well as their own perceptions.

Help students become aware of how they are influencing their environment.

Figure 4.18 An example of how a student's behavior can influence other people's beliefs and behaviors



Some students are aware of how their own behaviors affect others' beliefs and behaviors toward them (see Figure 4.18). For example, Joao may know that being nice to Maggie can lead Maggie to like him and increase the chances that Maggie will share her cookies with him at lunch. But other students might not be aware of how their behaviors affect others' beliefs about them. Or, they may be aware, but they may not attribute others' reactions to the correct cause. In these cases, teachers can help students understand how their behaviors are affecting others' beliefs and behaviors toward them, as demonstrated in the following example.

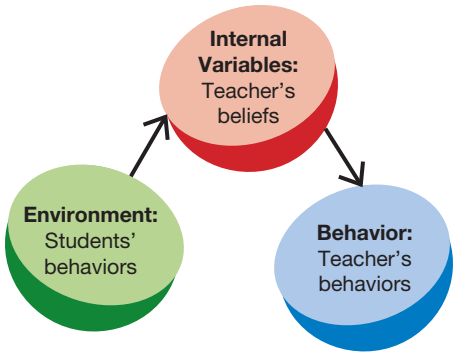
Sumeyra recently moved with her family from Turkey to the United States in order to live closer to her grandparents. Lately, she's been sad because no one wants to sit next to her at lunch or talk to her. She believes that others don't like her because she's from another country. One of her teachers, Mr. Wilkins, has noticed that the other students are not discriminating against her primarily because she's from another country but, rather, because she is not a good listener and talks about herself all the time. Sumeyra is very self-centered and likes to brag about how great she is, which limits her ability to join in two-way conversations with others. Having noticed this problem, Mr. Wilkins meets with Sumeyra briefly after class one day, kindly points out what he has noticed, and gives her suggestions for becoming a better listener. By doing so, Mr. Wilkins helps Sumeyra to become aware of how her lack of listening behavior is affecting others' beliefs and behaviors toward her. When Sumeyra implements these listening strategies, she finds that her peers react more positively toward her and enjoy talking to her at lunch.

[157] O. S. P. Davis et al., 2009; Flynn, 2003; Halpern & LaMay, 2000; Scarr & McCartney, 1983.

Be aware of how students' behaviors affect your own thoughts and behaviors.

From a teacher's perspective, students' behaviors are part of the environment. Thus, students' behaviors (as part of the teacher's environment) can affect a teacher's belief about students (an internal variable), which can then influence the teacher's behaviors toward students (see Figure 4.19).[158] Some teacher beliefs are accurate and lead to teachers reacting to students in appropriate ways, such as helping a student who clearly needs help during a reading activity. But at other times, teachers' beliefs can have negative effects on students. As an example, let's consider Randy, who is a quiet, well-behaved seventh-grade student whose in-class behaviors include looking out the window. Randy's teacher believes that he's not paying attention in class when he's looking out the window. But in reality, Randy is often thinking about what the teacher is saying and making sense of the concepts. When grading Randy's homework essay, the teacher consciously or unconsciously gives Randy a slightly lower grade than he deserved because she doesn't believe that he could really understand the concepts given that he doesn't pay attention in class. If the teacher is aware of her thoughts about Randy, she could make a conscious effort to grade Randy based on his work, not his classroom behaviors. But if she is unaware of her thoughts, she could unintentionally give Randy lower grades than he deserves. This example demonstrates the importance of teachers reflecting on whether their perceptions of students' behaviors are accurate and unbiased.

Figure 4.19 An example of how students' behaviors in a teacher's environment can influence a teacher's beliefs and behaviors



Summary

Our focus in this chapter has been on the many contexts that shape human learning and development. The Big Ideas presented at the beginning of the chapter sum up much of the chapter's content, and so we return to them now.

4.1 Immediate Stimuli as Context

Big Idea 4.1 Learners' behaviors and cognitive processes are influenced by the specific stimuli and consequences in their immediate environment.

Human learning takes place within many contexts that operate at a variety of levels. Learners' most local and immediate learning contexts consist of stimuli and events in the here-and-now—both those that elicit certain behaviors and those that are the consequences of learners' behaviors. Some especially influential factors are the people in learners' lives who model various ways of performing and thinking about everyday tasks.

Teachers can do many things to create supportive learning contexts for students. For example, they can make sure that productive behaviors lead to desirable consequences (reinforcement) and that counterproductive behaviors do not. They can provide role models to illustrate effective ways of handling life's various personal and professional challenges.

4.2 Social Interaction as Context

Big Idea 4.2 Learners co-construct their knowledge with others.

Learners acquire knowledge and skills not only from the things that environmental events and other people do *to* or *for* them but also from the things that other people do *with* them. Learners often co-construct knowledge with other people, sometimes with adults and other, more experienced individuals and sometimes with peers. Social interaction has many benefits. For instance, it introduces learners to ways in which their culture interprets and responds to everyday experiences and problems, and it encourages learners to elaborate on prior knowledge and examine existing beliefs for possible gaps in understanding. Also, other people can often provide the support and guidance—the *scaffolding*—learners need to successfully tackle new challenges. Teachers can foster the co-construction of knowledge by providing opportunities for students to engage in dialogue and cooperative activities that

[158] Babad, 1993; Good & Brophy, 1994; Graham, 1990; Rosenthal, 1994.

enable students to learn from one another. Other possibilities include using computer technologies or creating a community of learners that supports students' learning and motivation.

4.3 Culture and Society as Contexts

Big Idea 4.3 The cultural and societal contexts in which learners grow up also influence their behaviors and cognitive processes.

Culture is a largely human phenomenon that defines appropriate and inappropriate behaviors and beliefs and enables the transmission of knowledge and skills from one generation to the next. Any culture provides a wide variety of physical and cognitive tools that help learners survive and thrive in their physical and social worlds. Inconsistencies between cultures at home and at school can wreak havoc with school success, however, and teachers must bring the two contexts into alignment to the extent possible.

The society within which learners live is an additional context that can affect learning either directly or indirectly—for instance, through government policies that mandate certain instructional practices and through community groups and institutions that offer topic-specific expertise, learning opportunities, and support services. Yet not every member of a society has equal access to its resources. For example, many students in lower socioeconomic status families and neighborhoods have substandard housing, poor health care, and low-quality schools—factors that in one way or another can negatively impact students' long-term academic and social success.

Teachers can better promote students' learning and development when they understand and accommodate students' culture-specific behaviors and beliefs and when they also take into account the unique strengths and needs of students from lower-income families. Furthermore, by providing a truly *multicultural* education—one that incorporates the perspectives and experiences of numerous cultural and ethnic groups into the curriculum—and working hard to avoid racial microaggressions and to break down inaccurate stereotypes of particular groups, teachers can better equip students for participating in a multicultural world.

4.4 How Students Modify Their Environments

Big Idea 4.4 Although various environmental contexts influence learners and their development, so, too, do learners influence the environments in which they live and grow.

Learners' characteristics and behaviors affect the consequences they experience, the ways in which other people treat them, and the resources to which they have access. And especially as they get older and more independent, learners may actively seek out environments that are a good match with their existing characteristics and behaviors. Such niche-picking tends to increase differences among learners' ability levels in various subject areas. When teachers pay attention to how students' behaviors are affecting their own beliefs and perceptions, as well as those of others, they're more likely to create an optimal learning environment for students.

Case Study Practice Exercises

Adam

Thirteen-year-old Adam seems to cause problems wherever he goes. In his sixth-grade classroom, he is rude and defiant. On a typical school day, he comes to class late, slouches in his seat, rests his feet on his desk, yells obscenities at classmates and his teacher, and stubbornly refuses to participate in classroom activities. Not surprisingly, his grades are very low, just as they have been for most of his school career.

Away from his teacher's watchful eye, Adam's behavior is even worse. He shoves and pushes students in the hall, steals lunches from smaller boys in the cafeteria, and frequently initiates physical fights on the school grounds.

For obvious reasons, no one at school likes Adam very much. His classmates say he's a bully, and their parents describe him as a "bad apple," rotten to the core. Even his teacher, who tries to find the best in all of her students, has seen few redeeming qualities in Adam and is beginning to write him off as a lost cause.

Adam doesn't seem to be bothered by the hostile feelings he generates. Already he's counting the days until he can legally drop out of school.

1. **Constructed-response question**

   Adam is the type of student whom educators often refer to as a *student at risk*: He has a high probability

of failing to acquire the minimal academic skills he will need to be successful in the adult world.

A. It is entirely possible that factors in his home and neighborhood are encouraging Adam's inappropriate behaviors. Yet factors at school may also be contributing to these behaviors. Drawing from concepts and principles of learning related to *operant conditioning*, identify two possible school-based causes for Adam's behaviors at school.

B. Again drawing on operant conditioning concepts and principles, describe two different strategies you might use to help Adam develop more appropriate and productive behaviors.

2. Multiple-choice question

Social cognitive theorists suggest that learning environments are ultimately the result of *reciprocal causation*. Which one of the following alternatives best reflects this concept?

a. Adam's defiant behaviors may be his way of escaping assignments he doesn't think he can complete successfully.

b. Adam's behaviors alienate his teacher, whose subsequent actions reduce his learning opportunities and class performance.

c. One of Adam's classmates decides that aggression is appropriate classroom behavior and acts accordingly.

d. Many parents complain to the principal that Adam is adversely affecting the quality of their children's education.

Chapter 5
Motivation and Emotions

Photo by Unsplash

Big Ideas to Master in this Chapter

5.1 Teachers play a major role in motivating students by designing effective learning environments and supporting students' motivation-related beliefs over time.

5.2 Learners' needs, interests, values, goals, thoughts, and beliefs about themselves and the subject matter can influence their motivation to learn.

5.3 Effective teachers create conditions that support learners' motivation and engagement.

5.4 Learners' emotions influence and are influenced by both their motives and cognitive processes.

Case Study: Passing Algebra

Fourteen-year-old Michael has been getting failing grades in his eighth-grade algebra class, prompting his family to ask graduate student Valerie Tucker to tutor him. In his initial tutoring session, Michael tells Ms. Tucker that he has no hope of passing algebra because he's not very good at math and his teacher doesn't teach the subject matter very well. In his mind, he's powerless to change either his own ability or his teacher's instructional strategies, making continuing failure inevitable.

As Ms. Tucker works with Michael over the next several weeks, she encourages him to think more about what *he* can do to master algebra and less about what his teacher may or may not be doing to help him. She points out that he did well in math in earlier years and so certainly has the ability to learn algebra if he puts his mind to it. She also teaches him a number of strategies for understanding and applying algebraic principles. Michael takes a giant step forward when he finally realizes that his own efforts play a role in his classroom success:

> Maybe I can try a little harder. . . . The teacher is still bad, but maybe some of this other stuff can work.[1]

When Michael sees gradual improvement on his algebra assignments and quizzes, he becomes increasingly aware that the specific strategies he uses are just as important as his effort:

> I learned that I need to understand information before I can hold it in my mind. . . . Now I do things in math step by step and listen to each step. I realize now that even if I don't like the teacher or don't think he is a good teacher, it is my responsibility to listen. I listen better now and ask questions more.[2]

As Michael's performance in algebra continues to improve in later weeks, he gains greater confidence that he can master algebra after all, and he comes to realize that his classroom success is ultimately up to him:

> The teacher does most of his part, but it's no use to me unless I do my part. . . . Now I try and comprehend, ask questions and figure out how he got the answer. . . . I used to just listen and not even take notes. I always told myself I would remember but I always seemed to forget. Now I take notes and I study at home every day except Friday, even if I don't have homework. Now I study so that I know that I have it. I don't just hope I'll remember.[3]

Please answer these questions before you read further:

1. On what factors does Michael initially blame his failure?
2. To what factors does he later attribute his success?
3. How do his changing beliefs affect his learning strategies?
4. What inferences about motivation might you draw from the case study? Think about how learners' cognitive processes influence their motivation and how teachers' behaviors can also impact learners' motivation.

Michael initially believes he's failing algebra because of two things he can't control: his own low ability and his teacher's poor instruction. As a result, he doesn't listen very attentively or take notes in class. With Ms. Tucker's guidance, however, Michael gains a better understanding of algebra and learns how to use it to solve mathematical problems. He also discovers that increased effort and better strategies—for instance, taking notes and asking questions—*do* affect his classroom performance. Suddenly Michael himself is in control of the situation and not his teacher or some genetically predetermined inability that lurks within him. As a result, his confidence skyrockets, and he works hard to master algebra. From this case study, you might have inferred that students' motivation is

[1] Tucker & Anderman, 1999, p. 5.
[2] Tucker & Anderman, 1999, p. 5.
[3] Tucker & Anderman, 1999, p. 6.

Chapter Outline

Case Study: Passing Algebra

5.1 The Nature of Motivation
- The Role of Motivation in Education
- Teacher Beliefs About and Assessment of Students' Motivation
- Teaching Strategies: Assessing Students' Motivation and Engagement

5.2 Internal Factors That Affect Learners' Motivation and Engagement
- Learners' Psychological Needs
- Learners' Interests and Enjoyment
- Learners' Values and Goals
- Learners' Self-Efficacy, Attributions, and Beliefs

5.3 Teaching Strategies to Support Students' Motivation and Engagement
- Teaching Strategies That Empower Students
- Teaching Strategies That Demonstrate the Usefulness of Activities
- Teaching Strategies That Foster Perceptions of Success
- Teaching Strategies That Stimulate Interest
- Teaching Strategies That Show and Promote Caring

5.4 Emotions and Their Effects on Motivation and Learning
- The Role of Emotions in Student Motivation and Learning
- Teaching Strategies: Generating Productive Emotions for Learning

Summary

Case Study Practice Exercises: Praising Students' Writing

affected by how they attribute their failures and successes. For example, do they attribute failures to their own low ability that cannot be improved or to the use of poor strategies that they are capable of changing? Teachers can help students to think about why they are failing and succeeding, which—as you will see in this chapter—can have a powerful effect on students' motivation.

In our discussions of learning and development in previous chapters, we've focused primarily on the question "What can children and adolescents do and learn?" As we turn to motivation in this chapter, we focus on a very different question: "How *likely* are children and adolescents to do what they're capable of doing and to learn what they're capable of learning?" Even when learners have the capabilities and prior experiences necessary to do something, their *motivation* affects whether they intend to do it and then whether they follow through to actually do it. In the upcoming pages, we identify a variety of factors that influence students' motivation and emotions, and then translate what we've learned about both topics into effective instructional strategies.

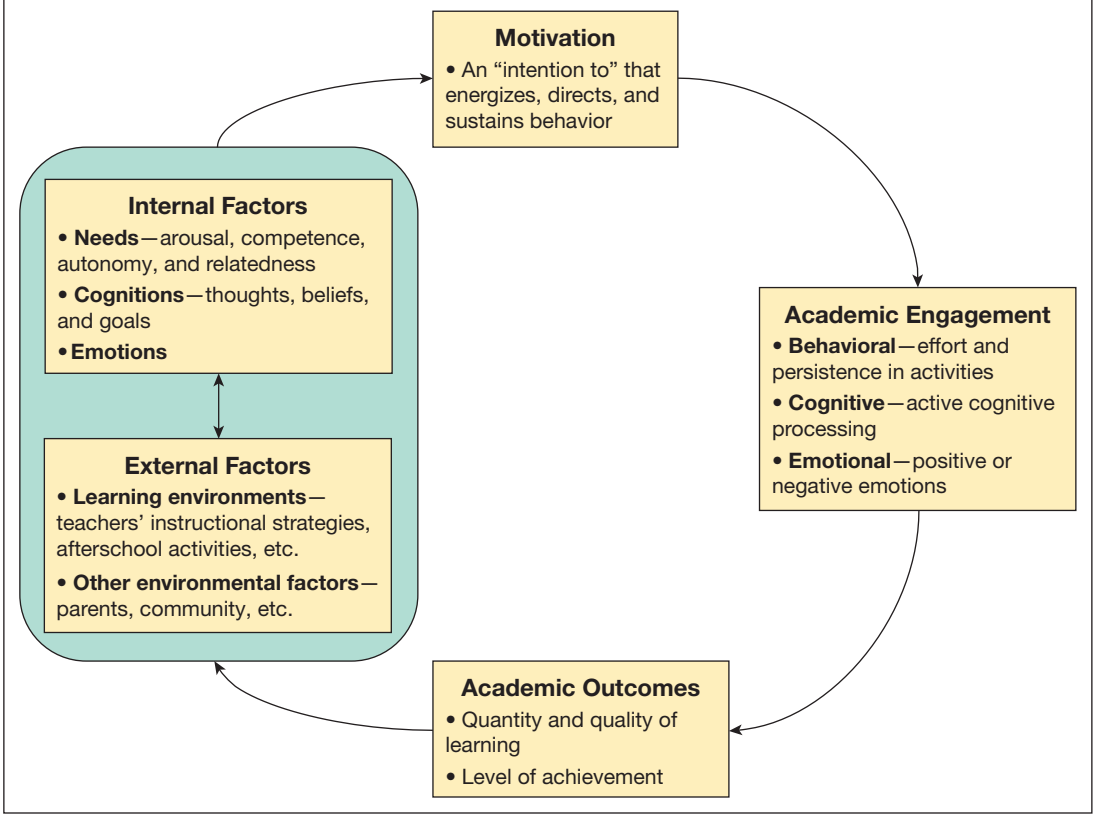
5.1 The Nature of Motivation

Big Idea 5.1 **Teachers play a major role in motivating students by designing effective learning environments and supporting students' motivation-related beliefs over time.**

The Role of Motivation in Education

Motivation is an inner state that energizes, directs, and sustains behavior. It's a sense of *intending to* that directs people's actions toward particular goals. As Figure 5.1 illustrates, motivation is affected both by *internal factors* that are inside people—such as their needs,

Figure 5.1 Factors that affect, and that are affected by, students' motivation



Sources: Based on Jones, 2018, 2020b; Osborne & Jones, 2011; Reeve, 2009a; E. A. Skinner & Pitzer, 2012.

cognition, and emotions—and by *external factors* that are outside of them, such as their teachers' instructional strategies and other environmental factors (e.g., parents, community). Together, these internal and external factors motivate students to get moving toward their goals and to *keep* moving toward and accomplish their goals.[4]

Note that the internal and external factors on the left side of Figure 5.1 don't just influence motivation, they can also influence *each other*. For example, a teacher who engages students in hands-on, thought-provoking science experiments (an external factor) might lead students to believe that science is fun and to aspire to possible careers as scientists (internal factors). Meanwhile, a student who shows obvious interest in a certain topic or activity (an internal factor) might lead parents or teachers to provide learning opportunities (external factors) through which the student can further pursue that interest area. (Recall the discussion of how learners modify their environments in Chapter 4.)

Motivation influences the activities that learners choose, as well as their **academic engagement**—their level of behavioral, cognitive, and emotional involvement in an academic activity—as follows:[5]

- **Behavioral engagement.** *Motivation increases the amount of effort and persistence in activities directly related to learners' needs and goals.*[6] Motivation determines whether learners pursue a task enthusiastically and wholeheartedly or apathetically and lackadaisically. Furthermore, motivated learners are more likely to persist at a task until they've completed it, even if they're occasionally interrupted or frustrated in the process. In general, then, motivation increases learners' *time on task*, an important factor affecting their learning and achievement.[7]
- **Cognitive engagement.** *Motivation influences what learners pay attention to and how actively they mentally process information.*[8] Motivated learners are more likely to pay attention and, as we discovered in Chapter 2, attention is critical for getting information into working memory, and eventually, long-term memory. Motivated learners also try to understand and elaborate on material—to learn it meaningfully—rather than simply "go through the motions" of learning in a superficial, rote manner. We see this principle at work in the opening case study. As Michael's confidence and motivation increases, he begins to pay attention, take notes, and ask questions in class.
- **Emotional engagement.** *Motivation influences learners' emotions and general feelings about activities.*[9] Learners who are motivated to pursue a learning activity generally have good feelings about it, such as being excited about learning and enjoying the activity. Those who are less motivated usually have unpleasant feelings about the activity and may be bored, sad, frustrated, or anxious.

Because of the effects of motivation on learners' behavioral, cognitive, and emotional engagement, motivation often leads to improved *academic outcomes* such as learning and achievement (see Figure 5.1). For instance, the learners who are most motivated to learn and excel in classroom activities tend to be the highest achievers.[10] Conversely, the learners who are least motivated to master academic subject matter are at high risk for dropping out before they graduate from high school.[11]

As you can see in Figure 5.1, students' academic outcomes can affect the internal and external factors that, in turn, affect their motivation. For example, in the opening case

[4] M. E. Ford & Smith, 2007; Gollwitzer & Bargh, 2005; Rovee-Collier, 1999.
[5] Bae et al., 2020; Christenson et al., 2012; Fredricks et al., 2004.
[6] Csikszentmihalyi & Nakamura, 1989; Maehr, 1984; Pintrich et al., 1993.
[7] Larson, 2000; E. Skinner et al., 2008; Wigfield, 1994.
[8] Blumenfeld et al., 2006; Hidi & Renninger, 2006; Sins et al., 2008; Voss & Schauble, 1992.
[9] Pekrun, 2006; Renninger & Hidi, 2011.
[10] Gottfried, 1990; Hidi & Harackiewicz, 2000; L. H. Meyer et al., 2008; Toste et al., 2020.
[11] Brayboy & Searle, 2007; Hardré & Reeve, 2003; Vallerand et al., 1997.

study, Michael's poor performance in math (an academic outcome) led him to low-ability beliefs (an internal factor), which then led to low motivation and little engagement (e.g., he didn't take notes), which perpetuated his poor achievement. Fortunately, Ms. Tucker (an external factor) broke the cycle by working hard to change Michael's ability beliefs and by teaching him new learning strategies. Michael's more optimistic beliefs and better strategies led to higher achievement, which, in turn, led to increased motivation and more engagement (e.g., asking questions and taking notes), which led to still further improvements in his learning and achievement.

A variety of theories are often helpful in explaining students' motivation.

People are motivated by a variety of different internal and external factors. To explain the effects of these different factors on individuals' motivation, psychologists have developed many different theories. Because they've been unable to find one "big" theory that can fully capture individuals' motives, mini-theories are used to explain different pieces of the motivation "puzzle." Figure 5.2 lists most of the key mini-theories described in this chapter.

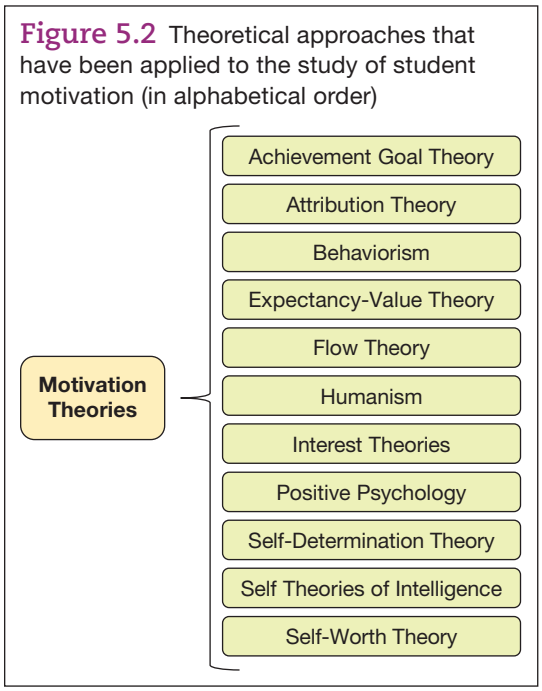


Figure 5.2 Theoretical approaches that have been applied to the study of student motivation (in alphabetical order)

Behaviorism was one of the first theories within educational psychology that explained the mechanisms involved in a learner's motivation.[12] In Chapter 4, we discussed behaviorism from a *learning* perspective: that learning and behavior can be explained in terms of stimulus–response relationships. But behaviorism can also be used to explain students' motivation and engagement by describing how consequences (reinforcements and punishments) can affect a student's behavior. To motivate people to engage in a new behavior or to increase their current engagement, behaviorists use reinforcements. In fact, neuroscientific research suggests that seeking rewards is a primary motivator of humans.[13] And to decrease someone's motivation to engage in a behavior, behaviorists use punishments (see Chapter 4 for a more complete explanation of reinforcements and punishments). Later in this chapter, we discuss these concepts as they relate to extrinsic motivation.

Some people, such as humanists, have objected to behaviorists' depiction of people's behaviors as being largely the result of external environmental factors, such as reinforcements and punishments. **Humanism** is the theoretical perspective that people have within themselves a tremendous potential for psychological growth, and they continually strive to fulfill that potential.[14] They believe that when given a caring and supportive environment, people strive to understand themselves, to enhance their abilities, and to behave in ways that benefit both themselves and others. Because early humanist ideas were grounded more in philosophy than in research findings, many contemporary motivation theorists have largely left them by the wayside. However, one contemporary perspective—positive psychology—has some roots in the humanist perspective.

Positive psychology is a theoretical perspective that focuses on human strengths and examines the good and functional aspects of humanity, as opposed to trying to fix what's wrong with people.[15] For instance, educational psychologists may study how teachers can

[12] Prominent behaviorists include Clark Hull, B. F. Skinner, Dorothea Lerman, and Jack Michael.
[13] Hidi, 2016.
[14] Prominent humanist theorists include Carol Rogers and Abraham Maslow.
[15] Peterson & Seligman, 2004; Seligman & Csikszentmihalyi, 2000. Prominent positive psychologists include Martin Seligman, Mihaly Csikszentmihalyi, and Christopher Peterson.

create learning environments in which students can flourish and reach their full potential.[16] And, like other contemporary motivation theories, it bases its views on research findings rather than the philosophical speculations that dominated humanism. As a distinct perspective of motivation, positive psychology emerged on the scene more recently—in the late 1990s—and in its current form it's better characterized as a collection of ideas rather than as a full-fledged, well-integrated theory.

Between the older views of behaviorism and newer perspectives such as positive psychology lie many different motivation theories, several of which are explained throughout this chapter. Although the large number of motivation theories may seem daunting to teachers, some of the theories overlap to some extent, which reduces the number of important principles that teachers need to know to effectively motivate their students. As we proceed through this chapter, we help you focus on the bigger principles and the related teaching strategies that researchers and teachers have found to be most useful.

Researchers have identified some general principles about students' motivation.

To help you better understand how many of the same principles underlie different theoretical perspectives, please complete the following exercise.

See For Yourself

Reflecting on Your Beliefs About Motivation

True/False

Decide whether each of the following statements is *true* or *false.*

_____ 1 Some students have little or no motivation.
_____ 2 If students aren't motivated to learn certain classroom topics, there's not much a teacher can do to motivate them.
_____ 3 Students can turn their motivation "on" and "off" quickly and easily.

Now let's see how your answers compare to the following three general principles that researchers have found to be true about motivation:

1. *All children and adolescents are motivated.* One common misconception is that some students are motivated and others are not. In reality, all students have basic needs and desires—that is, they're all motivated. However, some may strive to satisfy these needs and desires in ways that don't contribute to their academic achievement; for example, they may be more interested in playing sports or video games, texting friends, or using social media. One key strategy for motivating students to engage actively and productively in classroom learning activities, then, is to capitalize on their *existing* motives.
2. *Conditions in the classroom have a significant impact on students' motivation to learn and achieve.* Another common misconception is that motivation is something students "carry around" inside of them. In fact, a good deal of motivation is **situated motivation**—that is, it emerges from conditions in a learner's immediate environment.[17] As you'll discover, there are many, many things teachers can do in the classroom environment to enhance students' motivation to learn and master classroom subject matter.[18]

[16] Jones, 2020a.
[17] Nolen et al., 2015.
[18] Boaler, 2002; Dietrich et al., 2019; Jones, 2020b; Paris & Turner, 1994; Rueda & Moll, 1994; J. C. Turner & Patrick, 2008.

3. *Motivation to do well in school is grounded in a variety of cognitive and sociocultural factors that evolve over time.* Yet a third misconception is that students can turn their motivation "on" or "off" at will, much as one would flip a light switch. Although teachers can create situations that capture students' interests and get them immediately engaged in learning activities, students' motivation to achieve—or *not* achieve—in school is also the result of many factors that don't easily change overnight. Internal factors, such as students' thoughts, beliefs, and goals, often take time to change. In the opening case study, Michael's confidence for mastering math improves, but only *gradually* as he discovers that by applying effort and good strategies, he can be successful in the class. Some external factors may also change only slowly, perhaps because they're integral parts of students' outside lives. For example, parents may believe that math is inherently easier for boys than girls and thus communicate the message that their sons are more likely than their daughters to succeed in math-related careers.[19] Such gender stereotypes about math ability—which are largely unfounded—can affect students' motivation to study math and to persist in their efforts to understand challenging mathematical concepts.[20]

In the upcoming pages we identify a variety of internal factors (i.e., needs, cognition, and emotions) that influence students' motivation—factors that we later translate into strategies for promoting motivation and productive emotions in instructional settings.

Teacher Beliefs About and Assessment of Students' Motivation

When teachers believe that they can affect students' motivation and that it's important to motivate them, they are more likely to implement instructional strategies to motivate students.[21] The principles in this section highlight the importance of teacher beliefs and affective assessment.

Teachers should believe that they can affect students' motivation and that it's important to motivate students.

Because teachers' beliefs are related to their instructional practices and student outcomes, it's important for teachers to be aware of their beliefs about student motivation and to reflect on them.[22] For example, teachers may consider how their beliefs about students' motivation affect how they talk to and give feedback to different students. Your answers to the "See for Yourself" exercise in the previous section provide you with some insight as to your own beliefs. Hopefully, as you read the remainder of this chapter, you will reflect further on your beliefs about students' motivation.

Teachers can assess students' motivation and engagement.

To motivate students effectively, teachers need to accurately assess students' perceptions of the learning environment so that they can adjust instruction to increase students' motivation and engagement when needed. Teachers can assess students' perceptions in a variety of ways, some of which are rather informal (e.g., observing and talking to students) and others that are more formal (e.g., surveying students).[23] We explain some of these assessment strategies (sometimes referred to as *affective assessment*) in the next section.[24]

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[19] Eccles et al., 1990; Gunderson et al., 2012.
[20] Jacobs, 1991.
[21] Fives & Buehl, 2012; Katz & Shahar, 2015; Philippou & Christou, 2002.
[22] Fives & Buehl, 2012.
[23] 2018; Jones, 2020c.
[24] Anderson & Bourke, 2013; Popham, 2003.

Teaching Strategies: Assessing Students' Motivation and Engagement

Teachers can assess the motivation of *individual* students, but they can also assess students' perceptions of particular classes or activities by assessing all of the students in that class or activity.[25] The following strategies provide examples of how teachers can do so.

Assess students' motivation by observing their behaviors and reactions during class.

Teachers need to pay attention to students' engagement during class. *Behavioral* engagement can be observed through the behaviors that students exhibit during class, such as participating in class activities and following directions. Students who are more behaviorally engaged are probably more motivated. *Cognitive* engagement is impossible to observe directly, but teachers can sometimes observe it indirectly. For example, students who pay attention and are focused on their classwork are likely to be cognitively engaged and motivated for the activity. *Emotional* engagement can also be difficult to observe directly, but students sometimes make their emotions known verbally (e.g., "This is really fun!") and through body language (e.g., facial expressions, posture). Although observations can provide valuable insights into students' motivations, other means of assessing students' motivations are also necessary because observations don't always provide a complete picture of students' true motivations and can sometimes be misleading (think about students who pretend to pay attention in class by nodding at appropriate times but are actually daydreaming about being somewhere else besides their boring class).

Assess students' motivation by talking to them.

Talking to students can be an easy way to obtain more information about their motivation. Teachers can talk to students during class, but they can also chat with them before and after class, as well as at other school-sponsored activities, such as sporting events. Depending on the situation, teachers may want to use broad questions that might be perceived as less threatening, such as: "How is class going for you?" Or, teachers may want to ask specific questions that relate to observations they have made during class, such as: "Were you interested in the activity we did yesterday?" and "Did you find that assignment useful?"

Assess students' motivation by surveying them.

Surveying students can provide teachers with information from all of their students relatively quickly and effectively.[26] Teachers can ask closed-ended and open-ended questions on the survey, such as those shown in Figure 5.3.[27] Surveys can be administered on paper or online. An advantage of administering the survey online is that students' responses to closed-ended questions can be summarized (with frequency distributions and averages) without the teacher manually entering the responses into a calculator or computer spreadsheet. Another advantage of online surveys is that they are easier for students to complete outside of class time as homework (especially for older students) on their phones, tablets, or other electronic devices.

[25] Jones, 2020b; LaCroix et al., 2018; Popham, 2003.
[26] Anderson & Bourke, 2013; Popham, 2003.
[27] Jones, 2020c; Jones et al., 2012.

Figure 5.3 Example survey questions that can be used to assess students' motivation-related perceptions of a class

Example closed-ended items to be rated on the following scale:

1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree

1. ____ The classwork is interesting to me.
2. ____ The classwork is useful to me.
3. ____ I am confident that I can succeed in the classwork.
4. ____ The teacher cares about how well I do in the classwork.
5. ____ I have choices about what I can do in this class.

Example open-ended items

What could be changed in this class:

1. to make it more interesting?
2. to make it more useful to you?
3. to make you feel more successful?
4. to make you feel that the teacher cares about you?
5. to give you more choices?

Sources: Jones, 2020c; Jones, Watson, Rakes, & Akalin, 2012; For more items, go to www.theMUSICmodel.com.

5.2 Internal Factors That Affect Learners' Motivation and Engagement

Big Idea 5.2 Learners' needs, interests, values, goals, thoughts, and beliefs about themselves and the subject matter can influence their motivation to learn.

The left side of Figure 5.1 (shown previously) indicates that internal factors affect students' motivation, which then affects their engagement and academic outcomes. In this section, we describe a variety of internal factors that are grouped into four sections: (1) learners' psychological needs, (2) learners' interests and enjoyment, (3) learners' values and goals, and (4) learners' self-efficacy, attributions, and beliefs.

Learners' Psychological Needs

Psychologists have speculated that people have a wide variety of needs. Some needs—such as for oxygen, food, water, and warmth—are related to *physical* well-being, and these needs undoubtedly take high priority when physical survival is in jeopardy.[28] Other needs are more closely related to *psychological* well-being—that is, to feeling comfortable and content in day-to-day activities. In the following principles, we explore several basic psychological needs that can have a significant effect on learners' motivation and psychological well-being.

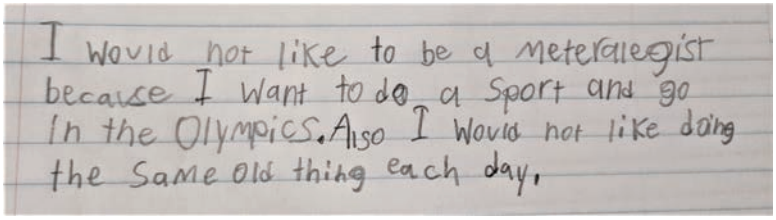
Learners have a basic need for arousal.

Several classic studies conducted in the 1950s and 1960s suggest that humans have a basic need for stimulation—that is, a **need for arousal**.[29] You may have felt this need for arousing stimulation during a boring lecture, on a long car ride (with no phone or other entertainment), or sitting in a doctor's waiting room for an hour with nothing to do. People tend to feel better when they're doing something—even something quite trivial—rather than

[28] Maslow, 1973, 1987.

[29] For example, see Berlyne, 1960; Heron, 1957; also see E. M. Anderman et al., 2004, for a more contemporary discussion of this need.

Figure 5.4 One of the reasons this 9-year-old is not motivated to pursue a career as a meteorologist is that he believes it would not fulfill his need for arousal ("I would not like doing the same old thing each day")



nothing at all. Yet, there seems to be a certain *optimal level* of arousal at which people feel best.[30] Too little stimulation is unpleasant, but so is too much. For example, you may enjoy watching a television reality show or listening to music, but you would probably rather not try to listen to a live band, watch a video on your phone, and talk to your friend all at once. Different people have different optimal levels, and they may prefer different kinds of stimulation. For instance, some children and adolescents are *sensation seekers* who thrive on physically thrilling and possibly dangerous experiences.[31] Others prefer a lot of cognitive stimulation—eagerly tackling challenging puzzles, reading about intriguing new ideas, arguing with peers about controversial issues, and so on—reflecting a *need for cognition*, which we discuss further in Chapter 6.[32]

The need for arousal explains some of the choices people make in life (see Figure 5.4), but it also explains things that students do in the classroom. For example, it explains why many students happily pull out a favorite book and read it if they finish in-class assignments before their classmates. But it also explains why students sometimes engage in off-task behaviors—for instance, texting or playing practical jokes—during boring lessons. Obviously, students are most likely to stay *on* task when classroom activities keep them sufficiently aroused that they have little need to look elsewhere for stimulation.

Learners want to be in control of their actions to some degree.

Self-determination theory consists of several mini-theories, including *cognitive evaluation theory*, which proposes that people have three basic psychological needs—the need for autonomy, competence, and relatedness—that are essential to their well-being and life satisfaction.[33] These needs affect people's motivations because people tend to pursue goals, subject areas, and relationships that allow them to satisfy their needs. We discuss the need for autonomy in this section and then discuss the need for competence and relatedness in the following sections.

Humans have a **need for autonomy** in that they have a need to believe that they can act with a full sense of willingness and volition.[34] For instance, when we think "I *want* to do this" or "This is *my* choice," we have a high sense of autonomy. In contrast, when we think "I *have* to do this" or "I *should* do this," we're indicating that someone or something else is making decisions for us. To better understand these ideas, try the following exercise.

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[30] E. M. Anderman et al., 2004; Berlyne, 1960; Labouvie-Vief & González, 2004.
[31] Cleveland et al., 2005; V. F. Reyna & Farley, 2006.
[32] Cacioppo et al., 1996; Raine et al., 2002.
[33] Prominent self-determination theorists include Edward Deci, Richard Ryan, and Johnmarshall Reeve. Deci & Moller, 2005; Deci & Ryan, 1985, 1992, 2012; Reeve et al., 2004; R. M. Ryan & Deci, 2000, 2017, 2020.
[34] d'Ailly, 2003; deCharms, 1972; Deci & Moller, 2005; Deci & Ryan, 2012; Kağitçibaşi, 2007; Ryan & Deci, 2000.

See For Yourself

Painting Between the Lines

Imagine that a teacher gives you a set of watercolor paints, a paintbrush, two sheets of paper (a fairly small one glued on top of a larger one), and some paper towels. He asks you to paint a picture of your home and then gives you the following instructions:

> You have to keep the paints clean. You can paint only on this small sheet of paper, so don't spill any paint on the big sheet. And you must wash out your brush and wipe it with a paper towel before you switch to a new color of paint so that you don't get the colors all mixed up. In general, don't make a mess with the paints.[35]

How much fun do you think your task would be? After reading these rules, how eager are you to begin painting?

These rules about painting are restrictive: They make it clear that the teacher is in charge of the situation and that you, as the artist, have few choices about how to complete your task. You aren't given much *empowerment*—that is, you don't have much freedom to control your actions.[36] With more empowerment, it's likely that you would have more desire to paint the picture and express more creativity.[37]

Even preschoolers and kindergartners seem to prefer classroom activities of their own choosing, and their perceptions of autonomy versus control are often seen in their notions of "play" or "work."[38] For example, when students in Ms. Paley's kindergarten class are asked whether activities at the class painting table are "work" or "play," two of them respond as follows:

> ***Clarice:*** If you paint a real picture, it's work, but if you splatter or pour into an egg carton, then it's play.
>
> ***Charlotte:*** It's mostly work, because that's where the teacher tells you how to do stuff.[39]

think about it

Consider this fifth-grader's explanation of school: "If I had to explain school to aliens, I would tell them that it's like a prison. It has a fence around it and the front door is locked." Besides fences and locked doors, what other environmental factors can affect students' perceptions of autonomy in school?

For Clarice, painting a real picture requires her to follow some rules about how a "real" picture is painted, whereas splattering and pouring paint is done with fewer rules, which gives her the freedom of autonomy. Similarly, Charlotte believes that painting is "work" when she feels controlled by the teacher's directions because it limits her autonomy. Thus, "play" is defined, in part, by having autonomy, and "work" is defined, in part, by feeling controlled and not having much autonomy.

Although children and adolescents around the world want some autonomy, the amount of autonomy and the forms that it takes may differ considerably from group to group.[40] For example, adults in some Native American groups (e.g., those living in the Navajo Nation in the southwestern United States) give children more autonomy and control over decision making, and do so at an earlier age, than do many adults in mainstream Western culture.[41] (Recall the opening case study "Why Jack Wasn't in School" in Chapter 4.) In contrast, many Asian and African American parents give children *less* autonomy than other American adults.[42]

Cultural differences have also been observed in one important aspect of autonomy: opportunities to make choices. Although young people around the world find choice-making opportunities highly motivating, those from Asian cultures often prefer that

[35] Koestner et al., 1984, p. 239.
[36] B. D. Jones, 2009, 2018.
[37] Amabile & Hennessey, 1992; Deci, 1992; Koestner et al., 1984; Peterson, 2006; Reeve, 2006.
[38] E. J. Langer, 1997; Paley, 1984; Schmidt et al., 2009.
[39] Paley, 1984, p. 31.
[40] d'Ailly, 2003; Deyhle & LeCompte, 1999; Fiske & Fiske, 2007; Rogoff, 2003.
[41] Deyhle & LeCompte, 1999.
[42] McLoyd, 1998; Qin et al., 2009; Tamis-Lemonda & McFadden, 2010.

people they trust (e.g., parents, teachers, respected peers) make choices for them.[43] Perhaps Asian children see trusted others as people who can make *wise* choices, which will ultimately lead to higher levels of learning and competence.

Learners want to believe they are competent and have self-worth.

The 2-year-old child of one of us authors said, "I'm going to do some great dance maneuvers, and then you can clap for me." Why would she say this? Or consider a middle school student who tells his parents that he doesn't want their help with his homework because he can do it himself. What do these two children have in common? Well, underlying both of these statements is likely a **need for competence**, which is a need for people to believe that they can deal effectively with their environment.[44] The 2-year-old seems to want her father to clap to acknowledge that she is a competent dancer. And the middle school student seems to want to prove to himself and others that he is competent at completing his homework by himself. In fact, people of all ages have a need to feel competent.

Although one's *need for competence* is included in self-determination theory, many other motivation theories also include ideas related to competence because it is such a vital aspect of helping people to develop and adapt to their environment.[45] For example, competence is at the core of self-worth theory. In **self-worth theory**, individuals try to establish and maintain their sense of personal value to themselves and others by demonstrating that they are good and competent.[46] When people are competent at an activity, they can be successful at it, which makes them feel worthy and motivated to continue to participate in the activity. When people are incompetent at an activity, they cannot be successful, which makes them feel ashamed and worthless, and they are less motivated to continue to participate in the activity. As a first-grade student explained, "I don't like to read out loud because it makes me feel dumb." Consequently, people try to protect their sense of competence to feel proud of themselves and avoid feeling the shame of failure and feeling worthless (see Figure 5.5).

Other people's judgments and approval play a key role in the development of a sense of competence and self-worth.[47] Regularly achieving success in new and challenging activities—as Michael eventually does in math in the opening case study—is another important way of maintaining or enhancing perceptions of competence. Appearing competent may be a reason that some people upload photos to Instagram that they think will get them a lot of "likes." People may also remove photos that don't get many likes because they don't want to appear incompetent. But consistent success isn't always possible, particularly when learners must undertake especially difficult tasks. In the face of such tasks, an alternative way to maintain self-worth is to *avoid failure* because failure gives the impression of low ability.[48] Failure avoidance manifests itself in a variety of ways. Learners might refuse to engage in a task, minimize the task's importance, or set exceedingly low expectations for their performance.[49] They might also hold tightly to their current beliefs despite considerable evidence to the contrary (which is one reason why some learners are reluctant to undergo conceptual change).[50]

Figure 5.5 A medal won in a race can serve as a symbol of success that makes a high school track athlete feel competent at running. Hanging medals won at competitions can remind athletes of their competence and elicit feelings of pride.

[43] Bao & Lam, 2008; Hufton et al., 2002; Iyengar & Lepper, 1999; Vansteenkiste et al., 2005.
[44] Boggiano & Pittman, 1992; Elliot & Dweck, 2005b; Reeve et al., 2004; White, 1959.
[45] Elliot & Dweck, 2005a.
[46] Covington, 1992, 2009; Hattie, 2008; Rhodewalt & Vohs, 2005; Sedikides & Gregg, 2008. A prominent self-worth theorist is Martin Covington.
[47] Harter, 1999; Rudolph et al., 2005; Weiner, 2005.
[48] Covington & Müeller, 2001; Elliot & Dweck, 2005a; Urdan & Midgley, 2001.
[49] Covington, 1992; Martin et al., 2001; Rhodewalt & Vohs, 2005.
[50] Sherman & Cohen, 2002; Sinatra & Mason, 2008.

Learners want to feel connected to other people.

To some extent we're all social creatures: We live, work, and play with our fellow human beings. It appears that most people of all ages have a fundamental **need for relatedness**, which is a basic need to feel socially connected to others and to secure others' love and respect.[51]

Warm and caring interpersonal relationships are typically among students' highest priorities.[52] Students are more likely to be academically motivated and successful—and more likely to stay in school rather than drop out—when they believe that their teachers and peers like and respect them and when they feel that they truly "belong" in the classroom community.[53] In fact, many children and adolescents place a high priority on interacting with friends, often at the expense of getting their schoolwork done.[54] They may also be concerned about projecting a favorable public image—that is, by looking smart, popular, athletic, or cool. By looking good in the eyes of others, they not only satisfy their need for relatedness but also enhance their need for competence and sense of self-worth.[55] Still another way to address the need for relatedness is to work for the betterment of others, such as by helping peers who are struggling with classroom assignments.[56]

The need for relatedness seems to be especially high in early adolescence.[57] Young adolescents tend to be quite concerned about what their classmates think of them, often prefer to hang out in tight-knit groups, and are especially susceptible to peer influence (more on these points in Chapter 7).

Culture can also play a role in students' need for relatedness. For instance, in comparison to other groups, East Asian children tend to spend less time socializing with peers and place greater importance on gaining teachers' attention and approval.[58] And while East Asian students are likely to have friends who encourage academic achievement, some students from certain other ethnic groups (boys especially) may feel considerable peer pressure *not* to achieve at high levels, perhaps because high achievement reflects conformity to mainstream Western culture (more on this point in Chapter 7). Additionally, students from many cultural and ethnic groups (e.g., those from many Native American, Hispanic, and Asian communities, as well as those in some rural European American communities) have especially strong loyalties to family and may have been raised to achieve for their respective communities, rather than just for themselves as individuals. Motivating statements such as "Think how proud your family will be!" and "If you go to college and get a good education, you can really help your community!" are likely to be especially effective in motivating such learners.[59]

Finally, the need for relatedness can sometimes be at odds with the need for autonomy. In particular, achieving relatedness can involve doing what *others* want one to do, whereas achieving autonomy involves doing what one *personally* wants to do. Many East Asians resolve this apparent conflict by willingly agreeing to adjust personal behaviors and goals to meet social demands and maintain overall group harmony.[60]

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[51] Baumeister & Leary, 1995; Connell & Wellborn, 1991; Deci & Ryan, 2012; Martin & Dowson, 2009.
[52] Dowson & McInerney, 2001; Juvonen, 2006.
[53] Furrer & Skinner, 2003; Goodenow, 1993; Hughes et al., 2008; Hymel et al., 1996; A. M. Ryan & Patrick, 2001; Zee et al., 2020.
[54] Dowson & McInerney, 2001; Doyle, 1986; Wigfield et al., 1991.
[55] Harter, 1999; Juvonen, 2000; Rudolph et al., 2005.
[56] Dowson & McInerney, 2001; M. E. Ford & Smith, 2007.
[57] Brown et al., 1986; Juvonen, 2000; A. M. Ryan & Patrick, 2001.
[58] Dien, 1998; Steinberg, 1996.
[59] Chiu & Hong, 2005; Fiske & Fiske, 2007; Kağitçibaşi, 2007; Piña-Watson et al., 2015; Suina & Smolkin, 1994; Timm & Borman, 1997.
[60] Heine, 2007; Iyengar & Lepper, 1999; Kağitçibaşi, 2007; Li & Fischer, 2004.

Learners' Interests and Enjoyment

In addition to learners' psychological needs, learners' interests and enjoyment can affect their motivation to engage in learning activities, as explained in this section.

Learners have existing interests, but new interests can be triggered by the environment.

When we say that people have an **interest** in a particular topic or activity, we mean that they find it intriguing and enjoyable. Learners who are interested in what they're doing experience cognitive arousal, and they feel emotions such as enjoyment and excitement.[61] Interest, then, has both cognitive and emotional components.

Learners who are interested in a particular topic devote more attention to it and become more cognitively engaged in it.[62] They're also apt to learn it in a more meaningful and elaborative manner—for instance, by relating it to prior knowledge, interconnecting ideas, drawing inferences, forming visual images, generating examples, and identifying potential applications.[63] And unless they're emotionally attached to their current beliefs, interested learners are more likely to undergo conceptual change when they encounter information that contradicts their existing understandings.[64] As you might guess, then, learners who are interested in what they study show higher academic achievement and are more likely to remember the subject matter over the long run.[65]

Interest theories explain the factors that affect and that are affected by short-term *situational interests* and longer-term *individual interests*.[66] **Situational interest** is evoked temporarily by something in the immediate environment. Things that are new, different, unexpected, or especially vivid often generate situational interest, as do things with a high activity level or intense emotions.[67] Learners also tend to be intrigued by topics related to people and culture (e.g., disease, violence, holidays), nature (e.g., dinosaurs, weather, the sea), and current events (e.g., television shows, popular music, substance abuse, gangs).[68] Works of fiction (novels, short stories, movies, etc.) are more interesting and engaging when they include themes and characters with which readers can personally identify.[69] And nonfiction is more interesting when it is easy to understand and relationships among ideas are clear.[70]

Learners also tend to have personal preferences about the topics they pursue and the activities in which they engage. These preferences are called **individual interests** because they are long-term, relatively stable interests in a particular topic or activity.[71] For example, a high school student named Matt might have an individual interest in soccer during his high school years (see Figure 5.6). All individual interests begin as situational interest and can progress to become individual interests over time, as people obtain more knowledge about the topic or activity. Often interest and knowledge perpetuate each other as an interest in a topic fuels a quest to learn more about the topic, and the increased knowledge gained, in turn, promotes greater interest.[72] But more than knowledge is needed for an

[61] Ainley & Ainley, 2011; Hofer, 2010; Renninger, 2009; Renninger et al., 2015.
[62] Hidi & Renninger, 2020; E. Skinner et al., 2008.
[63] Hidi & Renninger, 2020; Pintrich & Schrauben, 1992; Schraw & Lehman, 2001; Tobias, 1994.
[64] Andre & Windschitl, 2003; Linnenbrink & Pintrich, 2003; Mason et al., 2008.
[65] Garner et al., 1992; Hidi & Harackiewicz, 2000; Mason et al., 2008; Renninger et al., 1992.
[66] Prominent interest theorists include Mary Ainley, Suzanne Hidi, Andreas Krapp, Ann Renninger, and Ulrich Schiefele.
[67] Hidi & Renninger, 2006; Mitchell, 1993; Renninger et al., 1992; Schank, 1979.
[68] Zahorik, 1994.
[69] Hidi & Harackiewicz, 2000; Schank, 1979; Wade, 1992.
[70] Schraw & Lehman, 2001; Wade, 1992.
[71] Hidi & Renninger, 2006; Renninger & Hidi, 2016.
[72] P. A. Alexander, 1997; Hidi & McLaren, 1990; Tobias, 1994.

Figure 5.6 Many children and adolescents have individual interests that pervade much of what they do. Here we see an example of Matt's passion for soccer during the high school years. He created this art—a heart gradually morphing into a soccer ball in a crowd—to accompany an essay about soccer in his language arts portfolio. Matt's interest in soccer was evident many years earlier, as you'll see in excerpts from his first-grade journal in Chapter 9.

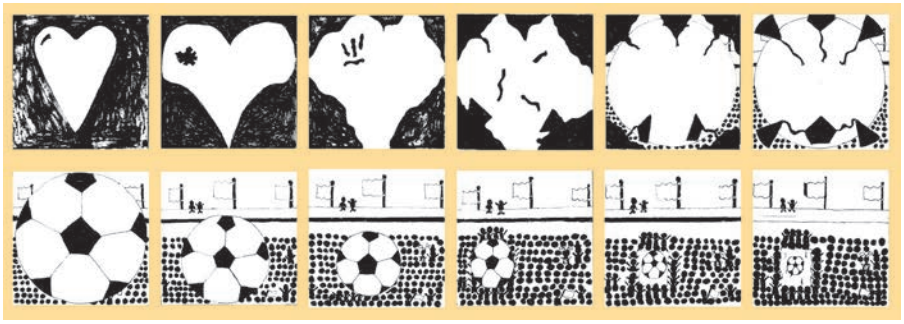


Figure 5.7 Interests progress from situational interest to individual interest as knowledge, value, and positive feelings increase

interest to develop into an individual interest; the person must also *value* the topic or activity and have continued positive feelings about it (see Figure 5.7).[73]

Even in the early elementary grades, many children have specific interests—perhaps in reptiles, ballet, or outer space—that persist over time and lead to consistent patterns in the choices made.[74] By and large, learners form interests in activities that they can do well in and that are stereotypically appropriate for their gender and socioeconomic group.[75] Individual interests are ultimately more beneficial than situational interests because they sustain engagement, effective cognitive processing, and improvement over the long run. Yet situational interest is important as well because it captures learners' attention and emotion and can provide a seed from which an individual interest might grow.[76]

Learners experience greater enjoyment and interest in school activities when their psychological needs are met.

Students enjoy and are more interested in activities that allow them to meet their needs for arousal, autonomy, competence, and relatedness. As we noted previously, self-determination theorists focus on individuals' needs for autonomy, competence, and relatedness, and claim that when these three needs are met (especially the need for autonomy and competence), people experience intrinsic motivation.[77] Therefore, **intrinsic motivation** is defined as the motivation to engage in an activity because it is enjoyable and interesting.[78] For intrinsically motivated learners, the enjoyment received during the activity is its own reward. When learners are intrinsically motivated for a particular topic or task, they are more likely to learn the topics, to willingly tackle the assigned tasks, and to process

[73] Hidi & Renninger, 2020; Renninger & Hidi, 2016.
[74] J. M. Alexander et al., 2008; Nolen, 2007; Y.-M. Tsai et al., 2008.
[75] J. M. Alexander et al., 2008; Hidi et al., 2004; Nolen, 2007; Wigfield, 1994.
[76] Ainley & Ainley, 2015; A. A. Alexander et al., 1994; Durik & Harackiewicz, 2007; Hidi & Renninger, 2006; Reed et al., 2004.
[77] Deci & Ryan, 2012; R. M. Ryan & Deci, 2000.
[78] Deci & Ryan, 2012; R. M. Ryan & Deci, 2000.

information in effective ways (e.g., by engaging in meaningful learning) and are more likely to achieve at high levels.[79]

It's important to note that intrinsically motivated students don't necessarily *value* the activity—they don't necessarily find it useful or important—they simply enjoy it and find it interesting. As an example, think of people who like to play video games. Video games typically give players autonomy by allowing them to make decisions and can help players meet their need for competence as they successfully meet challenges during the game. Some games also allow players to play with others in person or online, which can meet their need for relatedness. These video game features allow players to have fun and enjoy playing, which is called intrinsic motivation. Yet, playing the games may not be valuable or useful to the person playing; in fact, playing games for a long time may prevent individuals from engaging in activities that are directly useful to their daily lives, such as completing homework that's due the following day. (Note that video games can be very useful in helping people learn various things, but the point here is that the people in this example are playing the games because they enjoy them, not because they're trying to learn something useful from them.[80])

Learners can become immersed in an activity when the conditions are right.

Please complete the following exercise.

See For Yourself

Enjoyable Activity

Think of a time when you enjoyed a challenging activity so much that you were completely absorbed in it to the extent that you weren't thinking about anything else. The activity should be somewhat challenging, not simply pleasurable (e.g., sleeping, eating), and you should be actively involved and totally immersed in the activity. When you've thought of something, answer these three questions:

1. What were you doing?
2. What were the environmental conditions that allowed you to become totally absorbed in the activity?
3. How did you feel during the activity?

When people become extremely focused on an activity and absorbed in it to the extent that nothing else seems to matter, they are described as experiencing **flow**. You can think of flow as peak intrinsic motivation because it provides a holistic sensation that is very enjoyable. **Flow theory** describes the characteristics of experiences in which one is completely focused on and absorbed in a challenging activity.[81] The study of flow experiences is considered part of positive psychology because it describes people's positive experiences that enable them to thrive.[82]

Now compare your answers from the exercise to the descriptions of flow shown in Figure 5.8.[83] Are your answers similar? Do the conditions of flow shown in Figure 5.8 explain why you were able to focus on and enjoy the activity? During the activity, did you have similar experiences to those listed in Figure 5.8? If your answers were similar, then you likely experienced flow during the activity.

Figure 5.8 Flow theory describes certain conditions that lead to flow and the experiences during flow

Conditions of an Activity That Lead to Flow
1. The activity has clear goals (often bounded by rules)
2. The activity gives you immediate feedback about how you're progressing towards your goals
3. The activity is challenging in a way that neither underutilizes your skills nor overmatches them

During Flow You Have These Experiences
1. You can concentrate on the activity in the moment
2. You act with a deep but effortless involvement that removes the worries and frustrations of everyday life
3. Your action and awareness merge
4. You lose an awareness of yourself (you are not self-conscious)
5. You have a sense of control over your actions
6. Your sense of time is altered (time passes quickly)

Sources: Based on Csikszentmihalyi, 1990; Nakamura & Csikszentmihalyi, 2009.

[79] Hayenga & Corpus, 2010; Lepper et al., 2005.
[80] Blumberg, 2014; Granic et al., 2014.
[81] Csikszentmihalyi, 1990; Csikszentmihalyi et al., 2005.
[82] Jackson, 2012; Seligman & Csikszentmihalyi, 2000.
[83] Csikszentmihalyi, 1990; Nakamura & Csikszentmihalyi, 2009.

Learners' Values and Goals

So far we've explained some of the reasons why people find activities interesting and enjoyable, such as the activities meet their psychological needs, trigger their situational interest, or include the conditions of flow. Students will often participate in school activities because they find them interesting and enjoyable. But not everything that students experience in school is enjoyable and their intrinsic motivation can fluctuate over the course of the school day or year, especially during lengthy activities and assignments. At these times, students need other sources of motivation besides their interest and enjoyment to remain engaged in school activities. In this section, we explain how learners' values and goals can provide the motivation needed to stay engaged in learning activities.

Figure 5.9 Expectancy-value theory identifies four values that affect students' motivation (choices and effort) and performance

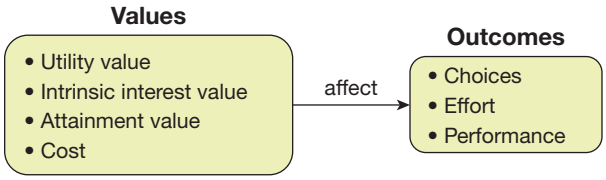


Figure 5.10 Knowing how to read clocks and tell time has utility value for students who need to get on the bus at a particular time

Learners are more likely to choose to devote time and effort to activities that they value.

When learners **value** an activity, they believe that the activity has direct or indirect benefits to them. Students are motivated to engage in activities that they find valuable. Their appraisal of the value of various tasks affects the subject matter and activities they pursue in their free time, the courses they choose to take, and many other choices they make.[84]

Expectancy-value theory identifies four different types of values that can affect students' choices, effort, and performance: utility value, intrinsic interest value, attainment value, and cost (see Figure 5.9).[85] An activity has *utility value* if it is seen as useful to reaching a desired goal (see Figure 5.10). For example, although the daughter of one of us authors found mathematics confusing and frustrating, she struggled through 4 years of high school math classes simply because many colleges require a strong math background. In other words, the math courses were useful in helping her to achieve her goal of attending college.

An activity has *intrinsic interest value* if the learner finds it interesting and enjoyable and, therefore, its definition is similar to that of *intrinsic motivation*, which was described previously. An activity has *attainment value* if it's viewed as relevant to the person's sense of self, identity, and personal values. As an example, a ninth-grade boy who sees himself as a musician and wants to have a career as a high school band teacher—that is, he identifies as a musician and music is an important personal value to him—would likely choose to engage in music-related activities, put forth more effort into those activities, and want to be successful in those activities.[86]

In contrast, learners tend *not* to value activities that *cost* too much in terms of the time they take, the amount of effort they require, or the negative emotions that they elicit.[87] For

[84] Durik et al., 2006; Jacobs et al., 2005; Mac Iver et al., 1991; Wigfield & Eccles, 2002.
[85] Eccles, 2005, 2009; Eccles & Wigfield, 2020; Wigfield & Eccles, 1992, 2000. The *expectancy* construct in expectancy-value theory is referred to in the section that discusses self-efficacy. Prominent expectancy-value theorists include Jacquelynne Eccles, Judith Harackiewicz, and Allan Wigfield.
[86] Eccles, 2005; Osborne & Jones, 2011.
[87] Flake et al., 2015; Part et al., 2020.

example, when considering how much time to put into a homework assignment, students may consider the amount of time and effort needed to complete the homework well, the other things that they have to do that day (e.g., Do I have sports practice or other homework?), what else they will have to give up to do the homework (e.g., How badly do I want to play that game on my Xbox?), and the negative emotions that they may feel while completing the homework (e.g., Will I be frustrated or stressed out?). If students decide it's not worth one or more of these costs, they won't spend much time, if any, working on the homework.

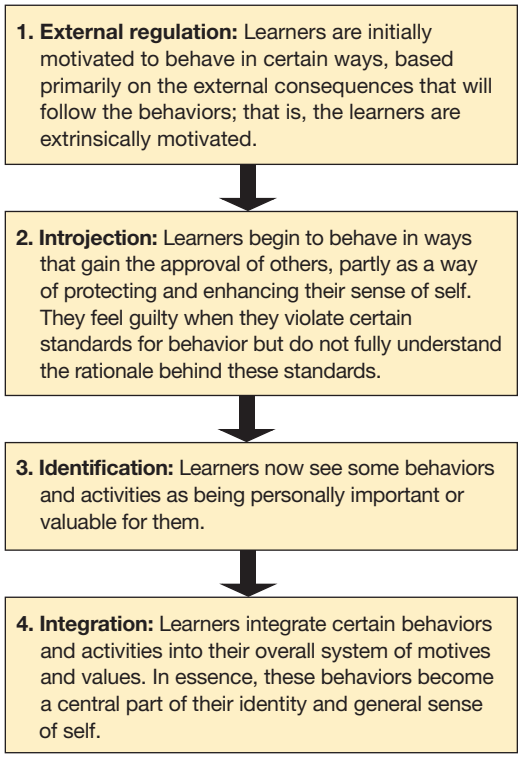
In the early elementary years, children often pursue activities they find interesting and enjoyable, regardless of their expectations for success.[88] As they get older, however, they increasingly attach value to activities for which they have high expectations for success and to activities they think will help them meet long-term goals, and they begin to *de*value activities at which they expect to do poorly.[89]

Learners' values are affected by their social and cultural environments.

As noted in the prior section, sometimes students are motivated to engage in an activity because it has utility value, that is, the activity is useful to them. Perhaps they want the good grades or recognition that the activity leads to when it is completed. In these cases, when students engage in an activity because it leads to a desired reward or consequence, they exhibit **extrinsic motivation**. In Chapter 4, we described how teachers can use consequences (i.e., reinforcements and punishments) as extrinsic motivators to engage students in activities.

When students only engage in an activity because it leads to certain consequences—that is, when they are extrinsically motivated—they demonstrate *external regulation* because they are regulated by external factors. Over time, however, factors in students' social and cultural environments can influence the things they value and can eventually lead students to value activities that were not previously valued. This process of internalizing the values of the people around them and culture in which they live is explained in a mini-theory within **self-determination theory** called *organismic integration theory*.[90] This theory proposes that values develop gradually over the course of childhood and adolescence, in the sequence depicted in Figure 5.11. This figure shows that students who are initially extrinsically motivated (they exhibit *external regulation*) can begin to internalize the value of activities as they move through *introjection*, *identification*, and *integration*. As they do so, students internalize the "pressure" to perform the activities and begin to see the activities as important in their own right. Such internalization of values is most likely to occur if adults (parents, teachers, etc.) who espouse those values provide a warm, supportive, and structured environment that offers learners some autonomy in decision making and allows them to feel successful. That is, the environment allows learners to meet their basic psychological needs of relatedness, autonomy, and competence. As an example, researchers have studied the social and cultural factors that influence rural students' decisions to attend college and have found that their decisions are influenced by the value (or lack thereof) that parents, teachers, school counselors, and others in the community place on higher education.[91]

Figure 5.11 Sequence in which values can become internalized as part of a learner's identity



[88] Wigfield, 1994.
[89] Jacobs et al., 2002; Osborne & Jones, 2011; Wigfield, 1994.
[90] Deci & Moller, 2005; Deci & Ryan, 1995, 2012; R. M. Ryan & Deci, 2000.
[91] Chambers et al., 2019; Cobb et al., 1989.

The more learners have internalized the value of academic subject matter, the more engaged they become in the subject matter and the better their overall learning is likely to be.[92] Appreciation of an activity's value also fosters self-regulated learning—a general work ethic in which learners spontaneously engage in activities that, although not always fun or immediately gratifying, are essential for reaching long-term goals.[93] Sometimes such conditions *aren't* present when it comes to learning academic subject matter. Accordingly, the value students find in many school subjects (e.g., math, English, music, sports) declines markedly over the school years.[94]

Although most cultural and ethnic groups place high value on getting a good education, researchers have observed differences in more specific values related to school learning.[95] For example, many Asian cultures (e.g., in China, Japan, and Russia) emphasize learning for learning's sake: With knowledge comes personal growth, better understanding of the world, and greater potential to contribute to society. Important for these cultures, too, are hard work and persistence in academic studies, even when the content isn't intrinsically enjoyable.[96] Students from European American backgrounds are less likely to be diligent when classroom topics have little intrinsic appeal, but they often find value in academic subject matter that piques their curiosity and in assignments that require creativity, independent thinking, or critical analysis.[97]

Learners from diverse cultural backgrounds may also define academic success differently and, as a result, may set different achievement goals. For example, on average, Asian American students aim for higher grades than do students from other ethnic groups, in part to win the approval of their parents and in part to bring honor to their families.[98] Even so, Asian American students—and African American students as well—tend to focus more on mastery goals (i.e., truly understanding what they are studying) than European American students do.[99] And students brought up in cultures that value group achievement over individual achievement (e.g., many Asian, Native American, Mexican American, and Pacific Islander cultures) tend to focus their mastery goals not on how much they alone can improve but instead on how much they *and their peers* can improve—or in some instances on how much their own actions can contribute to the betterment of the larger social group or society.[100]

Learners typically form goals related to their academic achievement; the specific nature of these goals influences learners' cognitive processes and behaviors.

As an example of how goals can affect students' motivation, consider what three different boys might be thinking during the first day of a basketball unit in Mr. Wesolowski's physical education class:

> ***Tim:*** This is my chance to show all the guys what a great basketball player I am. If I stay near the basket, Travis and Tony will keep passing to me, and I'll score a lot of points. I can really impress Mr. Wesolowski and my friends.

[92] Assor et al., 2009; B. D. Jones et al., 2015; La Guardia, 2009; Lens et al., 2002; Osborne & Jones, 2011; R. M. Ryan & Deci, 2000.
[93] Harter, 1992; McCombs, 1996; R. M. Ryan et al., 1992; Stipek, 2002.
[94] Deci & Moller, 2005; Eccles et al., 1998; Jacobs et al., 2002; La Guardia, 2009; Watt, 2004; Wigfield et al., 1991.
[95] Cook & Ludwig, 2008; Fuligni & Hardway, 2004; Phalet et al., 2004; Spera, 2005.
[96] Chiu & Hong, 2005; Hufton et al., 2002; Li, 2006; Morelli & Rothbaum, 2007.
[97] Hess & Azuma, 1991; Kuhn & Park, 2005; Nisbett, 2009.
[98] Nisbett, 2009; Steinberg, 1996.
[99] Freeman et al., 2002; Qian & Pan, 2002; Shim & Ryan, 2006.
[100] Chiu & Hong, 2005; Kağitçibaşi, 2007; Li, 2005, 2006.

Travis: I hope I don't screw this up. If I shoot at the basket and miss, I'll look like a real loser. Maybe I should just stay outside the 3-point line and keep passing to Tim and Tony.

Tony: I really want to become a better basketball player. I can't figure out why I don't make more of my shots. I'll ask Mr. Wesolowski about how I can improve my game. Maybe some of my friends will have suggestions, too.

Although all three boys want to play basketball well (they all have *achievement goals*), they have different reasons for wanting to play well. Tim is concerned mostly about looking good in front of his teacher and classmates and so he wants to maximize opportunities to demonstrate his skill on the court. Travis, too, is concerned about the impression he'll make, but he just wants to make sure he doesn't look bad. Unlike Tim and Travis, Tony isn't thinking about how his performance will appear to others. Instead, he's interested mainly in developing his basketball skills and doesn't expect immediate success. For Tony, making mistakes is an inevitable part of learning a new skill, not a source of embarrassment or humiliation.

To understand these boys' motivations, it can be helpful to consider **achievement goal theories** because they explain individuals' motivations by examining whether they engage in an activity because they want to either *develop* or to *demonstrate* competence.[101] Tony's approach to basketball illustrates a **mastery goal**, a desire to acquire additional knowledge or master new skills (i.e., to *develop* competence).[102] Tim and Travis each have a **performance goal**, a desire to present themselves as competent in the eyes of others (i.e., to *demonstrate* competence). More specifically, Tim has a **performance-approach goal**: He wants to look good and receive favorable judgments from others. In contrast, Travis has a **performance-avoidance goal**: He wants to avoid looking bad and receiving unfavorable judgments. Achievement goals often have an element of social comparison, in that learners are concerned about how their accomplishments compare to those of their peers.[103]

Mastery goals, performance-approach goals, and performance-avoidance goals aren't necessarily mutually exclusive. Learners may simultaneously have two kinds, or even all three.[104] For example, returning to our basketball example, we could imagine a fourth boy, Trey, who wants to improve his basketball skills *and* look good in front of his classmates *and* not come across as uncoordinated.

In many instances, having mastery goals is the optimal situation. As Table 5.1 reveals, learners with mastery goals tend to engage in the activities that will help them learn.[105]

Having performance-*approach* goals sometimes has very positive effects, spurring learners on to achieve at high levels, especially in adolescence and in combination with mastery goals.[106] Yet by themselves, performance-approach goals may be less beneficial than mastery goals. To accomplish them, learners may exert only the minimal effort required, use relatively superficial learning strategies, and possibly cheat on classroom

[101] Ames, 1992; Elliot, 2005; Maehr & Midgley, 1991; Nicholls, 1984; Urdan & Kaplan, 2020. Achievement goal theories are sometimes referred to as goal orientation theories; prominent achievement goal theorists include Carol Ames, Carol Dweck, Andrew Elliot, Martin Maehr, and John Nicholls.

[102] Some theorists distinguish between *mastery-approach* and *mastery-avoidance goals*. Our focus here is on mastery-approach goals. Mastery-avoidance goals—that is, wanting to avoid possible failure in a new learning task—seem to have effects similar to those of performance-avoidance goals; for example, see Elliot, 2005; Elliot & McGregor, 2000; Witkow & Fuligni, 2007.

[103] Elliot, 2005; Midgley et al., 1998; Régner et al., 2007.

[104] Covington & Müeller, 2001; Hidi & Harackiewicz, 2000; Liem, 2016; Meece & Holt, 1993; Schwinger & Wild, 2012.

[105] Kumar et al., 2002; Shim et al., 2008; Sins et al., 2008; Wentzel & Wigfield, 1998.

[106] Hidi & Harackiewicz, 2000; Linnenbrink, 2005; McNeil & Alibali, 2000; Rawsthorne & Elliot, 1999; Urdan, 1997.

Table 5.1 Typical Differences Between Learners with Mastery Goals and Learners with Performance Goals (Especially Performance-Avoidance Goals)

LEARNERS WITH MASTERY GOALS	LEARNERS WITH PERFORMANCE GOALS (ESPECIALLY THOSE WITH PERFORMANCE-AVOIDANCE GOALS)
Are more likely to enjoy learning classroom subject matter	Are more likely to be motivated by expectations of external reinforcement and punishment and to cheat to obtain good grades
Believe that competence develops over time through practice and effort; persist in the face of difficulty	Believe that competence is a stable characteristic (people either have talent or they don't); think that competent people shouldn't have to try very hard; give up quickly when facing difficulty
Exhibit more self-regulated learning and behavior	Exhibit less self-regulation
Use learning strategies that promote true comprehension and complex cognitive processes (e.g., elaboration, comprehension monitoring, transfer)	Use learning strategies that promote only rote learning (e.g., repetition, copying, word-for-word memorization); may procrastinate on assignments
Choose tasks that maximize opportunities for learning; seek out challenges	Choose tasks that maximize opportunities for demonstrating competence; avoid tasks and actions (e.g., asking for help) that make them look incompetent
Are more likely to undergo conceptual change when confronted with convincing evidence that contradicts current beliefs	Are less likely to undergo conceptual change, in part because they are less likely to notice the discrepancies between new information and existing beliefs
React to easy tasks with feelings of boredom or disappointment	React to success on easy tasks with feelings of pride or relief
Seek feedback that accurately describes their ability and helps them improve	Seek feedback that flatters them
Willingly collaborate with peers when doing so is likely to enhance learning	Collaborate with peers primarily when doing so can help them look competent or enhance social status
Evaluate their own performance in terms of the progress they make	Evaluate their own performance in terms of how they compare with others
Interpret failure as a sign that they need to exert more effort	Interpret failure as a sign of low ability and therefore predictive of future failures
View errors as a normal and useful part of the learning process; use errors to improve performance	View errors as a sign of failure and incompetence; engage in self-handicapping to provide apparent justification for errors and failures
Are satisfied with their performance if they try hard and make progress	Are satisfied with their performance only when they succeed; are apt to feel ashamed and depressed when they fail
View a teacher as a resource and guide to help them learn	View a teacher as a judge and as a rewarder or punisher
Remain relatively calm during tests and classroom assignments	Are often quite anxious about tests and other assessments
Are more likely to be enthusiastic about, and become actively involved in, school activities	Are more likely to distance themselves from the school environment

Sources: C. Ames & Archer, 1988; R. Ames, 1983; E. M. Anderman et al., 1998; E. M. Anderman & Maehr, 1994; Corpus et al., 2009; Dweck, 1986; Dweck et al., 2004; L. S. Fuchs et al., 1997; Gabriele, 2007; Graham & Weiner, 1996; Hardré et al., 2007; Jagacinski & Nicholls, 1984, 1987; Kaplan & Midgley, 1999; Lau & Nie, 2008; Liem et al., 2008; Linnenbrink & Pintrich, 2002, 2003; Locke & Latham, 2006; McCombs, 1988; McGregor & Elliot, 2002; Middleton & Midgley, 1997; Murphy & Alexander, 2000; Newman & Schwager, 1995; Nolen, 1996; Pekrun et al., 2006; Pugh & Bergin, 2006; Rawsthorne & Elliot, 1999; A. M. Ryan et al., 2001; Schiefele, 1991, 1992; Schunk et al., 2014; Sideridis, 2005; Sinatra & Mason, 2008; Sins et al., 2008; Skaalvik, 1997; Southerland & Sinatra, 2003; Stipek, 2002; Urdan & Midgley, 2001; Urdan et al., 1998.

assessments.[107] Performance-approach goals appear to be most detrimental when learners are fairly young (e.g., in the elementary grades) and have low self-efficacy for classroom tasks.[108]

Learners with performance-*avoidance* goals may stay away from the challenging tasks that could help them master new skills. And these learners tend to process information in a rote, relatively "thoughtless" manner. However, learners with performance-avoidance goals in collectivist countries (e.g., Brazil, China, India) appear to behave more like learners with mastery and performance-approach goals in terms of being intrinsically motivated

[107] E. M. Anderman et al., 1998; Brophy, 1987; L. H. Meyer et al., 2008; Midgley et al., 2001.
[108] Hidi & Harackiewicz, 2000; Kaplan, 1998; Kaplan & Midgley, 1997; Midgley et al., 2001.

and using effective cognitive and meta-cognitive strategies.[109] Because learners in collectivist countries place the needs of their social group over their own individual needs, receiving a low grade is not only considered a personal failure, but it also has implications for their larger social group. Therefore, learners may want to avoid a poor performance to avoid looking bad to members of their group.

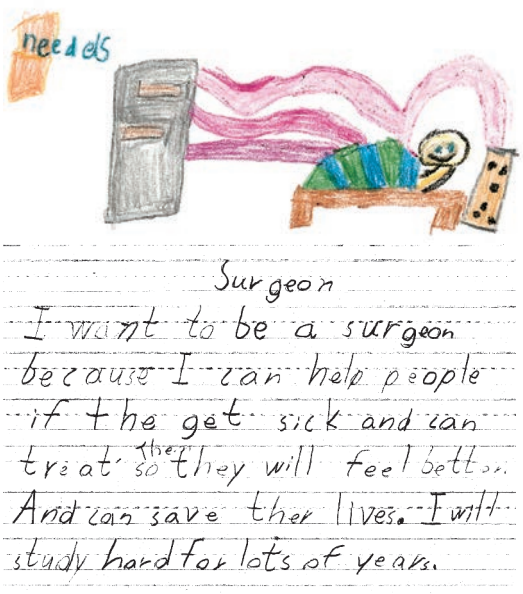
Most young children focus primarily on mastery goals.[110] But once they're in school, they're regularly surrounded by peers with whom they can compare their performance, and so they begin to view success as doing as well as or better than classmates. In addition, they may have trouble evaluating their progress on the complex cognitive skills they're learning (reading, writing, math, etc.) and so they must rely on others (e.g., teachers) to make judgments about their competence and progress. For such reasons, mastery goals decline and performance goals become increasingly prevalent as children progress through the elementary and secondary school grades.[111] Most academically motivated high school students are primarily concerned about getting good grades, and they prefer short, easy tasks to lengthier, more challenging ones. Performance goals are also common in competitive team sports, where the focus is often more on winning and gaining public recognition than on developing new skills and seeing improvement over time.[112]

Learners must juggle their achievement goals with their many other goals.

Children and adolescents typically have a wide variety of goals.[113] Not only might they want to do well in school, but they also want to have a good time, be healthy and safe, earn money, and eventually embark on a rewarding career. Many of their goals are apt to be **social goals** that can help them meet their need for relatedness (see Figure 5.12). For example, they may want to gain the approval of adults, be liked and respected by peers, belong to a supportive social group, and contribute to other people's welfare.[114] When a sixth-grade student found out that she wasn't going to be in a math class with her best friends the following year in seventh grade, she exclaimed, "My life is ruined!" This comment shows that social goals are very important for some students.

Among learners' many goals are certain **core goals** that drive much of what they do.[115] For instance, learners who attain high levels of academic achievement typically make classroom learning a high priority, whereas learners who achieve at lower levels are often more concerned with social relationships.[116] Some students seem to demonstrate high levels of perseverance and passion for their long-term goals, a stable disposition that has been called *grit*.[117] Researchers are still trying to figure out why some students exhibit higher levels of grit than others.

Figure 5.12 Career aspirations are often among learners' many goals. Here 7-year-old Ashton explains why he wants to be a surgeon. Notice how his career goal also has a social-goal component: "I can help people if [they] get sick."



[109] Khajavy et al., 2018; King, 2016.
[110] Bong, 2009; Dweck & Elliott, 1983.
[111] Bong, 2009; Dweck & Elliott, 1983; Elliot, 2005; Elliot & McGregor, 2000; Harter, 1992; Ramos et al., 2020; Régner et al., 2007.
[112] Roberts et al., 1997.
[113] M. E. Ford & Smith, 2007; Schutz, 1994.
[114] H. A. Davis, 2003; Dowson & McInerney, 2001; M. E. Ford & Smith, 2007; Patrick et al., 2002; Wentzel et al., 2007.
[115] Boekaerts et al., 2006; Schutz, 1994.
[116] Wentzel & Wigfield, 1998; Wigfield et al., 1996.
[117] Duckworth et al., 2007.

Learners use several strategies to juggle their many goals.[118] Sometimes they find activities that allow them to address two or more goals simultaneously. For instance, they can address both achievement goals and social goals by forming a study group to prepare for a test. Sometimes they modify their ideas of what it means to achieve particular goals. For instance, an ambitious high school student who initially hopes to earn all As in three challenging classes may eventually decide that earning Bs in two of them is more realistic. And sometimes learners entirely abandon one goal in order to satisfy another. For example, they may find that the multiple demands of school coerce them into focusing on performance goals (e.g., getting good grades) rather than studying the subject matter as thoroughly as they'd like. Brian, a junior high school student, expresses his regret about leaving mastery goals behind as he strives for performance goals:

> I sit here and I say, "Hey, I did this assignment in five minutes and I still got an A+ on it." I still have a feeling that I could do better, and it was kind of cheap that I didn't do my best and I still got this A. . . . I think probably it might lower my standards eventually, which I'm not looking forward to at all. . . . I'll always know, though, that I have it in me. It's just that I won't express it that much.[119]

Learners' Self-Efficacy, Attributions, and Beliefs

In addition to the motivating factors described in this chapter so far (i.e., psychological needs, interests, enjoyment, values, goals), learners are motivated by how well they expect to do, by the attributions they make for their successes and failures, and by their beliefs about their abilities and intelligence. These internal factors are explained in the following principles.

Learners are more likely to choose activities and try harder at them when they believe that they can succeed at them.

In our earlier discussion of self-determination theory and self-worth theory, we discovered that people have a general need to feel competent in their environment. Yet people also realize that they have both strengths and weaknesses. In other words, their beliefs about their competence can vary across activities and subject areas. The following exercise illustrates this point.

See For Yourself

Self-Efficacy for Different Activities

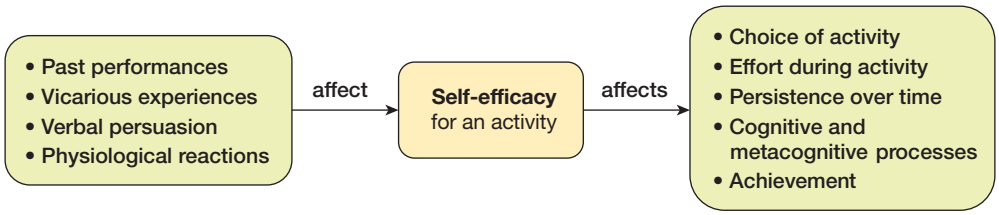
Rate how confident you are that you can do each of the following activities. Please rate your degree of confidence by selecting a number from 0 to 100 using this scale:

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately certain can do					Highly certain can do

1. How confident are you that you can apply the concepts in this chapter to your teaching? _____
2. How confident are you that you can hit a tennis serve into your opponent's service box? _____
3. How confident are you that you can find the area of a circle if you are given the diameter of the circle? _____

[118] Covington, 2000; Dodge et al., 1989; Phelan et al., 1994; Urdan & Maehr, 1995.
[119] Thomas & Oldfather, 1997, p. 119.

Figure 5.13 Self-efficacy is influenced by a variety of factors and, in turn, it can affect other factors



Your responses to these questions are referred to as your *self-efficacy* for these activities. **Self-efficacy** is a belief that one is capable of executing certain behaviors or reaching certain goals.[120] When learners have a higher self-efficacy for an activity, they are more likely to choose to participate in that activity, put forth effort in the activity, and persist at the activity over time, even when they are faced with challenges (see Figure 5.13).[121] For example, if you have high self-efficacy for hitting a tennis serve into the service box, you are more likely to choose to play competitive tennis (which requires serving to an opponent), try your best when serving, and keep trying to improve your serve, even when you're struggling to hit it well. High self-efficacy also leads students to engage in effective cognitive and metacognitive processes (paying attention, elaborating, effectively managing study time, etc.) that help them learn and achieve at higher levels.[122] As you can see, self-efficacy relates to a *specific activity* and is often assessed by asking students questions that they rate on a scale from 0 (not at all confident) to 100 (very confident), such as the questions you answered in the previous "See for Yourself" exercise.[123]

Students' self-efficacy is affected by their past performance. Students feel more confident that they can succeed at an activity (i.e., they have a higher self-efficacy) when they've previously succeeded at that activity or at similar activities.[124] In the opening case study, Michael has been getting Fs in his algebra class, and so his self-efficacy for passing the class were initially very low. But as he sees himself improve with effort and new strategies, his self-efficacy increases, and he begins to persist at trying to master algebra. He starts listening carefully and taking notes in class and says he studies "every day except Friday."[125]

When students form their self-efficacy for an activity, they consider not only their past performances but also factors such as vicarious experiences (observing others succeed or fail), verbal persuasion (feedback from others), and physiological reactions (bodily reactions and emotional arousals) (see Figure 5.13).[126] Seeing other people achieve success at an activity—especially seeing successful peers similar to themselves—can increase students' own self-efficacy for the activity.[127] Verbal persuasion from others, such as words of encouragement (e.g., "I bet Judy will play with you if you just ask her") and suggestions about how to improve (e.g., "I know that you can write a better essay, and here are some

[120] The concept of self-efficacy is part of social cognitive theory, which was also discussed in Chapter 4 and has been studied by Albert Bandura, Dale Schunk, Barry Zimmerman, and Frank Pajares, among others. Self-efficacy is similar conceptually to the *expectancy for success* construct that is part of expectancy-value theory.

[121] Bandura, 1997, 2000, 2006b; Schunk & Pajares, 2005; Schunk & Usher, 2012; Wigfield & Eccles, 2002.

[122] Bembenutty & Karabenick, 2004; Bong & Skaalvik, 2003; R. Klassen, 2002; Pajares, 2005; Shores & Shannon, 2007.

[123] Bandura, 2006a; Bong & Skaalvik, 2003.

[124] Usher & Pajares, 2008, 2009; Valentine et al., 2002; T. Williams & Williams, 2010.

[125] Tucker & Anderman, 1999, p. 6.

[126] Bandura, 1997.

[127] Dijkstra et al., 2008; Schunk, 1983; Schunk & Pajares, 2005; Usher, 2009; Usher & Pajares, 2009.

suggestions for how to do so"), can also enhance self-efficacy, especially when the persuader is believable and knowledgeable.[128] Physiological reactions can also affect a student's self-efficacy for an activity. Consider how your self-efficacy for giving a speech in a class might be affected if you noticed that during the speech your heart rate increased, you felt nervous, and you began to sweat. These types of physiological reactions would likely decrease your self-efficacy for delivering a good speech, which could negatively affect your performance during the speech, as well as decrease the likelihood that you would choose to give speeches in the future.

Once students have developed a high sense of self-efficacy for an activity, an occasional failure is unlikely to dampen their optimism much. In fact, when students encounter small setbacks on the way to achieving success, they learn that sustained effort and perseverance are key ingredients of that success. In other words, they develop **resilient self-efficacy**.[129] The key word here is *occasional* failure. If students *consistently* fail at an activity, they gain little confidence about their chances of future success.

Most 4- to 6-year-olds are quite confident about their ability to perform various tasks. In fact, they may overestimate what they're capable of doing.[130] As they progress through the elementary grades, however, they can better recall their past successes and failures, and they become increasingly aware that their performance doesn't always compare favorably with that of their peers.[131] Presumably as a result of these changes, they become less confident, although usually more realistic, about their chances for success.[132]

When learners think their chances of success are slim, they may behave in ways that make success even *less* likely.

Even with considerable persistence, learners can't always be successful at certain activities they're asked to perform. Repeated failures in a particular domain may lower not only their self-efficacy for the domain but also their general sense of competence and self-worth. Unfortunately, some students may not seek the help they need in class for fear of being laughed at by others or slowing down the class by asking questions.[133]

When learners can't avoid activities at which they think they'll do poorly, they have alternative strategies at their disposal. Occasionally they make excuses that seemingly justify their poor performance.[134] They may also engage in **self-handicapping**—doing things that actually *undermine* their chances of success. Self-handicapping takes a variety of forms, including the following:[135]

- **Reducing effort:** Putting forth an obviously insufficient amount of effort to succeed
- **Misbehaving:** Engaging in off-task behaviors in class
- **Setting unattainably high goals:** Working toward goals that even the most capable individuals couldn't achieve
- **Taking on too much:** Assuming so many responsibilities that no one could possibly accomplish them all
- **Procrastinating:** Putting off a task until success is virtually impossible
- **Cheating:** Presenting others' work as one's own
- **Using alcohol or drugs:** Taking substances that will inevitably reduce performance

[128] Usher, 2009; Usher & Pajares, 2008; Zeldin & Pajares, 2000.
[129] Bandura, 1994, 2008; Dweck, 2000.
[130] R. Butler, 2008; Eccles et al., 1998; Lockhart et al., 2002.
[131] Butler, 2008; Davis-Kean et al., 2008; Dijkstra et al., 2008.
[132] Bandura, 1986; Schunk & Zimmerman, 2006; Wigfield et al., 2006.
[133] Peeters et al., 2020.
[134] Covington, 1992; Urdan & Midgley, 2001.
[135] Anderman et al., 1998; Covington, 1992; D. Y. Ford, 1996; Hattie, 2008; E. E. Jones & Berglas, 1978; Riggs, 1992; Török et al., 2018; Urdan et al., 2002.

It might seem paradoxical that learners who want to be successful would actually try to undermine their own success. But if they believe they're unlikely to succeed no matter what they do—and especially if failure will reflect poorly on their intelligence and ability—they increase their chances of *justifying* the failure and thereby protecting their self-worth (see Figure 5.14).[136]

Curiously, some learners are more likely to perform at their best and less likely to display self-handicapping behaviors when outside, uncontrollable circumstances seemingly minimize their chances of success. In such cases, failure doesn't indicate low ability and so it doesn't threaten their sense of self-worth.[137]

Figure 5.14 In this interview, a student explains why she sometimes doesn't work very hard on her assignments

Interviewer: What if you don't do so well?

Student: Then you've got an excuse. . . . It's just easier to cope with if you think you haven't put as much work into it.

Interviewer: What's easier to cope with?

Student: From feeling like a failure because you're not good at it. It's easier to say, " I failed because I didn't put enough work into it." than "I failed because I'm not good at it."

Source: Martin, A. J., Marsh, H. W., Williamson, A., & Debus, R. L. (2003). Self-handicapping, defensive pessimism, and goal orientation: A qualitative study of university students. Journal of Educational Psychology, 95, 617–628.

Learners identify what are, in their minds, the likely causes of their successes and failures.

People try to make sense of their experiences, such as when they try to identify the reasons for success or failure in particular situations. We can see this in a 7-year-old boy's explanation to his father as to why he missed two free-throw shots during a basketball game: "The basket we were shooting at wasn't as good as the other one." (Note that the explanations children provide don't always align with reality!) To gain insight into the kinds of explanations you yourself might identify, try the following exercise.

See For Yourself

Carberry and Seville

1. Professor Josiah S. Carberry has just returned the first exam, scored and graded, in your advanced psychoceramics class. You discover that you've received one of the few high test grades in the class, an A–. Why did you do so well when most of your classmates did poorly? Jot down several possible explanations for why you might have received a high grade in Dr. Carberry's class.
2. An hour later, you get the results of the first test in Professor Barbara F. Seville's sociocosmetology class, and you learn that you *failed* it! Why did you do so poorly? Jot down several possible reasons for your F on this test.

The reasons you just wrote down are called *attributions*, which are one's beliefs about what behaviors and other factors influence events in their lives. Learners form attributions for many events in their daily lives, such as why they do well or poorly on tests and assignments, why they're popular or unpopular with peers, why they're skilled athletes or totally uncoordinated, and so on. **Attribution theory** explains how peoples' motivation is affected by their causal explanation for an event, such as why they succeeded or failed at an activity.[138] Are the attributions you wrote for your grades in Professors Carberry and Seville's courses similar to those shown in Figure 5.15? Obviously, these examples are only some of many attributions you could've made. Notice that the attributions in Figure 5.15 are categorized in three ways:

- **Locus ("place"): Internal versus external.** Learners sometimes attribute the causes of events to *internal* factors within themselves. Thinking that a good grade is due to your own hard work and believing that a poor grade is due to your lack of ability

[136] Covington, 1992; Rhodewalt & Vohs, 2005; Sedikides & Gregg, 2008.
[137] Covington, 1992.
[138] Graham, 2020; Weiner, 1986, 2000, 2010. Prominent attribution theorists are Bernard Weiner, Carol Dweck, and Sandra Graham.

Figure 5.15 Possible attributions for the good test grade in Dr. Carberry's class (the "a" responses) and the bad test grade in Dr. Seville's class (the "b" responses)

	Internal Locus		External Locus	
	Controllable	**Uncontrollable**	**Controllable**	**Uncontrollable**
Stable	1a. "I take school seriously and always make studying a high priority." 1b. "I really don't care about college—never will!"	2a. "I'm really intelligent!" 2b. "I don't have much natural talent in sociocosmetology."	3a. "Dr. Carberry was lenient in grading me because I'm friendly in class." 3b. "Professor Seville doesn't like me because I always argue with her in class."	4a. "Professor Carberry is known around campus for his easy tests." 4b. "Dr. Seville is a really bad instructor; she has no clue how to teach."
Unstable	5a. "I studied a lot for the test." 5b. "I didn't go to class for 2 weeks because I was too busy blogging."	6a. "I was in a good mood, and so I was able to concentrate on the questions." 6b. "I had the flu all week, and I was still tired when I took the test."	7a. "A tutor at the college learning center helped me study the right things." 7b. "I couldn't convince my friends to study for the test with me."	8a. "I was lucky that Dr. Carberry asked only questions about things I'd studied." 8b. "The student next to me was constantly distracting me with his coughing."

are examples of internal attributions. At other times learners attribute events to *external* factors outside themselves. Concluding that you received a scholarship because you "lucked out" and interpreting a classmate's scowl as a sign of her bad mood (rather than as something you might have done to upset her) are examples of external attributions.

- **Stability: Stable versus unstable.** Sometimes learners believe that events are due to *stable* factors—to things that probably won't change much in the near future. For example, if you believe that you do well in science because of your innate intelligence or that you have trouble making friends because you're unattractive, you're attributing events to stable, relatively long-term causes. But sometimes learners instead believe that events result from *unstable* factors—things that can change from one time to the next. Thinking that winning a hockey game because of a lucky shot and believing you got a bad test grade because you were exhausted when you took the test are examples of attributions involving unstable factors.
- **Controllability: Controllable versus uncontrollable.** On some occasions, learners attribute events to *controllable* factors—to things they can influence and change. For example, if you think a classmate invited you to a party because you often smile and say nice things to him, and if you think you failed a test simply because you didn't study the right things, you're attributing these events to controllable factors. On other occasions, learners attribute events to *uncontrollable* factors—to things over which they have no influence. If you think that you were chosen for the lead in the school play only because you look "right" for the part or that you played poorly during the basketball game because the basket wasn't good, you're attributing these events to uncontrollable factors.

think about it
To what do you attribute your successes and failures?

It's important to remember that attributions are constructed by learners in their minds; therefore, their attributions may not reflect the *real* causes of an outcome. For instance, a student may blame a low test grade on a "tricky" test or an "unfair" teacher when the real cause was the student's own lack of effort or ineffective study strategies. In general, learners tend to attribute their successes to internal causes (e.g., high ability, hard work) and their failures to external causes (e.g., luck, other people's behaviors) to maintain their sense

of self-worth.[139] Yet when learners *consistently* fail at tasks, and especially when they see their peers succeeding at those same tasks, they're apt to put the blame on a stable and seemingly uncontrollable internal factor: their own low ability.[140] Such an attribution is counterproductive, of course, because it doesn't spur learners to engage in successful strategies. Instead, they might engage in self-handicapping, which can lead to behaviors that make failure even *more* likely.

Learners' cultural and ethnic backgrounds influence their attributions as well. For instance, students from families with traditional Asian cultural beliefs are more likely than students from mainstream Western culture to attribute classroom success and failure to unstable factors—effort in the case of academic achievement, and temporary situational factors in the case of appropriate or inappropriate behaviors.[141] In addition, because Western cultures emphasize individualism and individual autonomy and East Asian cultures tend to emphasize collective responsibility, people in Western cultures tend to make internal attributions (attribute events to things that they have control over) and people in East Asian cultures tend to make external attributions (attribute events to things in the environment).[142] Also, some researchers have found a greater tendency for African American students to develop a sense of learned helplessness about their ability to achieve academic success. To some extent, racial prejudice may contribute to their learned helplessness: Students may begin to believe that because of the color of their skin, they have little chance of success no matter what they do.[143]

Learners' attributions for past successes and failures affect their emotional reactions and future performances.

Let's return to those two fictional exams you considered in the "Carberry and Seville" exercise—the psychoceramics exam (on which you got an A–) and the sociocosmetology exam (on which you got an F). Imagine that you'll be taking a second exam in both psychoceramics and sociocosmetology in about 3 weeks' time. Your attributions for your earlier test grades will affect both how you feel about taking the exams and how much time you'll spend studying for them.

Let's first consider your A– on Professor Carberry's exam. If you think you did well because you studied hard for this test (1a and 5a in Figure 5.15), you'll probably feel proud and spend a lot of time studying for the second test because you attribute your high grade to your hard work (internal) that is within your control.[144] If you think you did well because you're smart or a natural whiz at psychoceramics (2a in the figure), you may not study quite as much, especially if you think of academic ability as an inherited, uncontrollable, talent. If you think the A– reflects how much Carberry likes you because of your friendly disposition (3a in the figure), you may decide that time spent talking to him after class is more important than time spent studying. And if you believe your success was because he gives easy tests (4a in the figure), you may hardly study at all.

Now let's consider your failing grade on Professor Seville's exam. If you believe you didn't study enough or prepare appropriately (5b in the figure), you'll likely feel guilty and you may spend more time studying the next time because you believe that your effort and strategies are internal and controllable. If you think your poor grade was due to a temporary situation—perhaps you weren't feeling well (6b in the figure), or perhaps you couldn't concentrate during the exam (8b in the figure)—you will likely feel hopeful and

[139] Hattie, 2008; Paris & Byrnes, 1989; Rhodewalt & Vohs, 2005; Whitley & Frieze, 1985.
[140] Covington, 1987; Hong et al., 1995; Schunk, 1990; Weiner, 1984.
[141] Grant & Dweck, 2001; Hess et al., 1987; Li & Fischer, 2004; Weiner, 2004.
[142] Morris & Peng, 1994.
[143] Allen, 2017; Graham, 1989; Holliday, 1985; Madubata et al., 2018; Sue & Chin, 1983; van Laar, 2000.
[144] Weiner, 2000.

may study in much the same way as you did before, because these unfortunate events were uncontrollable and unstable. If you believe your failure was due to your low aptitude for sociocosmetology (2b in the figure), you may feel helpless, ashamed, and/or embarrassed, and you may study even less than you did the first time because your performance is due to something uncontrollable and stable.[145] And you may decide not to use effective learning strategies and, instead, use rote-learning approaches.[146] Finally, if you believe that your failure was due to the fact that Dr. Seville doesn't like you (3b in the figure) or that he is a poor instructor (4b in the figure), you may be angry and decide it isn't worth studying because the cause of your failure is something stable and external to you.[147]

One especially important attribution is whether you believe that your innate intelligence is controllable or uncontrollable (2b in the figure). As we will discover in Chapter 6, psychologists disagree about the extent to which intelligence is the result of the environment (and thus controllable and able to be increased with instruction and practice) or inherited genetics (and thus stable and uncontrollable). Even children and adolescents have differing opinions on the matter.[148] **Self-theories of intelligence** address students' beliefs about the nature of their intelligence.[149] Individuals with a **growth mindset** (also called an *incremental view of intelligence*) believe that intelligence improves with effort and practice. In contrast, those with a **fixed mindset** (also called an *entity view of intelligence*) believe that intelligence is a distinct ability that is relatively permanent and unchangeable.[150] A student named Sarah clearly reveals a fixed mindset in her explanation of why she has trouble in math:

> My dad is very good at math, and my brother, I, and my mom aren't good at math at all, we inherited the "not good at math gene" from my mom and I am good in English but I am not good in math.[151]

Students with a growth mindset and specific academic abilities are likely to adopt mastery goals in the classroom, to work hard at their studies, and to earn increasingly high grades. In contrast, students with a fixed mindset (like Sarah) adopt performance goals, quickly lose interest in topics that don't come easily to them, self-handicap in the face of failure, and earn lower grades over time.[152]

To summarize, students are more likely to be engaged in school and achieve at high levels when they have internal, controllable attributions (rather than external ones they can't control) and have the strategies they need to be successful (see Figure 5.16).[153] We saw the importance of having internal, controllable attributions and effective strategies in the opening case study of this chapter. Michael initially attributes his failure in algebra to two uncontrollable, stable factors: low math ability and poor instruction. These factors probably make him feel a combination of shame (due to his low ability) and anger (due to the poor instruction). Because the perceived causes of his failure were both stable and uncontrollable, he didn't expect to succeed; and thus, he had little reason to exert much effort

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[145] Blackwell et al., 2007; Dweck, 1978, 2000; Feather, 1982; Weiner, 1984.

[146] R. Ames, 1983; Dweck et al., 2004; Mangels, 2004; D. J. Palmer & Goetz, 1988; Pressley et al., 1987; Zimmerman, 1998.

[147] Hareli & Weiner, 2002; Pekrun, 2006.

[148] Dweck, 2000; Dweck et al., 2004; Dweck & Leggett, 1988; B. D. Jones et al., 2009.

[149] Dweck, 2000, 2006; Mueller & Dweck, 1998.

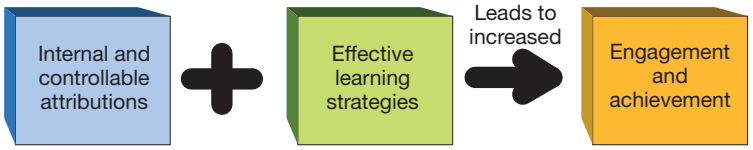
[150] These implicit theories about the changeability of intelligence are sometimes called *mindsets*; Dweck, 2006; Dweck & Yeager, 2019; Yeager & Dweck, 2012.

[151] K. E. Ryan et al., 2007, p. 5.

[152] Blackwell et al., 2007; Dweck & Leggett, 1988; Dweck & Molden, 2005; B. D. Jones et al., 2012.

[153] L. E. Davis et al., 2002; Dweck, 2000; Dweck et al., 2004; Eccles, 2009; Pintrich, 2003; Pomerantz & Saxon, 2001; Schunk, 1990; Weiner, 2005.

Figure 5.16 With the appropriate attributions and learning strategies, students are more likely to increase their engagement and achievement



(e.g., he didn't take notes). But as he acquired new study strategies and gained a better understanding of algebraic concepts and procedures, he experienced success in class. This led him to attribute his performance to two unstable, *internal* factors he *could control*: effort and better strategies:

> I realize now that even if I don't like the teacher or don't think he is a good teacher, it is my responsibility to listen. . . . The teacher does most of his part, but it's no use to me unless I do my part. . . . Now I try and comprehend, ask questions and figure out how he got the answer.[154]

Learners' attributions are affected by their teachers' attributions and resulting expectations for students' performance.

When teachers have high expectations for students, they present challenging tasks, interact with students frequently, persist in their efforts to help students understand, and give a lot of positive feedback. In contrast, when teachers have low expectations for certain students, they present easy tasks, offer few opportunities for speaking in class, and give little feedback about students' responses.[155] Teachers' expectations about students' abilities also affect their attributions for students' successes and failures.[156] Consider the following interpretations of a student's success:

- "You did it! You're so smart!"
- "That's wonderful. Your hard work has really paid off, hasn't it?"
- "You've done very well. It's clear that you really know how to study."
- "Terrific! This is certainly your lucky day!"

And now consider these interpretations of a student's failure:

- "Hmmm, maybe this just isn't something you're good at. Perhaps we should try a different activity."
- "Why don't you practice a little more and then try again?"
- "Let's see if we can come up with some study strategies that might work better for you."
- "Maybe you're just having a bad day."

All of these comments are presumably intended to make a student feel good. But notice the different attributions they imply—in some cases to uncontrollable abilities (being smart or not "good at" something), in other cases to controllable and therefore changeable behaviors (hard work, lack of practice, effective or ineffective study strategies), and in still other cases to external, uncontrollable causes (a lucky break, a bad day).

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[154] Tucker & Anderman, 1999, pp. 5–6.
[155] Babad, 1993; Brophy, 2006; T. L. Good & Brophy, 1994; Graham, 1990; Rosenthal, 1994.
[156] Weiner, 2000, 2005.

Teachers communicate their attributions for students' performance not only through what they say, but also through the emotions they convey.[157] As an example, let's return to the opening case study, in which Michael is initially doing poorly in his eighth-grade algebra class. Imagine that you're Michael's teacher. Imagine, too, that you believe Michael has low mathematical ability: He just doesn't have a "gift" for math. When you see him consistently getting Ds and Fs on assignments and quizzes, you might reasonably conclude that his poor performance is beyond his control, and so you communicate pity and sympathy. But now imagine, instead, that you believe Michael has *high* math ability: He definitely has what it takes to do well in your class. When you see his poor marks on assignments and quizzes, you naturally assume he isn't trying very hard. In your eyes, Michael has complete control over the amount of effort he exerts, and so you might express anger or annoyance when he doesn't do well. Some teachers might even punish him for his poor performance.[158]

Most children and adolescents are well aware of their teachers' differential behaviors toward different students and use such behaviors to draw inferences about their own and others' abilities.[159] When they can't figure out why they're doing well or poorly, they may eagerly seek out information to help them explain their performance.[160] If teachers repeatedly give them low-ability messages, they may begin to see themselves as their teachers see them, and their behavior may mirror their self-perceptions.[161] In some cases, then, teachers' expectations and attributions may become **self-fulfilling prophecies**: What teachers expect students to achieve becomes what students actually *do* achieve.[162] Self-fulfilling prophecies occur most frequently when students are making a significant transition in their schooling (e.g., when they enter first grade or begin junior high school), and they're more common for girls and for students from ethnic minority groups.[163]

Over time, learners acquire a general attributional style.

Consider these two girls, who have the *same* ability:

- Jane is an enthusiastic, energetic learner. She works hard at school activities and takes obvious pleasure in doing well. She likes challenges, especially the brainteaser problems her teacher assigns as extra-credit work each day. She can't always solve the problems, but she takes failure in stride and is eager for more problems the following day.
- Julie is an anxious, fidgety student who doesn't have much confidence in her ability to accomplish school tasks successfully. In fact, she often underestimates what she can do: Even when she has succeeded, she doubts that she can do it again. She prefers filling out drill-and-practice worksheets that help her practice skills she's already mastered, rather than attempting new tasks and problems. As for those daily brainteasers Jane likes so much, Julie sometimes takes a stab at them but gives up quickly if the answer isn't obvious.

Over time, some learners, like Jane, develop an "I can do it" attitude known as a **mastery orientation**—a general sense of optimism that they can master new tasks and succeed in a variety of endeavors. Other learners, like Julie, develop an "I *can't* do it"

[157] C. Reyna & Weiner, 2001; Weiner, 2005.
[158] C. Reyna & Weiner, 2001; Weiner, 2005.
[159] R. Butler, 1994; T. L. Good & Nichols, 2001; Weinstein, 2002.
[160] Weiner, 2000.
[161] Marachi et al., 2001; Murdock, 1999.
[162] For a classic study of the self-fulfilling prophecy, see Rosenthal & Jacobson, 1968. See also Gentrup et al., 2020; Rubie-Davies et al., 2020.
[163] Graham, 1990; Hinnant et al., 2009; Jussim et al., 1996; Kuklinski & Weinstein, 2001; Raudenbush, 1984.

attitude known as **learned helplessness**—a general sense of futility about their chances for future success. You might think of this distinction, which really reflects a continuum rather than an either–or dichotomy, as a difference between *optimists* and *pessimists*.[164]

Even when learners with a mastery orientation and those with learned helplessness have equal ability initially, those with a mastery orientation behave in ways that lead to higher achievement over the long run. They set ambitious goals, seek challenging situations, and persist in the face of failure. Learners with learned helplessness behave quite differently. Because they underestimate their ability, they set goals they can easily accomplish, avoid the challenges that are likely to maximize their learning and cognitive growth, and respond to failure in counterproductive ways (e.g., giving up quickly) that almost guarantee future failure.[165] In the opening case study, Michael's initial pessimism about his chances of future success in algebra suggests some degree of learned helplessness, at least about mathematics.

Table 5.2 draws from developmental trends in attributions and other cognitive factors in motivation to describe common motivational characteristics of students in the elementary, middle, and high school grades.

5.3 Teaching Strategies to Support Students' Motivation and Engagement

Big Idea 5.3 **Effective teachers create conditions that support learners' motivation and engagement.**

Early in this chapter, we explained how students' motivation was affected by both internal factors (needs, cognitions, and emotions) and external factors (learning environments and other factors) (see Figure 5.1). In this section, we focus on *external* factors that can affect students' motivation, including specific strategies that teachers can use to motivate and engage students in learning. The **MUSIC Model of Motivation** uses the acronym MUSIC to organize many specific motivation strategies into five more general strategies: Teachers should *e***M***power* students, demonstrate the **U***sefulness* of teaching activities, ensure that students believe they can **S***ucceed*, stimulate **I***nterest*, and show and promote **C***aring* (see Figure 5.17).[166] It's important to realize that these strategies only work if they affect *students' perceptions*. In other words, students are more motivated when they *believe* that they are empowered, that the content is useful, that they can be successful, that the content or activity is interesting, and that they have caring relationships within the classroom environment.

Teaching Strategies That Empower Students

Students are more motivated when they feel empowered—that is, when they believe they have some control over their learning environment.[167] The strategies in this section can empower students by supporting their sense of autonomy in the classroom.

Give students control over some aspects of classroom life.

When students have some sense of autonomy at school, they're more likely to be motivated to engage in academic and extracurricular activities, use effective self-regulation strategies, perform better academically, use skills acquired at school in out-of-school settings, and

[164] Peterson, 1990, 2006; Scheier & Carver, 1992; Seligman, 1991.
[165] Dweck, 2000; Graham, 1989; Peterson, 1990, 2006; Seligman, 1991.
[166] B. D. Jones, 2009, 2016, 2018, 2020b.
[167] B. D. Jones, 2009, 2018.

Developmental Trends

Table 5.2 Motivation at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **Grades K–2**	• Tendency to define teacher-chosen activities as "work" and self-chosen activities as "play" • Rapidly changing interests for many students; more stable interests for others • Pursuit of interesting and enjoyable activities regardless of expectation for success	Six-year-old Alex loves learning about lizards. He often draws lizards during his free time, and when he goes to the school library, he invariably looks for books about lizards and other reptiles. One day, with his teacher's permission, he brings his pet iguana to class and explains the things he must do to keep it healthy.	• Engage students' interest in classroom topics through hands-on, playlike activities. • Entice students into reading, writing, and other basic skills through high-interest books and subject matter (e.g., animals, superheroes, princes and princesses).
JohnnyGreig/E+/ Getty Images **Grades 3–5**	• Emergence of fairly stable individual interests • Increasing tendency to observe peers' performance as a criterion for judging one's own performance, resulting in a gradual decline in expectancies for overall academic performance • Increasing focus on performance goals	During a gymnastics unit in physical education, 9-year-old Marta watches her peers as they perform forward and backward rolls, handstands, and cartwheels. She willingly executes the rolls, but when she has trouble getting her legs up for a handstand, she quickly gives up, saying, "I can't do handstands and cartwheels—not like Jessie and Sharonda can."	• Allow students to pursue individual interests in independent reading and writing tasks. • Teach students strategies for tracking their own progress over time. • Demonstrate your own fascination and enthusiasm about classroom topics; communicate that many topics are worth learning about for their own sake.
Photo by Unsplash **Grades 6–8**	• Increasing interest in activities that are stereotypically "gender-appropriate"; decrease in activities considered to be "gender-inappropriate" • Noticeable decline in perceptions of competence and intrinsic motivation for mastering academic subject matter • Increasing tendency to value activities associated with long-term goals and high expectations for success • Decline in perceived value of many content domains (e.g., English, math, music, sports) • Increasing focus on social goals (e.g., interacting with peers, making a good impression) • Learned helplessness becomes more common as a fixed mindset is more common	Thirteen-year-old Regina has always liked math. But now that she's in an advanced eighth-grade math class, she's starting to worry that her peers might think she's a "math geek." She diligently does her math homework every night and earns high grades on assignments and quizzes, but she rarely raises her hand in class to ask or answer questions. And when her friends ask her about the class, she rolls her eyes and says that she's in the class only because "Dad made me take it."	• Promote interest in classroom topics by presenting puzzling phenomena and building on students' individual interests. • Focus students' attention on their improvement; minimize opportunities for them to compare their own performance to that of classmates. • Relate classroom subject matter to students' long-term goals (e.g., through authentic activities). • Provide opportunities for social interaction as students study and learn (e.g., through role-playing activities, classroom debates, cooperative learning projects).
Photo by Unsplash **Grades 9–12**	• Increasing integration of certain interests, values, and behaviors into one's *sense of self* (i.e., one's overall beliefs about who one is as a person; see Chapter 7) • Continuing decline in motivation to master academic subject matter • Prevalence of performance goals (e.g., getting good grades) rather than mastery goals for most students • Increase in cheating as a means of accomplishing performance goals • Increasing focus on postgraduation goals (e.g., college, careers); for some students, inadequate self-regulation strategies for achieving these goals	Sixteen-year-old Randall wants to become a pediatric oncologist—"a cancer doctor for kids," he tells people, "so I can help kids with leukemia, like my sister had." He knows he needs good grades in order to get into a prestigious college, which, in turn, can help him get into medical school. Yet he has trouble saying no when his friends ask him to go to a basketball game the night before an important biology test. And when he gets home after the game, he spends an hour playing video games instead of studying.	• Provide opportunities to pursue interests and values through out-of-class projects and extracurricular activities (e.g., community service work). • Make it possible for students to attain good grades through reasonable effort and effective strategies (e.g., minimize competitive grading practices, such as grading on a curve). • Discourage cheating (e.g., by giving individualized assignments and monitoring behavior during in-class assessments), and impose appropriate consequences when cheating occurs. • Teach self-regulation strategies that can help students reach their long-term goals (see Chapter 3).

Sources: J. M. Alexander et al., 2008; Blumenfeld et al., 2006; Bong, 2009; Brophy, 2008; Cizek, 2003; Corpus et al., 2009; Covington, 1992; Dijkstra et al., 2008; Dotterer et al., 2009; Dweck, 2000; Eccles et al., 1998; Hidi et al., 2004; Jacobs et al., 2002, 2005; Lepper et al., 2005; Nolen, 2007; Otis et al., 2005; Paley, 1984; Patrick et al., 2002; Peterson et al., 1993; Renninger, 2009; Schunk & Zimmerman, 2006; Shute, 2008; Watt, 2004; Wigfield, 1994; Wigfield et al., 1991, 2006; Wigfield & Wagner, 2005; Wilson & Corbett, 2001; Youniss & Yates, 1999.

Figure 5.17 Strategies to motivate students can be organized using the acronym MUSIC

MUSIC Acronym	Students are more motivated when they believe that:	Strategies to Motivate Students	These strategies can support students':
M	they are **eMpowered**	**Empower** students by giving them reasonable control and choices	need for autonomy
U	the content is **Useful**	Demonstrate the **usefulness** of activities for students' lives and goals	utility value, extrinsic motivation, and core goals
S	they can be **Successful**	Help students believe they can **succeed** at classroom activities	need for competence, self-worth, self-efficacy, mastery- and performance-approach goals, productive attributions, growth mindset beliefs, and mastery orientation **Can minimize students'** self-handicapping, learned helplessness, fixed mindset beliefs, performance-avoidance goals, and debilitating anxiety
I	the content or activity is **Interesting**	Stimulate **interest** and enjoyment in topics and activities	situational and individual interests, need for arousal, affect, facilitating anxiety, intrinsic motivation, and chances of experiencing flow
C	they have **Caring** relationships	Show and promote **caring** within the classroom community	need for relatedness and social goals

Sources: Based on B. D. Jones, 2009, 2018, 2020b.

stay in school until graduation.[168] Naturally, teachers can't give students total freedom over what they can and can't do at school, but they can do several things to enhance students' sense of autonomy. For one thing, they can allow students to make choices. As an example, this second-grade teacher allowed students to choose the order of activities:

> After the teacher announced, "Please complete these three activities in the next hour," a student asked, "Can we do them in any order we like?" The teacher replied, "Yes, that would be fine." The student was satisfied and chose an activity to begin.

Other examples include allowing students to make decisions, either individually or as a group, about the following:[169]

- Rules and procedures to make a class run more smoothly
- Specific topics for research or writing projects
- Specific works of literature to be read
- Due dates for some assignments
- The order in which specific tasks are completed
- Ways of achieving mastery of a particular skill or of demonstrating that it has been mastered (e.g., see Figure 5.18)
- The criteria by which some assignments will be evaluated
- The method by which they can learn the material assigned for homework
- Specific activities and procedures in extracurricular activities (school clubs, community service projects, etc.)

[168] Chittum & Jones, 2015; Hagger et al., 2005; Hardré & Reeve, 2003; Jang et al., 2012; E. J. Langer, 1997; Reeve et al., 1999; Shernoff et al., 2000; Soenens et al., 2011; Standage et al., 2003; Wijnia et al., 2015.

[169] Lane et al., 2006; Larson, 2000; Meece, 1994; Parkes et al., 2015; Reed et al., 2004; Stipek, 2002.

Figure 5.18 By offering several options for demonstrating understanding of a science fiction book, a sixth-grade language arts teacher enhances students' sense of autonomy

Choose One!

SCIENCE FICTION BOOK PROJECTS

_____ Write a "Dear Abby" letter from one of the main characters, in which he or she asks for advice on solving his or her main problem. Then answer the letter.

_____ Draw a time line of the main events of the book.

_____ Create a comic book or a comic strip page that features a major scene from the book in each box.

_____ Make a collage of objects and printed words from newspapers and magazines that give the viewer a feeling for the mood of the book.

_____ Your book probably takes place in an unusual or exotic setting, so illustrate and write a travel brochure describing that location.

_____ Imagine yourself as a scientist who has been asked to explain the unusual events in the book. Write up a report in scientific style.

_____ With other students who have read the same book, plan a bulletin board display. Write a plot summary; character and setting descriptions; discussions of special passages. Each group member must contribute one artistic piece—for example, new book cover, bookmark, poster, banner, some of the ideas listed above. Arrange the writing and artwork under a colorful heading announcing the book.

To the extent that students can make choices about such matters, they're more likely to be interested in what they're doing, to work diligently and persistently, and to take pride in their work.[170] Furthermore, students who are given choices—even students with serious behavior problems—are less likely to misbehave in class.[171]

In some situations, students' choices can be almost limitless. For example, in a unit on expository writing, a wide variety of student-selected research topics might be equally appropriate. In other situations, teachers may need to impose certain limits on the choices students make. For example, if a teacher allows a class to set its own due dates for certain assignments, it might be with the stipulation that the schedule evenly distributes the student and teacher workload over a reasonable time period.

Communicate with students in a clear, but less-controlling manner.

When students behave inappropriately, teachers must address the behavior (as discussed in Chapter 4). However, when possible, teachers should try to communicate to students in a less controlling manner. As an example, when a first-grade teacher sees a student behaving inappropriately, instead of saying "Stop doing that!" (which is very controlling), she could say, "That's not one of our choices." This response clearly communicates that the behavior is not acceptable, yet it also reminds students that they have the autonomy to make other choices.

[170] Deci & Ryan, 1992; Patall et al., 2010; Reeve, 2006; Ross, 1988; J. C. Turner, 1995.
[171] Dunlap et al., 1994; Lane et al., 2006; Powell & Nelson, 1997; Vaughn & Horner, 1997.

Teachers also communicate to students when they evaluate their performance. Unfortunately, such external evaluation can undermine students' sense of autonomy, especially if communicated in a controlling manner. Ideally, teachers should present evaluations of students' work not as "judgments" that remind students how they *should* perform but as information that can help them improve their knowledge and skills.[172] For instance, rather than saying, "You didn't follow my instructions for writing a persuasive essay" (which can be perceived as controlling), a teacher might say, "You make some good points, but your essay could be more convincing if you also include and rebut counterarguments to your point of view" (which can be perceived as informational feedback).

Use extrinsic reinforcers when necessary but do so in ways that preserve students' sense of autonomy.

Teachers can motivate students through praise, stickers, free time, good grades, and other extrinsic reinforcers. However, a potential problem with using extrinsic reinforcers is that they may undermine intrinsic motivation, especially if students perceive them to be limiting their choices, controlling their behavior, or in other ways undermining their sense of autonomy.[173] Extrinsic reinforcers may also communicate the message that classroom tasks are unpleasant "chores" (why else would a reinforcer be necessary?) rather than activities to be carried out and enjoyed for their own sake.[174]

Extrinsic reinforcers appear to have no adverse effects when they're unexpected (e.g., when students get special recognition for a public service project in the local community) or when they're not contingent on specific behaviors (e.g., when they're used simply to make an activity more enjoyable).[175] They can even be beneficial if used to encourage students not only to do something but also to do it *well*.[176] And if they communicate that students *have* done something well (as a high grade might) or have made considerable improvement, they can enhance students' sense of self-efficacy and competence and focus students' attention on mastering the subject matter.[177]

Sometimes students may initially find a new topic or skill boring or frustrating and therefore need external encouragement to continue.[178] So how can teachers use extrinsic reinforcers and still empower students? One strategy is to praise students in a manner that communicates information but doesn't show an intent to control behavior.[179] Consider these statements as examples:

- "Your description of the main character in your short story makes her come alive."
- "I think you've mastered the rolling *R* sound in Spanish."
- "This poster clearly states the hypothesis, method, results, and conclusions of your science project. Your use of a bar graph makes the differences between your treatment and control groups easy to see and interpret."

Another strategy is to teach students to reinforce *themselves* for their accomplishments, a practice that clearly keeps control in students' hands (see the discussion of self-imposed contingencies in Chapter 3).

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[172] Deci & Moller, 2005; Reeve et al., 2004; Stipek, 2002.
[173] Deci, 1992; Deci et al., 1999, 2001; Lepper & Hodell, 1989; Pulfrey et al., 2013; Reeve, 2006.
[174] Hennessey, 1995; Stipek, 1993.
[175] Cameron, 2001; Deci et al., 2001; Reeve, 2006.
[176] Cameron, 2001.
[177] Cameron, 2001; Deci & Moller, 2005; Hynd, 2003; Reeve, 2006.
[178] Cameron, 2001; Deci et al., 2001; Hidi & Harackiewicz, 2000.
[179] Deci, 1992; R. M. Ryan et al., 1983.

Figure 5.19 With this handout, a middle school information technology teacher asks students to reflect on their current strengths and identify specific goals for improvement

Ask students to set some personal goals for learning and performance.

Students typically work harder toward *self-chosen* goals than toward goals that others have chosen for them, possibly because self-chosen goals help them maintain a sense of autonomy and possibly also because students are more likely to think of self-chosen goals as being relevant to their own lives and needs—and hence as being useful and having *value*.[180] Students' goals should, of course, be compatible with their teachers' goals for student achievement. Figure 5.19 shows a handout that one middle school teacher used to encourage students to identify and commit to short-term goals for their learning.

Teaching Strategies That Demonstrate the Usefulness of Activities

A frequent question in any teacher's mind should be "Do students understand why they're doing this?" and the answer should always be yes. Students' values and goals are especially relevant to the "U" component of the MUSIC acronym—usefulness—as reflected in the next recommendations.[181]

Explicitly relate class activities to students' values, goals, and everyday lives.

Teachers can foster motivation for learning certain topics and skills by relating class activities directly to students' values, goals, and everyday lives.[182] For instance, teachers might demonstrate how a new skill might enhance their ability to help their family or neighborhood. Or, how learning certain topics can help them to achieve their career goals. And, in general, teachers can convey how classroom subject matter can help students make better sense of the world around them, as explained by this seventh-grade science teacher.

> "I always tried to tell them that science is everything that they do, it's them eating, them breathing, them, you know, going outside, you know, the building that we're in, um, so I tried to get them to understand that it's not just what we're learning in the classroom, it's them . . . Um, and so you know I always try to bring back a real-world example."[183]

Ask students to talk or write about how what they are learning is useful to their lives.

Although teachers can tell students why the class content is useful, it can also be helpful for students to tell each other why it's useful. For example, teachers can place students in groups of three or four and ask each person to explain to the others how what they're learning is useful to them.[184] Students may share ideas that teachers have never thought of previously and students may be more likely to believe one another than the teacher as to the reasons why the content is useful. Teachers can also ask students to write short essays, perhaps every month or so, about how the content is useful to their lives.[185]

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[180] Reeve, 2009b; Tabachnick et al., 2008; Wentzel, 1999; Wigfield & Eccles, 2000.
[181] Brophy, 2008; Deci & Moller, 2005; Eccles, 2007; Jacobs et al., 2005; Reeve, 2009b.
[182] P. A. Alexander et al., 1994; C. Ames, 1992; Blumenfeld et al., 2006; Brophy et al., 2009; Ferrari & Elik, 2003; Parrisius et al., 2020.
[183] Schmidt et al., 2019, p. 22.
[184] McGinley & Jones, 2014.
[185] Hulleman & Harackiewicz, 2009; Hulleman et al., 2017.

Create conditions that foster internalization of values essential for students' long-term academic and professional success.

No matter how much teachers try to make classroom topics and tasks interesting and engaging, some of them may have little appeal to students. In such situations, students will pursue classroom assignments more energetically and persistently if they truly appreciate the importance of classroom learning and achievement—*in general*—to their long-term goals. The more students have internalized the value of learning and academic success, the more they'll be cognitively engaged in school subject matter and the better their overall classroom performance is likely to be.[186] Values are also an important aspect of self-regulated learning: They underlie a general work ethic in which learners spontaneously engage in activities that, although not always fun or immediately gratifying, are essential for reaching long-term goals.[187]

Teaching Strategies That Foster Perceptions of Success

Students are more motivated when they perceive they can be successful in the classroom and in the school environment in general. Following are several key strategies for enhancing students' optimism about being successful—the "S" component of the MUSIC acronym.

Protect and enhance students' self-efficacy and overall sense of competence and self-worth.

Simply telling students they're "good" or "smart" or "nice" is unlikely to boost a low sense of self-worth.[188] Furthermore, vague, abstract statements such as "You're special" have little meaning in the concrete realities of young children.[189] A more effective approach is to enhance students' self-efficacy for specific activities and tasks. As students become increasingly confident about their ability to succeed on specific activities in particular domains, they may also gain a greater sense of competence in that domain and general self-worth.[190]

As noted earlier, learners' past successes in an activity enhance their self-efficacy for the activity (see Figure 5.13). Their previous successes are even more likely to increase their self-efficacy when they realize that *they themselves* have been responsible for their successes; that is, when they attribute their performance to their own effort and ability.[191] Teachers can play a role here by drawing students' attention to specific, concrete successes—including significant improvements—that students may not have noticed on their own.

But how do students acquire self-efficacy for a task they've never tried? As mentioned earlier, words of encouragement ("You can do it, I *know* you can!") can sometimes be helpful over the short run. But a more powerful approach is to show students that peers very similar to them have successfully mastered the task at hand.[192]

Ideally, learners should have a reasonably accurate sense of what they can and cannot accomplish, putting them in a good position to capitalize on their strengths, address their weaknesses, and set realistic goals.[193] Yet a tad of overconfidence can be beneficial, in that

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[186] Brophy, 2008; La Guardia, 2009; Otis et al., 2005; Ratelle et al., 2007; R. M. Ryan & Deci, 2000; Walls & Little, 2005.
[187] Harter, 1992; McCombs, 1996; R. M. Ryan et al., 1992.
[188] Crocker & Knight, 2005; Katz, 1993; Marsh & Craven, 1997.
[189] McMillan et al., 1994.
[190] Bong & Skaalvik, 2003; Harter, 1999; Osborne & Jones, 2011; Swann et al., 2007.
[191] Dweck, 2009; Lam et al., 2008; Schunk et al., 2014.
[192] Dijkstra et al., 2008; Schunk & Pajares, 2005.
[193] Försterling & Morgenstern, 2002; Martin, 2008; Wang & Lin, 2005.

Classroom Strategies

Enhancing Self-Efficacy and Self-Worth

- **Teach basic knowledge and skills to mastery.**
  A high school biology teacher makes sure all students clearly understand the basic structure of DNA before moving to mitosis and meiosis, two topics that require knowledge of DNA structure.

- **Define success in terms of task accomplishment or improvement, not in terms of performance relative to others.**
  A second-grade teacher and one of her students meet to discuss items in the student's end-of-year portfolio. They identify several ways in which the student's writing has improved during the past year.

- **Assure students that they can be successful at challenging tasks, and point out that others like them have succeeded before them.**
  When many students in beginning band express frustration about learning to play their instruments, their teacher tells them that in every year of his 15-year career, students have started out with little skill, but eventually they gained considerable proficiency. As evidence, he plays them a recording of a song from last year's end-of-year beginning band concert.

- **Assign large, complex tasks as small-group activities.**
  A middle school teacher has students work in groups of three or four to write research papers about early colonial life in North America. The teacher makes sure that the students in each group collectively have the skills in library research, writing, word processing, and art necessary to complete the task. She also makes sure that every student has unique skills to contribute to the group effort.

- **Help students track their progress.**
  Students in Ms. Chittum's class keep a binder that includes all of their writing. Near the end of the year when she hears one of her students say, "I'm not very good at writing," Ms. Chittum asks him to read some of his writing samples from the beginning of the year. After reading them, the student enthusiastically replies, "Wow, I've really improved; my writing from the beginning of the year is terrible!"

- **When negative feedback is necessary, present it in a way to communicate that the student has the ability to improve.**
  An 11th-grade teacher tells a student, "I can see from the past few assignments that you're having trouble with integrals. I know you can solve those problems; you're just not using the correct strategies. Let me show you how to do it."

Sources: Bandura, 1997, 2000; Butler, 1998; Covington, 1992; Deci & Ryan, 1985; Graham & Golen, 1991; Hawkins, 1997, p. 332 (weaving example); Pintrich & Schunk, 2002; Schunk, 1983; Shute, 2008; Urdan & Turner, 2005.

it entices learners to take on challenging activities that will help them develop new skills and abilities.[194]

The Classroom Strategies box "Enhancing Self-Efficacy and Self-Worth" provides several examples of how teachers can help students feel successful and boost their self-efficacy for specific topics and skills, as well as their more general beliefs about competence. Teachers should keep in mind, however, that academic achievement isn't necessarily the most important thing affecting students' sense of self-worth. For many children and adolescents, such factors as physical appearance, peer approval, and social success are more influential.[195] Ideally, then, teachers should help students achieve success in the nonacademic as well as academic aspects of their lives.

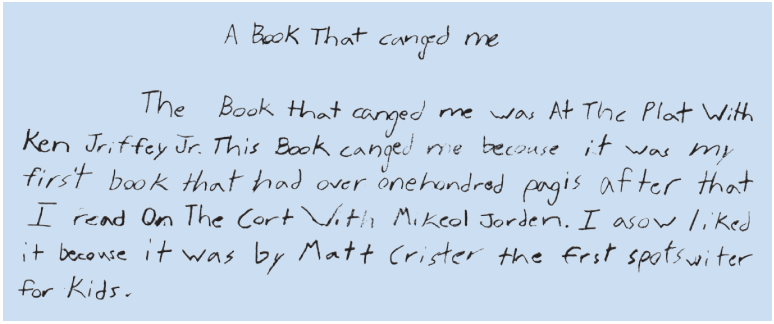
Present challenges that students can realistically accomplish.

Challenges can promote cognitive development (see Chapter 6) but, in addition, students who take on and master challenges gain a greater sense of self-efficacy and experience considerable satisfaction and pride in their accomplishments.[196] The artifact in Figure 5.20 reveals 8-year-old Anthony's pride about finishing his first 100-page book.

Challenges can have another benefit as well: They heighten students' interest in the subject matter.[197] When students are interested in learning about and mastering a topic,

[194] Assor & Connell, 1992; Lockhart et al., 2002; Pajares, 2005.
[195] Eccles et al., 1998; Rudolph et al., 2005.
[196] Clifford, 1990; Csikszentmihalyi & Nakamura, 1989; Deci & Ryan, 1992; Shernoff et al., 2000; J. C. Turner, 1995.
[197] Deci & Ryan, 1992; Miller & Meece, 1997; Perry et al., 2006; Strati et al., 2017; J. C. Turner, 1995.

Figure 5.20 In writing about "A Book That Changed Me," 8-year-old Anthony expresses pride in reading his first book of more than 100 pages. Also notice Anthony's personal interest in sports. One book (*At the Plate*) involves baseball; the other (*On the Court*) involves basketball.



A Book That canged me

The Book that canged me was At The Plat With Ken Griffey Jr. This Book canged me because it was my first book that had over onehundred pagis after that I read On The Cort With Mikeal Jordem. I asow liked it because it was by Matt Crister the frst spotswiter for Kids.

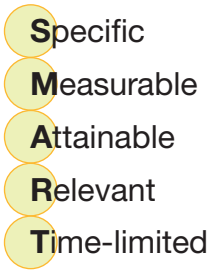
they often pursue further challenges of their own accord. They also exhibit considerable persistence in the face of difficulty—in part because earlier successes have led to greater self-efficacy—and they continue to remain interested even when they make frequent errors.[198] As you can see, then, challenges, self-efficacy, and interest mutually enhance one another, leading to a "vicious" cycle of the most desirable sort.

When are learners most likely to take on new and potentially risky challenges? Conditions such as the following appear to be optimal:[199]

- Standards for success are realistic for each individual.
- Scaffolding is sufficient to make success possible.
- There are few, if any, penalties for errors.
- The same rewards cannot be obtained by engaging in easier tasks, *or* rewards are greater for challenging tasks than for easy ones.
- Learners attribute their success to their own ability, effort, and strategies.

When the challenges are complex or extend over a lengthy period of time, teachers can help learners set a series of short-term, concrete goals—sometimes called **proximal goals**—along the way to their ultimate goal. **Goal-setting theory** describes the types of goals that are most likely to lead to high performance.[200] Although teachers should certainly encourage students to develop long-term goals (e.g., going to college, becoming an environmental scientist), such goals are sometimes too general and abstract to guide immediate behavior.[201] Goals are especially motivating when they're specific ("I want to learn how to play the C# scale on the trombone"), attainable but challenging ("Writing a limerick looks difficult, but I'm sure I can do it"), and the time to complete them is short term ("I'm going to learn to count to 100 in French by the end of the week").[202] Sometimes the acronym SMART is used to remember these three qualities (Specific, Attainable, and Time-limited) plus the ideas that they should be Measurable (you can determine if you're making progress toward your goal and you'll know when you achieve it) and Relevant (the goal aligns with your long-term goals or values) (see Figure 5.21). By setting and working toward proximal goals, students

Figure 5.21 Goals are more motivating when they have these "SMART" qualities



[198] Covington, 1992; Csikszentmihalyi et al., 2005; Deci, 1992; Harter, 1992.
[199] Brophy & Alleman, 1992; Clifford, 1990; Corno & Rohrkemper, 1985; Deci & Ryan, 1985; Dweck & Elliott, 1983; Stipek, 1993.
[200] Prominent goal-setting theorists include Edwin Locke, Gary Latham, and Martin Ford.
[201] Bandura, 1997; Husman & Freeman, 1999.
[202] Alderman, 1990; Brophy, 2004; Locke & Latham, 2006.

get regular feedback about the progress they're making; and if they succeed in achieving their goals, they may develop a greater sense of self-efficacy that they can master school subject matter and achieve at higher levels.[203] Such goals, accompanied by regular achievement of them, may be especially important for students with a history of academic failure.[204]

Teachers should keep in mind, however, that the school day shouldn't necessarily be one challenge after another. Such a state of affairs would be absolutely exhausting and probably quite discouraging. Instead, teachers should strike a balance between relatively easy tasks, which will boost students' self-efficacy over the short run, and the challenging tasks so critical for longer-term competence and self-worth.[205]

Form and communicate optimistic expectations and attributions.

Students are more likely to perceive that they can succeed when:

- their teachers hold optimistic expectations for their performance (within realistic limits), and
- when their teachers attribute students' successes and failures to things over which either students or teachers have control (students' effort, teachers' instructional methods, etc.).

The Classroom Strategies box "Forming Productive Expectations and Attributions" offers several strategies that can benefit students and teachers alike.

Minimize competition.

Competition is widespread in mainstream Western societies, not only in adult activities (e.g., in business and politics) but also in elementary and secondary schools. Schools compare students in a variety of ways. When teachers post "best work" on a bulletin board, they indirectly communicate that other papers aren't as good. When teachers grade "on the curve," their grades reflect how students stack up against one another, and only those at the top of the stack are identified as being successful. When students take college aptitude tests, their test scores reflect not what they know and can do but how their performance compares with that of their peers (more on this point in the discussion of norm-referenced scores in Chapter 10). Participation in school sports is also competitive, especially at the high school level, in that only students with the best athletic skills can join a team and only the best of the best achieve starting-player status.

Students are apt to be motivated by competition *if* they believe they have a reasonable chance of succeeding, which is often evidenced by winning.[206] But competition can have several negative side effects of which you should be aware:[207]

- It promotes performance goals rather than mastery goals.
- It can lead to undesirable or counterproductive behaviors, such as cheating or preventing classmates from getting needed resources for assignments.
- For students who expect to lose, it can lead to self-handicapping.
- For the students who *actually* lose, it can lead to a sense of low self-efficacy and self-worth.
- Because it makes differences among students more obvious, it encourages attributions to ability rather than to effort.

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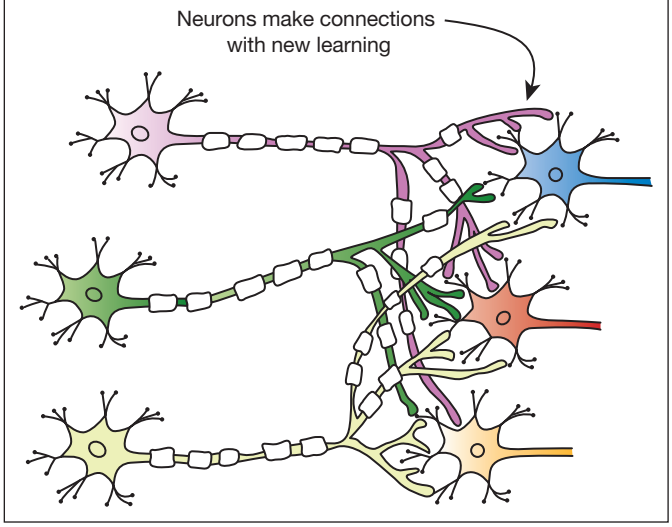
[203] Bandura, 1997; Locke & Latham, 2002; Page-Voth & Graham, 1999; Schunk & Pajares, 2005.
[204] E. S. Alexander, 2006.
[205] Spaulding, 1992; Stipek, 1993, 1996.
[206] Deci & Ryan, 1992; Johnson & Johnson, 2009; Linnenbrink, 2005.
[207] C. Ames, 1984; Deci & Moller, 2005; Hattie, 2008; Martin et al., 2003; Nicholls, 1984; Pekrun, 2006; Stipek, 1996; Thorndike-Christ, 2008.

Classroom Strategies

Forming Productive Expectations and Attributions

- **Remember that teachers can definitely make a difference.**
  The teachers at a historically low-achieving middle school meet once a month to discuss research articles they've identified and read related to strategies that are effective for the types of students at their school. They experiment with various strategies and share especially effective ones at their group meetings.
- **Consider multiple possible explanations for students' low achievement and classroom misbehaviors.**
  Mr. Abebe is frustrated that one of his students seems to intentionally misbehave during class. When talking to another teacher, he finds out that the student suffered a traumatic brain injury a few years prior. Because children with brain injuries have trouble inhibiting inappropriate behaviors through no fault of their own, Mr. Abebe works more closely with the student and his parents to develop a plan to help him better regulate his behavior.
- **Communicate optimism about what students can accomplish.**
  In September, a high school teacher tells his class, "In a few months I'll ask you to write a 15-page research paper. That may seem like a lot now, but we're going to start working on the various skills you'll need to research and write your paper. By the time your research paper is due, 15 pages won't seem like a big deal at all!"
- **Objectively assess students' progress and be open to evidence that contradicts your initial assessments of students' abilities.**
  A kindergarten teacher initially has low expectations for the daughter of migrant workers, a girl named Lupita who has previously had little access to books, toys, and other educational resources. When a video camera captures Lupita's strong leadership ability and her skill in assembling puzzles, the teacher realizes that Lupita has considerable potential and works hard to help her acquire the math and literacy skills she'll need to be successful in first grade.
- **Attribute students' successes to a combination of their ability and such controllable factors as effort and learning strategies.**
  In a unit on volleyball, a middle school physical education teacher tells students, "From what I've seen so far, you all have the capability to be good volleyball players. I like your effort during class and you're really applying many of the things we've talked about."
- **Attribute students' failures to factors that are controllable and easily changed.**
  A high school student seeks his teacher's advice about how he might improve his performance in her class. The teacher replies. "I wonder if part of the problem is that with your part-time job and all of your extracurricular activities, you just don't have enough time to study. Let's sit down before school tomorrow and look at what and how much you're doing to prepare for class."
- **When students fail despite obvious effort, attribute their failures to a lack of effective strategies and help them acquire such strategies.**
  Lisa is having difficulties on the challenging weekly quizzes in her biology class despite the fact that she studies every night. The teacher asks Lisa how she studies for the quizzes and finds out that she's trying to learn the material primarily through rote learning. The teacher tells Lisa that her effort is commendable, but that her choice of strategies is inadequate and shows her how to use more effective and meaningful learning strategies.
- **Explicitly teach students about what it means to have a growth mindset (i.e., an incremental view of intelligence) versus a fixed mindset.**
  After explaining what it means to have a growth mindset, Mrs. Alvarez shows her class a YouTube video of neurons connecting when someone learns something. She explains that the brain grows new connections and people "get smarter" when they learn new things in any subject area (see Figure 5.22).
- **Share examples of famous people who initially struggled academically or personally but overcame those struggles through effort and eventually excelled in life.**
  Mrs. Ahn shares a story in her chemistry class about how Michael Faraday struggled in his initial attempts to develop a machine that could change electricity into the motion of a wheel. He failed many times before his effort finally paid off in a successful machine. She also explains how Mr. Faraday was from a poor background and part of a religious minority group, which led to him facing a lot of class and religious prejudice. For homework, Mrs. Ahn has her students read similar examples about how Albert Einstein and Marie Curie also had to overcome intellectual and personal adversity.

Figure 5.22 Teachers can show students how neurons connect when people learn something new



Sources: Some ideas based on Blackwell et al., 2007 (growth mindset example); Brophy, 2006; Carrasco, 1981 (Lupita example); Curtis, 1992; Dweck, 2000, 2009; Good et al., 2003 (growth mindset example); Hattie, 2009; Hawley, 2005 (brain injury example); J. A. Langer, 2000; Lin-Siegler et al., 2016 (struggle story example); Pressley et al., 1987; Roeser et al., 2002; Skaalvik & Skaalvik, 2008; Weinstein et al., 1995.

For such reasons, competition ultimately leads to lower achievement for many students. When classroom success is judged on the basis of how well students perform relative to one another rather than on the basis of how much improvement they make, most students earn lower grades, show less creativity, and develop more negative attitudes toward school.[208] Competitive classroom environments may be especially disadvantageous to female students and to students from ethnic minority groups.[209]

Focus students' attention more on mastery goals than on performance goals.

To some degree, performance goals are inevitable in today's schools and in society at large.[210] Ultimately, however, mastery goals are the ones most likely to lead to effective learning and performance over the long run.[211] Focusing attention on mastery goals, especially when these goals relate to students' own lives, may especially benefit students from diverse ethnic backgrounds and students at risk for academic failure.[212]

Sometimes mastery goals come from within, especially when students have high interest in, and high self-efficacy for, learning something.[213] Yet classroom practices can also encourage mastery goals.[214] Some motivation theorists have suggested that mastery goal strategies can be organized using the acronym TARGETS, which stands for **T**ask, **A**utonomy, **R**ecognition, **G**rouping, **E**valuation, **T**ime, and **S**ocial support (see Table 5.3).[215] Note how the strategies in Table 5.3 are consistent with the MUSIC model strategies in that they give students empowerment, demonstrate the usefulness of the material, help students feel successful, interest students in the material, and foster a caring environment.

Teaching Strategies That Stimulate Interest

Students are more motivated when they're interested in the class activities—the "I" in the MUSIC acronym. Remember that interest can be thought of as a transitory, situational interest or a longer-term, individual interest, as reflected in the next two recommendations.

Conduct interest-arousing lessons and activities.

One essential strategy for keeping students interested and engaged in learning is to conduct lessons that address students' basic need for arousal. Educational psychologists have identified numerous ways of provoking situational interest in classroom subject matter, and many of them work by satisfying students' need for either cognitive or physical stimulation. For instance, teachers can do the following:[216]

- Model curiosity and enthusiasm about classroom topics.
- Occasionally incorporate novelty, variety, fantasy, or mystery into lessons and procedures.
- Provide challenging activities that are not too easy or too hard, but that push students to use their abilities.

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[208] Amabile & Hennessey, 1992; Covington, 1992; Graham & Golen, 1991; Krampen, 1987.
[209] Inglehart et al., 1994; Tyler et al., 2008.
[210] Butler, 1989; Elliot & McGregor, 2000.
[211] For example, see Elliot et al., 2005; Gabriele, 2007; Vansteenkiste et al., 2006.
[212] S. D. Miller & Meece, 1997; Wlodkowski & Ginsberg, 1995.
[213] Bandura, 1997; Murphy & Alexander, 2000; Schiefele, 1992.
[214] Church et al., 2001; Midgley, 2002.
[215] C. Ames, 1992; L. H. Anderman & Anderman, 2009; Epstein, 1989; Maehr & Anderman. 1993.
[216] Ainley, 2006; Andre & Windschitl, 2003; Beike & Zentall, 2012; Brophy et al., 2009; Chinn, 2006; Flum & Kaplan, 2006; Frenzel et al., 2009; Hidi & Renninger, 2006; Parrisius et al., 2020 (modeling enthusiasm); Patrick et al., 2009; Strati et al., 2017 (challenging activities); Zahorik, 1994.

Table 5.3 Seven TARGETS Principles That Support Mastery Goals

PRINCIPLE	EDUCATIONAL IMPLICATIONS
Classroom **tasks** affect motivation.	• Present new topics through tasks that students find interesting, engaging, and perhaps emotionally charged. • Encourage meaningful rather than rote learning. • Relate activities to students' lives and goals. • Provide sufficient support to enable students to be successful.
The amount of **autonomy** students have affects motivation, especially intrinsic motivation.	• Give students some choice about what and how they learn. • Teach self-regulation strategies. • Solicit students' opinions about classroom practices and policies. • Have students take leadership roles in some activities.
The amount and nature of the **recognition** students receive affect motivation.	• Acknowledge not only academic successes but also personal and social successes. • Commend students for improvement as well as for mastery. • Provide concrete reinforcers for achievement only when students are not already motivated to learn. • Show students how their own efforts and strategies are directly responsible for their successes.
The **grouping** procedures in the classroom affect motivation.	• Provide frequent opportunities for students to interact (e.g., cooperative learning activities, peer tutoring). • Plan small-group activities in which all students can make significant contributions. • Teach the social skills that students need to interact effectively with peers.
The forms of **evaluation** in the classroom affect motivation.	• Make evaluation criteria clear and specify them in advance. • Minimize or eliminate competition for grades (e.g., don't grade "on a curve"). • Give specific feedback about what students are doing well and how they can improve. • Teach students how to evaluate their own work.
How teachers schedule **time** affects motivation.	• Give students enough time to gain mastery of important topics and skills. • Include variety in the school day (e.g., intersperse high-energy activities among more sedentary ones). • Include opportunities for independent learning during the school day.
The amount of **social support** students believe they have in the classroom affects motivation.	• Create a general atmosphere of mutual caring, respect, and support among all class members (including students who are excessively shy, who have limited academic skills, who have physical disabilities, etc.). • Convey affection and respect for every student, along with a genuine eagerness to help every student succeed.

Sources: C. Ames, 1992; E. M. Anderman & Maehr, 1994; L. H. Anderman & Anderman, 2009; L. H. Anderman et al., 2011; Bong, 2001; Brophy, 2004, 2008; Danner, 2008; Epstein, 1989; Graham & Weiner, 1996; Maehr & Anderman, 1993; Meece, 1994; Middleton & Midgley, 2002; Patrick et al., 1997; J. C. Turner, Meyer, et al., 1998; Urdan et al., 2002.

- Encourage students to identify with historical figures or fictional characters and to imagine what these people might have been thinking or feeling.
- Present dramatic stories with novel characters and unusual endings.
- Provide opportunities for students to respond actively to the subject matter, perhaps by manipulating physical objects, creating new inventions, debating controversial issues, or teaching something they've learned to peers.
- Incorporate newer technologies that are novel to students and challenge them to solve interesting problems (see Figure 5.23).[217]

Figure 5.23 Incorporating technologies into activities, such as programming a robot to move in different ways, can generate situational interest

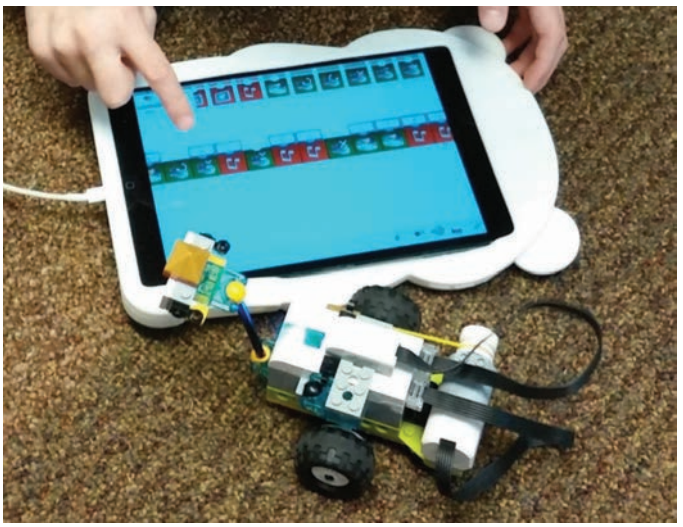

Figure 5.24 presents examples of how teachers might generate situational interest in a variety of content domains. Teachers can also create the conditions for flow shown previously in Figure 5.8 by designing activities that have clear goals, provide students with immediate feedback, challenge students at an appropriate level (the activities are not too easy or too difficult), and can be completed without distractions that interfere with students' ability to concentrate on the activity.

[217] Jones, 2020b.

Figure 5.24 Examples of how teachers might generate situational interest in various content domains

Art: Have students make a mosaic from items they've found on a scavenger hunt around the school building.

Biology: Have class members debate the ethical implications of conducting medical research on animals.

Creative writing: Ask students to write newspaper-like restaurant reviews of the school cafeteria or neighborhood fast-food restaurants.

Geography: Present household objects not found locally, and ask students to guess where they might be from.

Health education: In a lesson about alcoholic beverages, have students role-play being at a party and being tempted to have a beer or wine cooler.

History: Have students read children's perspectives of historical events (e.g., Anne Frank's diary during World War II, Zlata Filipovic's diary during the Bosnian War).

Language arts: Examine lyrics in popular hip-hop music, looking for grammatical patterns and literary themes.

Mathematics: Have students play computer games to improve their automaticity for number facts.

Music: In a unit on musical instruments, let students experiment with a variety of simple instruments.

Physical education: Incorporate steps from hip-hop, swing, or country line dancing into an aerobics workout.

Physical science: Have each student make several paper airplanes and then fly them to see which design travels farthest.

Reading: Turn a short story into a play, with each student taking a part.

Spelling: Occasionally depart from standard word lists, instead asking students to learn how to spell the names of favorite television shows or classmates' surnames.

Sources: Some ideas derived from Alim, 2007; Brophy, 1986; Lepper & Hodell, 1989; McCourt, 2005; Spaulding, 1992; Stipek, 1993; Wlodkowski, 1978.

Relate activities to students' individual interests.

To design instruction with consideration for students' individual interests, teachers first need to *identify* students' interests, because these interests often vary.[218] Through observations, teachers can pay attention to what students do in their free time. For example, teachers might notice the types of books students read, games they play, or websites they visit when they have choices. Teachers can also talk to students informally before or after class about their interests and hobbies. More formally, teachers can briefly interview or survey students about their interests. A survey given to students at the beginning of the school year might include such questions as, "What do you like to do in your spare time?" "What are some of your interests?" or "What types of careers are you considering?" Teachers can also give assignments and activities that provide students with choices so that they can select topics that interest them.[219]

Teaching Strategies That Show and Promote Caring

Students are more motivated to do well in school when they believe that their teacher and peers *care* about their academic success and general well-being.[220] The following strategies are relevant to this "C" component of the MUSIC acronym.

[218] Kerger et al., 2011.
[219] A. W. Williams, 2013.
[220] Allen et al., 2018; King, 2015; Quin, 2017; Raufelder et al., 2015; Rimm-Kaufman et al., 2014.

Show students that you respect them and are concerned about their well-being.

There are a variety of ways in which teachers can communicate that they respect students and are concerned about their well-being.[221] For example, they can provide extra assistance or a sympathetic ear in times of trouble and express interest in students' outside activities and interests. As an example, a middle school teacher tells one of his students that he saw her dancing troupe's performance at the local shopping mall over the weekend. "I had no idea you were so talented," he says. "How many years have you been studying dance?" Several other strategies that teachers can use to identify students' interests were provided in the previous section about relating activities to students' individual interests.

Teachers can also share some information about their personal lives (as appropriate) because doing so can help students find things they have in common with the teacher. And when students and teachers see themselves as having things in common, they're more likely to have better relationships.[222] As a third-grade child who loved sports told his parent: "Mr. Jackson is the best teacher I ever had because he knows about sports." When the parent replied, "Your teacher last year knew a lot about sports," the student responded, "Yes, but Mr. Jackson *talks* about sports."

Teachers can also demonstrate caring by attending to students' *academic* needs—for instance, by being well prepared for each lesson, holding high expectations for students' achievement, and tailoring instructional strategies to students' current knowledge and ability levels.[223] Such caring messages may be especially important for low-achieving students, students from low-income families, and students from culturally different backgrounds.[224]

Provide regular opportunities for students to interact productively with one another.

Group-based activities, such as discussions, debates, role-playing, cooperative learning tasks, and competitions among two or more teams of equal ability, all provide the means through which students can satisfy their need for relatedness while simultaneously acquiring (and possibly co-constructing) new knowledge and skills.[225] Activities are most effective when all students have something unique to contribute so that they can all "shine" in some way and gain the admiration of peers.

Create a classroom environment in which students respect one another.

Teachers can help ensure that students care about each other by creating a classroom culture in which respect for *everyone's* needs and well-being is paramount. For example, when a second-grade teacher overhears two students making fun of a fellow student who stutters, she discretely pulls them aside, explains that the classmate is extremely self-conscious about his speech and is working hard to improve it, and tactfully reminds the students that they, too, have imperfections as well as strengths.

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[221] Juvonen, 2006; Pianta et al., 2008; Reyes et al., 2012; Roorda et al., 2011.

[222] Gehlbach et al., 2016.

[223] C. Bergin & Bergin, 2009; Reeve, 2006; Wentzel, 1997.

[224] Bergin & Bergin, 2009; Meehan et al., 2003; Milner, 2006; Phelan et al., 1991.

[225] Blumenfeld et al., 2006; Brophy, 1987; Linnenbrink, 2005; Urdan & Maehr, 1995.

5.4 Emotions and Their Effects on Motivation and Learning

Big Idea 5.4 **Learners' emotions influence and are influenced by both their motives and cognitive processes.**

The Role of Emotions in Student Motivation and Learning

At the beginning of the opening case, Michael probably feels quite frustrated and doesn't like algebra very much. After learning effective strategies and improving his performance, however, he studies every day except Friday. At this point, it's likely that Michael takes pride in his performance and perhaps even enjoys working on his algebra assignments. Michael's feelings of frustration, pride, and enjoyment are his **emotions**, which are subjectively experienced reactions to objects or events that are accompanied by physiological and behavioral changes in the body.

Although some emotions are labeled as positive (e.g., happiness, joy, excitement, love) and others as negative (e.g., anger, anxiety, fear, sadness), it's not always clear which emotions are most beneficial in a learning environment. For instance, teachers may want their students to enjoy learning and to be excited about it—that is, to have positive emotions. Yet, when students are too excited or too silly, they may become distracted from the learning activities. Similarly, it's possible that negative emotions such as anxiety and frustration can be helpful in certain learning situations, such as when they motivate students to try harder and find creative solutions to problems.

In addition, cultural differences exist in how positive emotions should be viewed. Some cultures that place a high priority on social harmony discourage children from feeling pride about personal accomplishments because such an emotion focuses attention on an individual rather than on the overall group.[226] And for some cultural groups, joy and happiness can often be too much of a good thing. For instance, many Chinese and Japanese advocate striving for contentment and serenity—relatively calm emotions—rather than joy, excitement, and other intense emotions.[227]

Nonetheless, issues related to **social and emotional learning**—developing students' social and emotional abilities that contribute to their academic success and personal well-being—are important for teachers to understand.[228] The following principles explain the role of *emotions* in students' motivation and learning; the role of social skills and how to develop them is explained in Chapter 7.

Emotions and motivation are interrelated.

Without a doubt, people's automatic emotional reactions to certain events—for instance, a quick, fearful retreat from a person wielding a gun or knife—increase their chances of physical survival.[229] But emotions also play a significant role in the more intentional, goal-directed aspects of human motivation, such as when students solve math problems.[230] As a general rule, people act in ways they think will help them feel happy and comfortable rather than sad, confused, or angry—feelings that depend, in part, on whether they're satisfying their basic needs and accomplishing their goals.[231]

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[226] Eid & Diener, 2001.
[227] Cole & Tan, 2007; Kagan, 2010; Mesquita & Leu, 2007.
[228] Durlak et al., 2015; Elias et al., 1997; Weissberg, 2019; Wentzel, 2019; Wentzel & Ramani, 2016.
[229] Damasio, 1994; Öhman & Mineka, 2003.
[230] Di Leo et al., 2019.
[231] Ackerman et al., 2007; E. M. Anderman & Wolters, 2006; Mellers & McGraw, 2001; J. L. Tsai, 2007.

Some emotions, such as embarrassment, pride, guilt, and shame—collectively known as **self-conscious emotions**—are closely tied to people's self-evaluations and thus affect their sense of self-worth.[232] When people evaluate their behaviors and accomplishments as being consistent with their culture's standards for appropriate and desirable behavior, they're apt to feel proud. In contrast, when they see themselves as failing to live up to those standards—for instance, when they thoughtlessly cause harm to someone else—they're apt to feel guilty and ashamed.

Emotions and motivation are interrelated in other ways, too. When learners pursue a task they find interesting, they experience considerable positive emotions (e.g., pleasure, enjoyment, excitement).[233] Positive emotions come with high self-efficacy as well. Furthermore, learners' reactions to the outcomes of events depend on how they *interpret* those outcomes—in particular, whether they hold themselves, other people, environmental circumstances, or something else responsible for what has happened (recall the earlier discussion of attributions).[234]

Emotions are closely tied to learning and cognition.

Emotions are often an integral part of learning, memory, and cognition.[235] For example, while learning how to perform a task, learners simultaneously learn whether or not they like doing it.[236] Learners can think more creatively and solve problems more effectively when they enjoy the topic they're working with, and their academic successes often result in feelings of excitement, pleasure, and pride.[237] In contrast, learners may feel frustrated and anxious when they must struggle to master new material (as Michael does in the opening case study), and they may develop a dislike for the subject matter.[238]

Additionally, specific facts and ideas can occasionally evoke emotional reactions, as you'll discover in the following exercise.

See For Yourself

Flying High

As you read each of the following statements, decide whether it evokes positive emotions (e.g., happiness, excitement), negative emotions (e.g., sadness, anger), or no emotional response whatsoever. Check the appropriate blank in each case.

	Positive Emotions	Negative Emotions	No Emotions
1. The city of Denver opened DIA, its international airport, in 1995.	_____	_____	_____
2. In a recent commercial airline crash, 90 passengers and 8 crew members lost their lives.	_____	_____	_____
3. A dozen people survived that crash, including a 3-month-old infant found in the rear of the plane.	_____	_____	_____
4. Some flights between North America and Europe now include two full-course meals.	_____	_____	_____

[232] Hidi & Renninger, 2006; Lewis, 2019; Pekrun, 2006; Pekrun et al., 2002; Schiefele, 1998.
[233] Lewis & Sullivan, 2005; Pekrun, 2006.
[234] Hareli & Weiner, 2002; Harter, 1999; J. E. Turner et al., 2002.
[235] A certain structure in the brain, the *amygdala*, is especially important in making affect–cognition connections, in that it enables learners to associate particular emotions with particular stimuli or memories. See Adolphs & Damasio, 2001; Keltner & Horberg, 2015; Kuhbandner et al., 2011; Pekrun et al., 2017; Phelps & Sharot, 2008.
[236] Zajonc, 1980.
[237] E. M. Anderman & Wolters, 2006; Fredrickson, 2009; McLeod & Adams, 1989; Pekrun, 2006; Snow et al., 1996.
[238] Carver & Scheier, 1990; Goetz et al., 2008; Stodolsky et al., 1991.

You probably had little or no emotional reaction to Statement 1 (the opening of DIA). In contrast, you may have experienced unpleasant emotions when you read Statement 2 (the high number of deaths) and more pleasant emotions when you read Statement 3 (the surviving infant). Your response to Statement 4 (the two full-course meals) may have been positive, negative, or neutral, depending on your previous experiences with airline cuisine.

As learners think about, learn, or retrieve something, their very thoughts and memories may become emotionally charged—a phenomenon known as **hot cognition**.[239] For example, learners might get excited when they read about advances in science that could lead to effective treatments for spinal cord injuries, cancer, or mental illness. They may feel sad when they read about living conditions in certain parts of the world, and they will likely get angry when they learn about the atrocities committed against African American slaves in the pre–Civil War days of the United States. When information is emotionally charged, learners are more apt to pay attention to it, continue to think about it over a period of time, and repeatedly elaborate on it.[240] Later on, learners can usually retrieve material with high emotional content more easily than they can recall relatively nonemotional information.[241] It appears that learners' emotional reactions to classroom subject matter become integral parts of their network of associations in long-term memory.[242]

Encountering information that conflicts with what they currently know or believe can cause learners considerable mental discomfort, something that Piaget called *disequilibrium* but that many contemporary theorists call **cognitive dissonance**. Such dissonance typically leads learners to try to resolve the inconsistency in some way, perhaps by undergoing conceptual change or perhaps by finding fault with the new information (recall the discussion of confirmation bias in Chapter 2).[243] However, not all cultural groups are bothered by logical conflicts. When one of us authors was in China a few years ago, she was struck by how often people described something as being both one thing and also its opposite. Researchers report that many East Asians are quite tolerant and accepting of logical contradictions.[244]

Productive emotions can trigger effective learning strategies.

How effectively learners think about and make sense of new information depends, in part, on their general mood while they're studying. In general, positive emotions, such as feelings of pleasure and excitement, lead learners to attend actively to the subject matter at hand, to work hard to make sense of it, to think creatively and open-mindedly about it, and to use self-regulating learning strategies to keep themselves on task. In contrast, if learners feel generally sad or frustrated—or if they're bored with the subject matter—they're likely to process new information in more superficial, inflexible ways (e.g., by using rehearsal).[245]

Emotions can also trigger certain behaviors.

Learners' emotions often lead them to behave in certain ways. For example, feeling guilty or ashamed about something they've done can lead children and adolescents to make amends for their wrongdoings. Feeling frustrated during unsuccessful attempts to reach

[239] Kret & Bocanegra, 2016; Wang et al., 2017.
[240] G. H. Bower, 1994; Heuer & Reisberg, 1992; Schacter, 1999; Zeelenberg et al., 2006.
[241] Barkley, 1996; McGaugh, 2015; Phelps & Sharot, 2008; Reisberg & Heuer, 1992. Occasionally people have trouble retrieving highly anxiety-arousing memories. This phenomenon, known as *repression*, may occasionally occur with very traumatic personal events but is unlikely to be a factor in the retrieval of academic subject matter; for example, see Goodman et al., 2003; McNally & Geraerts, 2009.
[242] G. H. Bower & Forgas, 2001.
[243] Harmon-Jones, 2001; Marcus, 2008; Sinatra & Mason, 2008.
[244] Heine, 2007; Norenzayan et al., 2007; Peng & Nisbett, 1999.
[245] Ahmed et al., 2013; Di Leo et al., 2019; Fredrickson, 2009; Linnenbrink & Pintrich, 2004; Pekrun, 2006; Pekrun et al., 2002; Snow et al., 1996.

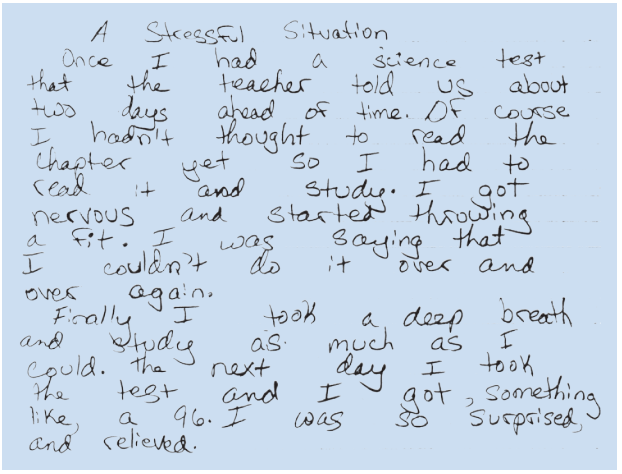
important goals can lead them to lash out at others or withdraw from classroom activities.[246] Feeling anxious about an upcoming event can be especially powerful in its influence on behavior.

On average, cultural groups differ in the degree to which they show their feelings in their behaviors and facial expressions. For example, whereas Americans and Mexicans are often quite expressive, people from East Asian cultures tend to be more reserved and may be reluctant to confide in other people in times of sadness or distress.[247] Considerable variability exists in any large society, of course. For instance, in one study with Americans, people of Irish ancestry were more apt to reveal their feelings in their facial expressions than were people of Scandinavian ancestry.[248]

Some anxiety is helpful, but a lot is often a hindrance.

Students get anxious for a variety of reasons. Some get anxious taking a test, while others get anxious speaking in front of their classmates. **Anxiety** is that feeling of uneasiness and apprehension about a situation that students get when they're not sure what the outcome will be. This feeling is accompanied by a variety of physiological symptoms, including a rapid heartbeat, increased perspiration, and muscular tension (e.g., a "knot" or "butterflies" in the stomach). But interestingly, a small amount of anxiety often improves performance. When it does so, it's called **facilitating anxiety**. A little anxiety spurs students into action—for instance, they go to class, complete assignments, and study for exams—which can lead to higher grades (see Figure 5.25).[249] However, a great deal of anxiety usually interferes with effective performance.[250] When it has this counterproductive effect, it's known as **debilitating anxiety**.

Figure 5.25 This writing sample, by 14-year-old Loretta, illustrates how anxiety can sometimes improve learning and achievement


A Stressful Situation
Once I had a science test that the teacher told us about two days ahead of time. Of course I hadn't thought to read the chapter yet so I had to read it and study. I got nervous and started throwing a fit. I was saying that I couldn't do it over and over again.
Finally I took a deep breath and study as much as I could. The next day I took the test and I got something like a 96. I was so surprised and relieved.

At what point does anxiety stop facilitating and begin debilitating performance? Very easy tasks—things that learners can do almost without thinking (e.g., running)—are typically facilitated by high levels of anxiety. But more difficult tasks—those that require considerable thought and mental effort—are best performed with only a small or moderate level of anxiety.[251] A lot of anxiety in difficult situations can interfere with several processes critical for successful learning and performance, including:[252]

- Paying attention to what needs to be learned
- Processing information effectively (e.g., by organizing or elaborating on it)
- Retrieving and using information and skills that have previously been learned

Anxiety is especially likely to interfere with such processes when a task places heavy demands on working memory or long-term memory, for instance, when a task involves problem solving or creativity. In such situations, learners may be so preoccupied with doing poorly that they can't get their minds on what they need to accomplish.[253]

think about it
Did you previously believe that *any* amount of anxiety is detrimental? If so, have you now revised your thinking about anxiety's effects?

[246] Berkowitz, 1989; E. Skinner et al., 2008; Wisner Fries & Pollak, 2007.
[247] Camras et al., 2006; Cole & Tan, 2007; Kim et al., 2008; Morelli & Rothbaum, 2007; Tyler et al., 2008.
[248] Camras et al., 2006; Cole et al., 2006; Tsai & Chentsova-Dutton, 2003.
[249] Preckel et al., 2006; Shipman & Shipman, 1985; Strack & Esteves, 2015; Travis et al., 2020.
[250] Hartwright et al., 2018; Vogel & Schwabe, 2016; Young & Young, 2015.
[251] Kirkland, 1971; Landers, 2007; Zeidner & Matthews, 2005.
[252] Cassady, 2004; Eysenck, 1992; Zeidner & Matthews, 2005.
[253] Ashcraft, 2002; Beilock, 2008; Matthews et al., 2006; J. C. Turner et al., 1998.

Facilitating anxiety is more common when learners face a *challenge*, a situation in which they believe they can probably achieve success with a significant yet reasonable amount of effort.[254] Learners are more likely to experience debilitating anxiety when they face a *threat*, a situation in which they believe they have little or no chance of succeeding. Yet, students are apt to have some degree of anxiety, either facilitating or debilitating, in situations in which their physical safety is at risk, when their self-worth is threatened, when they're in new situations, when they have a lot of schoolwork, and prior to and during testing.[255] Learners from different cultural backgrounds may have somewhat different sources of anxiety. For instance, some children and adolescents from Asian American families may feel so much family pressure to perform well in school that they regularly experience debilitating test anxiety.[256] And young people who are recent immigrants to a new country are often anxious about a variety of things: how to behave, how to interpret others' behaviors, how to make friends, and, more generally, how to make sense of the strange new culture in which they now find themselves (recall the discussion of cultural mismatch in Chapter 4).[257]

Table 5.4 describes developmental trends in anxiety, as well as in emotions more generally, across childhood and adolescence.

Teaching Strategies: Generating Productive Emotions for Learning

Students learn at high levels not only when they're genuinely motivated to master academic subject matter but also when their emotional states are conducive to productive cognitive processes and behaviors. Following are some recommendations for fostering feelings and emotions that can enhance students' learning.

Get students emotionally involved in the subject matter.

Academic subject matter certainly doesn't need to be dry and emotionless. On the contrary, students will often remember more if they have strong feelings about what they're studying, perhaps getting very excited about a scientific discovery or quite angry about past or present social injustices. In addition to presenting subject matter that evokes emotional reactions, teachers can promote hot cognition by revealing their own feelings about a topic. For instance, they might bring in outside materials (e.g., websites, articles, videos) about which they're excited, present material in an enthusiastic or impassioned fashion, and share the particular questions and issues about which they themselves are concerned.[258] And teachers can occasionally incorporate a few gamelike features into classroom tasks and activities.[259] For example, they might assign simple crossword puzzles to introduce new spelling words or use a game format for a class history review.

Help students to better regulate their emotions.

Teachers can help students to capitalize on their positive emotions and avoid the harmful effects of negative emotions by teaching them to better regulate their emotions in ways that are socially acceptable in school. Students who engage in **emotion regulation** monitor, evaluate, and modify their emotional reactions to accomplish their goals.[260] Students who

[254] Combs et al., 1976; Deci & Ryan, 1992; Zeidner & Matthews, 2005.
[255] Ashcraft, 2002; Cassady, 2004; Chabrán, 2003; Covington, 2009.
[256] Pang, 1995.
[257] Cole & Tan, 2007; Dien, 1998; Igoa, 1995.
[258] Brophy, 2004; Brophy et al., 2009; Pekrun, 2006.
[259] Brophy, 2004.
[260] Gross, 2001, 2015; Gross & Thompson, 2007; Stifter & Augustine, 2019; Thompson, 1994; Wisner Fries & Pollak, 2007.

Developmental Trends

Table 5.4 Anxiety and Other Emotions at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **Grades K–2**	• Possible culture shock and intense anxiety upon beginning school, especially if students have had few or no preschool experiences • Possible separation anxiety when parents first leave the classroom (especially in the first few days of kindergarten) • Reduced anxiety when teachers and other adults are warm and supportive • Only limited control of overt emotional behaviors (e.g., may cry easily if distressed or act impulsively if frustrated)	Jeff is quite nervous about going to kindergarten. On his first day, he's reluctant to say good-bye to his mother. When Mom finally tells him she has to leave, he bursts into tears.	• Ask parents about routines followed at home; when appropriate, incorporate these routines into classroom procedures. • If possible, provide an opportunity for students to meet you a few days or weeks before school begins. • Be warm, caring, and supportive with all students (but check school policies about hugs and other forms of physical affection). • Address inappropriate behaviors gently but firmly (see Chapter 9).
JohnnyGreig/E+/ Getty images **Grades 3–5**	• Increasing control of overt emotional behaviors • Emergence of math anxiety for some students • Tendency for close friends (especially girls) to talk about and dwell on negative emotional events; continues into adolescence • Possible anxiety and stress as a result of others' racist and sexist behaviors (e.g., racial slurs, unkind remarks about emerging sexual characteristics); continues into adolescence	For 9-year-old Tina, basic arithmetic procedures are easy to understand, but she can't understand the new procedures she's learning for fractions. She becomes increasingly frustrated when her attempts to solve fraction problems yield incorrect answers. Tina's aversion to math soon leads her to avoid the subject whenever possible, both in and outside of school.	• Monitor students' behaviors for subtle signs of serious anxiety or depression; talk with students privately if they seem anxious or upset; consult with the school counselor, if necessary. • Ensure that students master basic concepts and procedures before proceeding to more complex material. • Insist on respect for all class members' characteristics, feelings, and backgrounds; don't tolerate racist or sexist actions.
Photo by Unsplash **Grades 6–8**	• General decline in positive, upbeat emotions; extreme mood swings, partly as a result of hormonal changes accompanying puberty • Increased anxiety and potential depression accompanying the transition to middle school or junior high school • Decrease in enjoyment of school (especially for boys) • Increasing anxiety about how one appears to others (see *imaginary audience* in Chapter 7)	At the beginning of seventh grade, Jeannie moves from a small, close-knit elementary school to a large junior high school. At her new school, she knows only a few students in each class, and her teachers present themselves as cold, no-nonsense disciplinarians. Jeannie struggles in her efforts to make new friends and feels awkward when she must occasionally sit by herself in the cafeteria. Before long, she regularly complains of stomachaches so that she can stay home from school.	• Expect mood swings, but monitor students' behavior for signs of long-term depression. • Make a personal connection with every student; express confidence that students can succeed with effort; and offer support to facilitate success. • Design activities that capture students' interest in the subject matter; relate topics to students' personal lives and goals. • Provide opportunities for students to form friendships with classmates (e.g., cooperative group projects).
Photo by Unsplash **Grades 9–12**	• Emotional volatility (especially in grades 9 and 10) • Increasing ability to reflect on and control extreme emotional reactions, due in part to ongoing brain maturation • Considerable anxiety about school if transition to a secondary school format has been delayed until high school • Susceptibility to serious depression in the face of significant stress • Increasing prevalence of debilitating anxiety regarding tests, especially high-stakes tests • Feelings of uncertainty about life after graduation	In a text message to a classmate, 15-year-old Jonathan reveals his crush on a popular girl in their class. The classmate thinks the message is amusing ("I can't believe that loser thinks he has a chance with that girl!") and forwards it to more than 50 members of the sophomore class. Jonathan is at a loss about how to cope with his humiliation and contemplates suicide as the only solution to the problem. (*Teachers should immediately report any suspicions of planned student suicides*; see Chapter 7.)	• Be especially supportive if students have just made the transition from an elementary school format. • Take seriously any signs that a student may be considering suicide (e.g., overt or veiled threats, such as "I won't be around much longer"; actions that indicate "putting one's affairs in order," such as giving away prized possessions). • Give frequent classroom assessments so that no single test score is a "fatal" one; help students prepare for high-stakes tests (see Chapter 10). • Present multiple options for postgraduation career paths.

Sources: Arnett, 1999; Ashcraft, 2002; Benes, 2007; Benner & Graham, 2009; Chabrán, 2003; DuBois et al., 2002; Eccles & Midgley, 1989; Elkind, 1981; Gentry et al., 2002; Hill & Sarason, 1966; Hine & Fraser, 2002; Kerns & Lieberman, 1993; Kuhl & Kraska, 1989; Lapsley, 1993; Larson & Brown, 2007; Larson et al., 2002; D. K. Meyer & Turner, 2006; Midgley et al., 2002; Roderick & Camburn, 1999; Rose, 2002; Rudolph et al., 2001; Snow et al., 1996; Spear, 2000; Wang et al., 2020; Wiles & Bondi, 2001.

are able to effectively regulate their emotions are more likely to have better social skills, make better adjustments to the demands of school, be more accepted by their peers, succeed academically, and experience more positive emotions and fewer negative ones.[261] It's especially important for children to be able to regulate negative emotions such as anger, fear, and sadness because being able to do so reduces the likelihood of extreme negative emotional expressions and aggression.

It's important for teachers to consider, however, that students' cultural backgrounds can affect what they perceive to be acceptable expressions of emotions. For example, mainstream Western culture encourages children to act and speak up if someone infringes on their rights and needs, and expressing anger in a nonviolent way is considered quite acceptable. In many southeast Asian cultures, however, any expression of anger is viewed as potentially undermining adults' authority or disrupting social harmony.[262] Children brought up in some cultural groups, including many Buddhist groups and certain Native American and Pacific Islander communities, are encouraged to not even *feel* anger.[263] As an illustration, if children growing up in the Tamang culture of Nepal are unfairly embarrassed or accused, they might respond, "Tilda bomo khaba?" ("Why be angry?"). After all, the event has already occurred, and being angry about it serves no purpose.[264]

Within any culture, parents and caregivers play an important role in helping children to develop their emotion regulation skills in their early years.[265] But as children attend school, teachers and other adults can also play an important role in developing these skills. Although teachers need to be aware of and sensitive to cultural differences in emotional expressions, they also need to help students learn to regulate their emotions in ways that are socially acceptable within the school culture. Teachers can use the following strategies to help students to better regulate their emotions: [266]

- Help students to become aware of their emotions and how emotions can serve different functions. For example, Mrs. Martin explains to her class that anxiety lets them know that something around them may be harmful or dangerous so that they can react to it.
- Teach students to avoid situations they think may lead to an undesirable emotional response such as anger or aggression. For example, Mr. Singh tells Rachael not to intentionally walk by the student who always says or does something that makes her mad and causes her to retaliate in an aggressive manner.
- Tell students to think of something else (i.e., redirect their attention) when they experience an emotion that negatively affects their thinking or behavior. For example, when Chenaye is not really concentrating on her class project because she's sad that she can't go outside for recess on a rainy day, her teacher reminds her of something else "fun" that is happening that day or the next.
- Teach students strategies for keeping anxiety at a facilitative—and not a debilitating—level (specific strategies are provided in the next section).
- Model effective emotion regulation. For example, before showing students how to solve a difficult problem, Mrs. Rodriguez says, "I'm nervous because this looks like a hard problem. So, I'm going to take a deep breath and think about what I need to do. First, I need to figure out what I already know, then..."

[261] Blair et al., 2016; Denham et al., 2003, 2013; Graziano et al., 2007; Kwon et al., 2017; Spinrad et al., 2006.
[262] Mesquita & Leu, 2007; Morelli & Rothbaum, 2007; Zahn-Waxler et al., 1996.
[263] Cole et al., 2002, 2006; Solomon, 1984.
[264] Cole et al., 2002, p. 992.
[265] Stifter & Augustine, 2019.
[266] Gross, 2013; Gross & Thompson, 2007; Meyer, 2016; Volkaert et al., 2020; Webb et al., 2012.

The following strategies focus specifically on what teachers can do when students feel sad or disappointed after an unfortunate event:[267]

- Help students realize that their emotional reactions are normal.
- Help students identify strategies for minimizing the damage that certain events may have caused.
- Encourage students to find potential benefits in an unfortunate event—for instance, to treat it as a "wake-up call" or look for the "silver lining."
- Teach students strategies that can help them prevent similar unfortunate events in the future.

Through such coping strategies, students may learn that although they can't always control everything that happens to them, they can control how they *think* about what happens, enabling them to maintain at least some sense of autonomy.[268] Although the strategies in this section can be helpful to most students, teachers should refer students with severe emotional difficulties to school counselors and other specially trained professionals.

Keep anxiety at a low to moderate level.

As noted earlier in the chapter, students work most effectively and productively when they're a little bit anxious—enough to spur them into action—but not overly so. Teachers can address students' concerns about social matters (e.g., worries about peer acceptance and respect) by teaching social skills and by planning activities that foster productive peer interactions. Teachers can address students' concerns about their uncertain futures by teaching skills that will be marketable to potential employers and by providing assistance with college applications. But perhaps most importantly, teachers must take steps to ensure that students don't become overly anxious about classroom tasks and subject matter.

Because anxiety is largely beyond students' immediate control, simply telling them to "Relax" or "Calm down" is not likely to be effective. The key here is to *prevent* rather than "cure" debilitating anxiety. Following are several strategies that should keep students' anxiety at a facilitative level:[269]

- Communicate clear, concrete, and realistic expectations for performance.
- Match instruction to students' cognitive levels and capabilities (e.g., use concrete materials to teach mathematics to students not yet capable of understanding abstract mathematical symbols).
- Provide supplementary sources of support for learning challenging topics and skills until mastery is attained (e.g., additional practice, individual tutoring, a structure for taking notes).
- Teach strategies that enhance learning and performance (e.g., effective study skills).
- Assess students' performance independently of how well their classmates are doing and encourage them to assess their own performance in a similar manner.
- Provide feedback about specific behaviors, rather than global evaluations of classroom performance.
- Allow students to correct errors, so that no single mistake is ever a "fatal" one.

[267] J. E. Bower et al., 2009; Hall et al., 2006; Pekrun, 2006; Peterson, 2006; Richards, 2004.
[268] This phenomenon is known as *secondary control*; see Rothbaum et al., 1982.
[269] Brophy, 1986; Hattie & Timperley, 2007; Pekrun, 2006; Shute, 2008; Stipek, 1993; Zeidner, 1998.

As students make the transition to middle school or high school, make an extra effort to minimize their anxiety and address their need for relatedness.

Elementary school classrooms are often very warm, nurturing ones in which teachers and students get to know one another quite well. But somewhere around fifth to seventh grade, many students move from elementary school to a middle school or junior high school with more students and take classes with several different teachers. These changes can cause students to lose some of their previously formed relationships with teachers and other students and to be more likely to report feeling unsafe, bullied, and unaccepted in school.[270] Other changes that can occur during this transition that can negatively affect students include less individualized instruction, more responsibility for their learning, more reluctance to ask their peers for help, and higher standards for receiving high grades (which can result in lower grades).[271]

In addition to changes in schooling, students may find the physiological changes that accompany puberty and adolescence unsettling. This combination of changes can lead to decreases in academic competence and motivation and increases in anxiety.[272] Focus on social relationships increases, academic achievement drops, and some students can become emotionally disengaged from the school environment—a disengagement that may eventually result in dropping out of school.[273] Students in lower-income school districts are especially at risk for making a rough transition from an elementary to a secondary school format.[274]

Students who make a smooth transition to secondary school are more likely to be academically successful and, as a result, more likely to graduate from high school.[275] The Classroom Strategies box "Easing the Transition to Middle and Secondary School" offers several strategies for teachers at the middle school and high school levels.

Classroom Strategies

Easing the Transition to Middle and Secondary School

- **Provide a means through which every student can feel part of a small, close-knit group.**
  During the first week of school, a ninth-grade math teacher forms *base groups* of three or four students who provide support and assistance for one another throughout the school year. At the beginning or end of every class period, the teacher gives group members 5 minutes to help one another with questions and concerns about daily lessons and homework assignments.
- **Address students' personal and social needs as well as their academic needs.**
  Early in the school year, while his students are engaged in cooperative learning activities, a social studies teacher meets with each of his students individually at his desk area. In these meetings, he searches for interests that he and his students share and encourages them to seek him out whenever they need help with academic or personal problems. Throughout the semester, he continues to touch base with individual students (often during lunch or before or after school) to see how they're doing.
- **Teach students the skills they need to be successful independent learners.**
  After discovering that few of her students do not know how to take effective class notes, a high school science teacher distributes a daily "notes skeleton" that guides them through the note-taking process. The skeleton might include headings such as "Topic of the Lesson," "Definitions," Important Ideas," and "Examples."
- **Assign grades based on mastery (not on comparisons with peers), and provide reasonable opportunities for improvement.**
  A middle school language arts teacher requires students to submit at least two drafts of every essay and short story he assigns. He judges the compositions on several criteria, including quality of ideas, organization and cohesiveness, word usage, grammar, and spelling. He explains and illustrates each of these criteria and gives ample feedback on every draft that students turn in.

[270] Pellegrini & Long, 2004; Schwartz et al., 2016; Wentzel, 1999.
[271] Bagnall et al., 2020; H. A. Davis, 2003; Dijkstra et al., 2008; Eccles & Midgley, 1989; Hine & Fraser, 2002; Midgley et al., 2002; Rolland, 2012; Wentzel & Wigfield, 1998; Wigfield et al., 2006.
[272] Scherrer & Preckel, 2019.
[273] Cohen & Garcia, 2008; Eccles & Midgley, 1989; Gentry et al., 2002; Lam et al., 2016; Urdan & Maehr, 1995.
[274] Ogbu, 2003; Roderick & Camburn, 1999.
[275] Otis et al., 2005; Roderick & Camburn, 1999; Wigfield et al., 1996.

Summary

Motivation, emotions, and learning always go hand in hand, with each playing a crucial role in the development of the others. We can get a big-picture view of the interplay among motivation, emotions, and learning by returning to the Big Ideas presented at the beginning of the chapter.

5.1 The Nature of Motivation

Big Idea 5.1 Teachers play a major role in motivating students by designing effective learning environments and supporting students' motivation-related beliefs over time.

Motivation is an "intention to" condition that energizes, directs, and sustains behavior. The specific nature of students' motives can impact their behavioral, cognitive, and emotional engagement in classroom activities, which then affect academic outcomes such as learning and achievement. Motivation is influenced by *internal* factors, such as students' basic psychological needs, cognitive processes, and emotions. Furthermore, both motivation and these internal factors can be influenced by factors *external* to students, such as teachers' instructional strategies, ongoing classroom events and activities, and circumstances beyond school walls.

Researchers have developed a variety of mini-theories that are used to explain the factors that affect, and that are affected by, students' motivation. These theories support the notion that teachers, classroom conditions, and sociocultural factors can all influence students' motivation. Teachers who believe that they can affect students' motivation are more likely to seek out and try motivational strategies. To determine how instructional strategies are affecting students' motivation, teachers can observe students' behaviors and reactions during class; talk to students before, during, or after class; and survey students with open-ended and closed-ended questions.

5.2 Internal Factors That Affect Learners' Motivation and Engagement

Big Idea 5.2 Learners' needs, interests, values, goals, thoughts, and beliefs about themselves and the subject matter can influence their motivation to learn.

Virtually all people appear to share certain basic psychological needs, such as a need for arousal, autonomy, competence and worth, and relatedness. Students are motivated to meet these psychological needs and they tend to experience greater enjoyment and interest in school activities when these needs are met. Students are also motivated by their interests and by environmental conditions that allow them to become immersed in an activity and experience flow. But not everything students need to do in school is enjoyable, and for those activities, students are motivated when they value the activity, when the activity aligns with their goals, or when the activity leads to an extrinsic reward. Students' expectations for success and attributions for their successes and failures can also influence their motivation. Students who attribute their successes to internal and controllable factors—that is, they have a growth mindset—are more likely to be motivated to engage in school activities. Overall, then, students are motivated by a variety of internal and external factors that interact to motivate students in educational settings.

5.3 Teaching Strategies to Support Students' Motivation and Engagement

Big Idea 5.3 Effective teachers create conditions that support learners' motivation and engagement.

Because students' motivation is partially affected by external factors, teachers and other individuals in students' environments can play a role in motivating them to engage in learning activities. Many motivational teaching strategies can be organized into one of the five broad MUSIC model principles: Teachers should *e***M***power* students, demonstrate the **U***sefulness* of teaching activities, help students perceive that they can **S***ucceed*, stimulate students' **I***nterest*, and show and promote **C***aring*. Teachers can *empower* students by giving them control over some aspects of their learning environment, providing them with feedback in a noncontrolling manner, minimizing the use of extrinsic reinforcers, and allowing them to choose some short-term goals for their learning. It's also important for students to understand the *usefulness* of school activities—and the value of academic success more generally—for their own personal goals.

Age-appropriate teacher guidance and support in particular content domains can enhance students' *success* rates in those domains, thereby bolstering students' domain-specific self-efficacy and more general sense of competence and self-worth. By focusing students' attention on mastery goals—that is, on truly mastering a task or topic rather than simply attaining high test scores and grades—teachers increase the odds that students will engage in meaningful rather than rote learning. And by portraying students' successes and failures as being within students' power to control (e.g., through reasonable effort and use of good strategies), teachers can foster an optimistic, I-can-do-it attitude toward future learning activities.

Stimulating, high-interest activities can satisfy students' need for arousal and keep them cognitively and emotionally

engaged in classroom activities. Additionally, teachers can build on students' more enduring individual interests. Designing instruction that incorporates students' interests is also a way for teachers to demonstrate that they *care* about students. Other ways to show caring include planning and implementing well-designed instructional activities and showing genuine concern for students' academic and personal well-being. For instance, small-group and whole-class activities (cooperative learning projects, class debates, etc.) allow students to interact with one another in ways that can allow students to have satisfying relationships with their classmates.

5.4 Emotions and Their Effects on Motivation and Learning

Big Idea 5.4 Learners' emotions influence and are influenced by both their motives and cognitive processes.

Motivation and learning are closely intertwined with emotions, including both the emotions that learners bring to the learning situation and the feelings that instructional materials elicit. On average, topics that evoke strong feelings (excitement, anger, etc.) tend to be more memorable than neutral topics. However, it's possible to have too much of a good thing. For instance, situations that arouse a lot of anxiety often interfere with effective information processing and memory.

It's important that teachers engender productive emotions and minimize counterproductive ones. Ideally, teachers should promote hot cognition—that is, they should help students engage emotionally as well as cognitively with classroom topics. Furthermore, teachers can help students keep excess anxiety in check by matching instruction to students' current ability levels, communicating clear expectations for students' performance, and giving them some wiggle room to make errors without penalty. And many students are likely to need teachers' assistance in regulating intense emotional reactions to unsettling circumstances and in making the often anxiety-arousing transitions to middle school and high school.

Case Study Practice Exercises

Praising Students' Writing

Mrs. Gaskill's second-graders are just beginning to learn how to write the letters of the alphabet in cursive. Every day, Mrs. Gaskill introduces a new cursive letter and shows her students how to write it correctly. She also shows them some common errors in writing the letter—for instance, claiming that she's going to make the "perfect *f*" and then making it much too short and crossing the lines in the wrong place—and the children delight in finding her mistakes. After the class explores each letter's shape, Mrs. Gaskill asks her students to practice it, first by writing it in the air using large arm movements and then by writing it numerous times on lined paper.

Meanwhile, Mrs. Gaskill has decided to compare the effects of two kinds of praise on the children's performance. She has placed a small colored sticker on each child's desk to indicate membership in one of two groups. When children in Group 1 write a letter with good form, she gives them a happy-face token, says "Great" or "Perfect!" and either smiles or gives them a pat on the back. When children in Group 2 write a letter with good form at least once, she gives them a happy-face token and says something like "You sure are working hard," "You can write beautifully in cursive," or "You're a natural at this." When children in either group fail to meet her standards for cursive writing, she gives them whatever corrective feedback they need.

Therefore, the only way in which Mrs. Gaskill treats the two groups differently is in what she says to them when they do well, either giving them fairly cryptic feedback (for Group 1) or telling them that they are trying hard or have high ability (for Group 2). Despite such a minor difference, Mrs. Gaskill finds that the children in Group 2 say they enjoy cursive writing more, and they use it more frequently in their spelling tests and other writing tasks. Curiously, too, the children in Group 1 often seem disappointed when they receive their seemingly positive feedback. For instance, on one occasion a girl who writes beautifully but has the misfortune of being in Group 1 asks, "Am *I* a natural at this?" Although the girl consistently gets a grade of "+" for her cursive writing, she never writes in cursive voluntarily throughout the 3-week period in which Mrs. Gaskill conducts her experiment.[276]

[276] Study described by Gaskill, 2001.

1. Constructed-response question

Mrs. Gaskill praises all of her students for their performance, yet some kinds of praise seem to be more effective than others.

A. Identify two sources of evidence to support the claim that students who receive lengthy, specific feedback (Group 2) enjoy writing in cursive more than students who receive brief, general feedback (Group 1).

B. Explain why the praise given to Group 2 might be more motivating than the praise given to Group 1. Base your explanation on contemporary principles and theories of motivation.

2. Multiple-choice question

Which one of the following teacher behaviors in the case is an example of an *attribution*?

a. Amusing the students by intentionally writing the letter *f* incorrectly

b. Commenting, "You sure are working hard"

c. Awarding happy-face tokens for good writing

d. Giving students a pat on the back for good work

Chapter 6

Cognitive Development

Photo by Unsplash

Big Ideas to Master in this Chapter

6.1 As a result of ongoing interactions between biological and environmental influences, children show some similar patterns but also considerable diversity in their developmental pathways.

6.2 Cognitive development depends not only on brain maturation but also on stimulating physical, social, and cultural experiences and on children's natural inclinations to organize and try to make sense of those experiences.

6.3 Children continually build on existing knowledge and skills to develop more advanced thinking and reasoning abilities.

6.4 Although children in any age group differ somewhat in intelligence, cognitive styles, and dispositions, appropriately supportive environments can significantly enhance these abilities and characteristics.

Case Study: Hidden Treasure

Six-year-old Lupita has spent most of her life in Mexico with her grandmother, but she recently joined her parents in the United States and is now a quiet, well-behaved student in Ms. Padilla's kindergarten class. Ms. Padilla rarely calls on her because of her apparent lack of academic skills and is thinking about holding her back for a second year of kindergarten. Yet a researcher's video camera captures a side of Lupita her teacher hasn't noticed. On one occasion Lupita is quick to finish her Spanish assignment and starts to work on a puzzle during her free time. A classmate approaches, and he and Lupita begin playing with a box of toys. A teacher aide asks the boy whether he has finished his Spanish assignment, implying that he should return to his seat to complete it, but the boy doesn't understand the aide's subtle message. Lupita gently persuades the boy to finish his schoolwork and then returns to her puzzle. Two classmates having trouble with their own puzzles request Lupita's assistance, and she patiently shows them how to work cooperatively to assemble the pieces.

Ms. Padilla is amazed when she views the video. She readily admits, "I had written her off—her and three others. They had met my expectations and I just wasn't looking for anything else." Ms. Padilla and her aides begin working closely with Lupita on academic skills and often allow her to take a leadership role in group activities. At the end of the school year, Lupita earns achievement test scores indicating exceptional competence in language and math, and she is promoted to first grade.[1]

Please answer these questions before you continue:

1. Why might Ms. Padilla initially underestimate Lupita's academic potential?
2. What clues in the case study suggest that Lupita is, in fact, an intelligent child?

Over the years, Ms. Padilla has almost certainly had students who lacked basic knowledge and skills (color and shape names, counting, the alphabet, etc.), and many of them undoubtedly struggled with the kindergarten curriculum as a result. And in Ms. Padilla's experience, children usually speak up or raise their hands if they have useful contributions to class discussions, but Lupita is quiet and reserved. With such things in mind, it might be all too easy to conclude that Lupita needs a second year in kindergarten. Yet the speed with which Lupita finishes her assignment and her behavior during free time—her facility with puzzles, her correct interpretation of an aide's subtle message, and her skill in guiding peers—suggest that she learns quickly and has considerable social skills.

From preschool to high school and beyond, individuals change in many ways. The orderly, enduring changes that occur over the lifespan are called **development**. Recall from Chapter 2 that long-term changes due to *experiences* are called *learning*. However, students also develop due to their genetic heritage—the characteristics and predispositions they're born with—and these genetic factors interact with students' experiences in dynamic and complex ways to affect their development.[2] We've examined developmental changes in previous chapters, especially changes in learning strategies (Chapter 2), self-regulation and metacognition (Chapter 3), effective reinforcers (Chapter 4), and motivation and emotions (Chapter 5). In this chapter, we focus specifically on **cognitive development**, which includes developmental changes in thinking, reasoning, and language. Many other aspects of development have also been studied (see Chapter 7), such as personal development (changes in one's sense of self), social development (changes in how one relates to others), moral development (changes in one's standards regarding right and wrong behaviors), and physical development (changes in one's body) (see Figure 6.1).

[1] Based on case described by Carrasco, 1981.
[2] Lerner et al., 2015; Zelazo, 2013.

Chapter Outline

Case Study: Hidden Treasure

6.1 General Principles of Development
- Developmental Principles
- Teaching Strategies: Accommodating Developmental Differences and Diversity

6.2 Developmental Processes
- Knowledge Construction
- Knowledge Construction Through Interaction with Others
- Teaching Strategies: Facilitating Learners' Knowledge Construction

6.3 Trends in Cognitive Development
- Development of Working Memory, Knowledge, and Thinking Processes
- Stages of Cognitive Development
- Teaching Strategies: Fostering Cognitive Development

6.4 Intelligence
- The Nature of Intelligence
- Teaching Strategies: Teaching with a Consideration of Intelligence

Summary

Case Study Practice Exercises: A Floating Stone

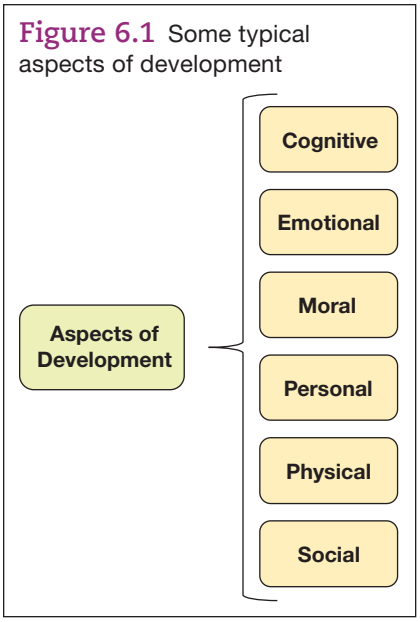


Figure 6.1 Some typical aspects of development

Many theories have made significant contributions to developmental psychology. However, the ideas of two early developmental theorists, Jean Piaget and Lev Vygotsky, have been especially influential in the study of cognitive development. Piaget observed that young learners acquire self-constructed understandings of physical and social phenomena that change in qualitatively distinct ways over time.[3] Because he focused on changes in cognition over time, Piaget is considered a cognitive-developmental theorist. Meanwhile, Vygotsky proposed mechanisms through which children's social and cultural environments influence their development, and his work provided the groundwork for sociocultural theory.[4] Some of Vygotsky's ideas—especially mediated learning, cognitive tools, and the importance of culture—appeared in Chapter 4. We continue to look at his ideas in this chapter because he was, first and foremost, concerned about children's cognitive development. However, our initial focus is on general processes and trends that characterize the development of the great majority of children and adolescents.

6.1 General Principles of Development

Big Idea 6.1 **As a result of ongoing interactions between biological and environmental influences, children show some similar patterns but also considerable diversity in their developmental pathways.**

Developmental Principles

Virtually any aspect of development is characterized by the general principles described in this section.

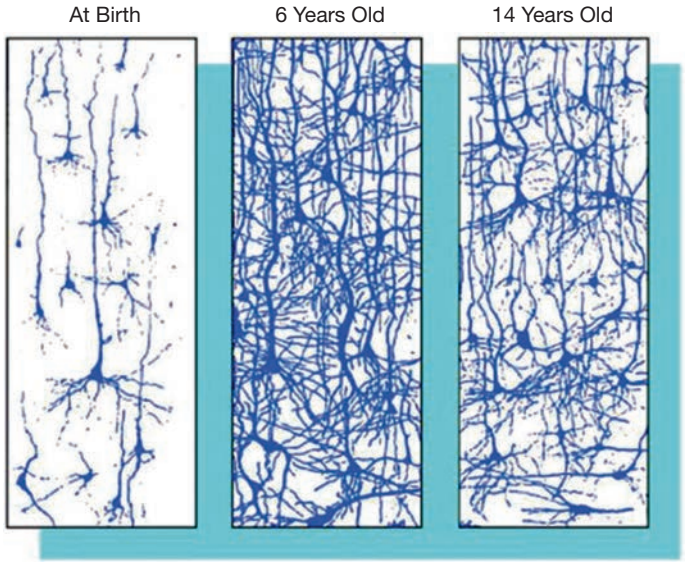
The brain continues to develop throughout childhood, adolescence, and adulthood.

When babies are born, their brains have all of the basic parts but are hardly finished products. Genetically driven maturational processes bring about many important changes in the brain during the first 20 or 30 years of life. The prefrontal cortex—the part of the brain responsible for sustaining attention, planning, decision making, and many other advanced reasoning processes (see Chapter 2)—is especially slow to mature and doesn't take on a truly adult-like form until individuals reach their early 20s.[5]

As we discovered in Chapter 2, two kinds of brain cells—*neurons* and *astrocytes*—appear to play a significant role in learning and development, and they continue to form throughout a person's lifetime.[6] Although neurons begin to form *synapses* with one another long before a child is born, the rate of synapse formation increases dramatically shortly after birth. Figure 6.2 shows the large number of synaptic connections at 6 years old as compared to at birth. Much of this early **synaptogenesis** appears to be driven primarily by genetic programming rather than by learning experiences. Thanks to synaptogenesis, children in the elementary grades have many more synapses than adults do. As children encounter a wide variety of stimuli and experiences in their daily lives, some synapses come in quite handy and become stronger because they are used repeatedly. Other synapses are largely irrelevant and useless, and these gradually fade away through a process

[3] For example, see Piaget, 1928, 1952b, 1959, 1970, 1980; Inhelder & Piaget, 1958.
[4] For example, see Vygotsky, 1962, 1978, 1987, 1997. Vygotsky died in 1934, but many of his works weren't translated into English until considerably later.
[5] Otero & Barker, 2014.
[6] Deng et al., 2010; Moreno-Jiménez et al., 2019.

Figure 6.2 As children age, the number of synaptic connections increases through synaptogenesis and then decreases through synaptic pruning



known as **synaptic pruning**. Figure 6.2 shows the synaptic pruning that can occur from age 6 to 14. In some parts of the brain, intensive synaptic pruning occurs fairly early (e.g., in the preschool or early elementary years). In other parts, it begins later and continues until well into adolescence.[7]

Why do growing brains create so many synapses, only to eliminate a sizable proportion of them later on? In the case of synapses, more isn't necessarily better.[8] Experts speculate that by generating more synapses than will ever be needed, human beings have the potential to adapt to a wide variety of conditions and circumstances. As children encounter certain regularities in their environment, some synapses are actually a nuisance because they're inconsistent with typical environmental events and behavior patterns. Synaptic pruning, then, helps to make the brain more efficient.

Another developmental process that enhances the brain's efficiency over time is **myelination**, which is a process in which neurons gradually acquire a white, fatty coating known as *myelin* that allows neurons to transmit messages much faster than they could previously. A few neurons (especially those involved in basic survival skills) become myelinated before birth, but most of them don't acquire myelin until well after birth, with different areas becoming myelinated in a predictable sequence.[9]

In the cortex—and especially the prefrontal cortex—synaptic pruning continues into the middle childhood and adolescent years, a second wave of synaptogenesis occurs at puberty, and myelination continues into early adulthood.[10] And several parts of the brain, especially those that are heavily involved in thinking and learning, continue to increase in size and interconnections until late adolescence or early adulthood.[11] In addition, the beginning of puberty is marked by significant changes in hormone levels, which affect the continuing maturation of brain structures and possibly also affect the production and

[7] Bruer, 1999; Huttenlocher & Dabholkar, 1997; M. H. Johnson & de Haan, 2001; Steinberg, 2009.
[8] Bruer & Greenough, 2001; Bryck & Fisher, 2012; Byrnes, 2001; Spear, 2007.
[9] Byrnes, 2001; M. Diamond & Hopson, 1998.
[10] Blakemore & Choudhury, 2006; Giedd et al., 2012; M. H. Johnson & de Haan, 2001; Lenroot & Giedd, 2007; Paus et al., 1999.
[11] Giedd et al., 1999; Pribram, 1997; Sowell & Jernigan, 1998; Sowell et al., 1999; E. F. Walker, 2002.

effectiveness of the chemical substances used in synapses.[12] This combination of changes may affect and possibly limit adolescents' functioning in a variety of areas, including attention, planning, and impulse control.[13]

Interestingly, as children develop their abilities in certain disciplines, they rely less on some areas of the brain and more on others. For example, as children gain more experience with math facts, they rely less on executive control from the prefrontal cortex to solve simple math problems and, instead, rely more on the parietal regions of the brain.[14] More experienced children can access their memories directly from the parietal areas without having to use the prefrontal cortex to help them put their memories together to solve the problems.

One widespread myth about the brain is that it does all its "maturing" within the first few years of life and that its development can best be nurtured by bombarding it with as much stimulation as possible—reading instruction, violin lessons, art classes, and so on—before its owner ever reaches kindergarten. But as we've just seen, nothing could be further from the truth. In fact, young brains probably aren't able to benefit from some kinds of experiences, especially those that are fairly complex and multifaceted.[15] And from a physiological standpoint, the brain's ability to reorganize itself in order to adapt to changing circumstances—its **plasticity**—persists throughout the lifespan.[16] The early years are important for development, to be sure, but so are the later years. For most topics and skills, there isn't a single "best" or "only" time to learn.[17]

think about it

Before you read this section, did you believe that the brain did all its maturing when children were young? If so, have you now undergone conceptual change about the issue?

The sequence of development is somewhat predictable.

Researchers have observed many **universals** in development—similar patterns in how children change over time despite considerable differences in their environments. Some of this universality is marked by the acquisition of **developmental milestones**—new, developmentally more advanced behaviors—in predictable sequences. For example, children usually learn to walk only after they've learned to sit up and crawl. And they become concerned about what other people think of them only after they realize that other people *do* think about them.

Children develop at different rates.

Researchers have found the average ages at which children and adolescents reach various developmental milestones. For example, the average child can hold a pencil and scribble at age 1½, starts using rehearsal as a way of remembering information somewhere between ages 5 and 7, and enters puberty at age 10 (for girls) or 11½ (for boys).[18] But not all children reach developmental milestones at the average age, which leads to considerable variability at any age and grade level. Thus, we must never jump to conclusions about what a particular learner can and cannot do based on age alone.

Development is often marked by spurts and plateaus.

Development doesn't necessarily proceed at a constant rate. Instead, periods of relatively rapid growth (*spurts*) may appear between periods of slower growth (*plateaus*). For example, toddlers may speak with a limited vocabulary and one-word "sentences" for several months. Then, sometime around their second birthday, their vocabulary expands rapidly and their sentences become longer and longer within just a few weeks' time. Similarly,

[12] Steinberg, 2009; E. F. Walker, 2002.
[13] Blakemore & Choudhury, 2006; Kuhn & Franklin, 2006; Shen et al., 2010; Spear, 2007; Steinberg, 2009.
[14] Rivera et al., 2005.
[15] C. A. Nelson et al., 2006.
[16] Chein & Schneider, 2012; Kolb et al., 2003; Lindenberger & Lövdén, 2019; C. A. Nelson et al., 2006.
[17] Bruer, 1999; Byrnes & Fox, 1998; Geary, 1998, 2008.
[18] T. M. McDevitt & Ormrod, 2016; McLane & McNamee, 1990.

some students may not get too much taller for a few years and then undergo an adolescent growth spurt, shooting up several inches within a year or so. Occasionally, in some aspects of development, children even take a temporary step *backward*, apparently because they're in the process of overhauling a particular physical or cognitive skill and are about to make a major leap forward.[19]

think about it
Can you think of times in your cognitive or physical development (or other type of development) when you experienced rapid or slower growth?

Development involves both quantitative and qualitative changes.

In some cases, development simply means acquiring *more* of something—for instance, more height, more knowledge, and more friends. Yet in many respects children tend to think and behave in qualitatively different ways at different ages. For example, in the early elementary grades, children rely largely on rehearsal when they're trying to remember something, with more sophisticated strategies such as organization and elaboration emerging in the middle and high school years (see Chapter 2). And in high school, some students' epistemic beliefs may gradually shift from a *knowledge-as-discrete-facts* view to a *knowledge-as-integrated-understanding* view (see Chapter 3).

Some theorists (especially cognitive-developmental theorists) suggest that patterns of uneven growth and qualitative change reflect distinctly different periods in children's development. In a **stage theory**, development is characterized as progressing through a predictable sequence of stages, with earlier stages providing a foundation on which later, more advanced ones build. For example, as we'll discover shortly, Piaget characterized the development of logical reasoning skills as having four distinct stages, and another prominent cognitive-developmental theorist, Lawrence Kohlberg, proposed that moral development also has a stagelike nature (see Chapter 7).

In recent years, many developmental psychologists have begun to believe that most aspects of development can be better characterized as reflecting general trends rather than discrete stages. Even so, developmental changes often do occur in a predictable sequence, with some acquisitions occurring before—and possibly being prerequisites for—later ones.

Heredity and environment interact in their effects on development.

Virtually all aspects of development are affected either directly or indirectly by children's inherited genetic profiles.[20] All of our genetic information is stored in *genes* that are composed of deoxyribonucleic acid (DNA). This DNA, which is present in every cell in our bodies, is what drives our development and makes us all unique individuals. For example, soon after birth children begin to show genetic inclinations, or *temperaments*, that predispose them to respond to physical and social events in certain ways—perhaps to be calm or irritable, outgoing or shy, cheerful or fearful. Throughout childhood and adolescence, genes continue to guide children's growth through the process of **maturation**, a gradual, genetically driven acquisition of more advanced physical and neurological capabilities over the course of childhood and adolescence. Even such seemingly simple skills as walking, running, and jumping emerge primarily as a result of genetically controlled advancements in the brain and in muscular strength and control.[21] These ideas are captured in **nativist theory**, which suggests that the foundations of some behaviors and abilities are biologically built-in traits and possibly unique to the human species.[22]

Yet genes have their effects only as they interact with conditions in their environment.[23] Thus, environmental factors also make substantial contributions to children's development. For example, genes require certain "supplies" and outside influences—in

[19] Gershkoff-Stowe & Thelen, 2004; Morra et al., 2008.
[20] Avinun, 2020; Moore, 2013; Zelazo, 2013.
[21] Kovas et al., 2014.
[22] Prominent nativist theorists include Noam Chomsky, Renee Baillargeon, and Elizabeth Spelke.
[23] Avinun, 2020; Lickliter, 2013; Manuck & McCaffery, 2014.

the forms of oxygen, nutrients, and environmental stimulation—to carry out their work. Thus, as we learned in Chapter 4, poor nutrition can hamper brain development. Also, basic motor skills appear only after brain and muscle maturation make them possible; exercise and practice (environmental influences) affect how fast children can run and how far they can jump. And although children's behaviors are partly the result of genetically based temperaments, the ways in which their local environment and broader culture socialize them to behave—through reinforcement, punishment, modeling, and so on—are just as influential.

The effects of both genes and the environment are well documented, but psychologists disagree about how *much* each contributes to development—an issue known as *nature versus nurture*. In fact, inherited genes (nature) and the environment (nurture) typically *interact* in their effects, such that we can probably never disentangle their unique influences on development.[24] In some cases the interaction between genes and the environment takes the form of a **sensitive period**, a biologically predetermined point in development during which a child is especially susceptible to environmental conditions. For example, the quality of nutrition has a greater impact on cognitive development in the early years, when children's brains are rapidly maturing, than in middle childhood or adolescence.[25] There may also be sensitive periods for some aspects of language development. In particular, children have an easier time mastering a language's grammatical subtleties and learning how to pronounce words flawlessly if they're immersed in the language within the first 5 to 10 years of life.[26] However, there's no evidence to indicate that sensitive periods exist for traditional academic subjects such as reading, writing, or mathematics.[27]

Children's own behaviors also influence their development.

Not only do children's genes interact with their environment, but so, too, do children's day-to-day *behaviors* interact with environmental factors. Furthermore, some of their behaviors are a result of genetic characteristics. Ultimately, then, we have a three-way interplay among genes (an internal variable), the environment, and behavior, as shown in Figure 6.3.[28] This three-way interplay, called *reciprocal causation*, is reflected in two principles provided in Chapter 4:

- **Learners alter their current environment through both their behaviors and such internal variables as beliefs, mental processes, feelings, and personality traits.** For example, in the opening case study, Lupita behaves in a quiet, reserved manner, possibly reflecting an inherited temperament to be calm and shy (i.e., Lupita's internal personality traits affect her behavior). Because her behavior is so easy to overlook, Ms. Padilla gives her very little time and attention in class (i.e., Lupita's behavior affects the environment).
- **Learners actively seek out environments that are a good fit with their existing behaviors and internal variables.** In the opening case study, Lupita voluntarily chooses to work on a puzzle during her free time. Thus, she actively seeks out a task that will nurture her interests and abilities (i.e., Lupita's internal interests and abilities affect her environment).

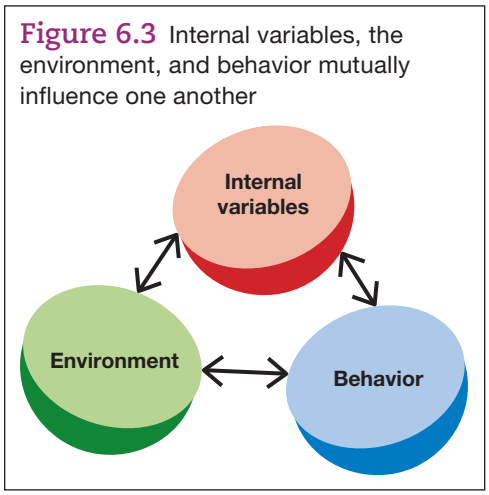


Figure 6.3 Internal variables, the environment, and behavior mutually influence one another

think about it
What kinds of extracurricular activities have you deliberately sought out? Would you say that they have strengthened your prior abilities to some degree?

[24] Belsky et al., 2007; S. W. Cole, 2009; W. Johnson, 2010; Spencer et al., 2009.
[25] Sigman & Whaley, 1998.
[26] Bialystok, 1994; Bortfeld & Whitehurst, 2001; M. S. C. Thomas & Johnson, 2008.
[27] Bruer, 1999; Geary, 1998, 2008; Wolf et al., 2009.
[28] O. S. P. Davis et al., 2009; Mareschal et al., 2007; Plomin & Spinath, 2004; Scarr & McCartney, 1983.

Teaching Strategies: Accommodating Developmental Differences and Diversity

Although there are many universals in developmental trends, differences in learners' genes, behaviors, and environment can lead to developmental differences that teachers need to consider when planning instruction.

Ideally, teachers individualize instruction for every student.

Teachers must adjust their instructional goals and strategies to students' unique characteristics, and they must be especially flexible when working with students who have exceptional cognitive abilities or disabilities. Ideally, teachers individualize instruction for *every* student, a practice called *differentiated instruction*. **Differentiated instruction** is the practice of individualizing instructional methods—and possibly also individualizing specific content and instructional goals—to align with each student's existing knowledge, skills, and needs. For example, teachers may need to identify more basic goals for some students (e.g., those with intellectual disabilities) and provide especially challenging activities for certain other students. Strictly one-way instruction (e.g., a lecture, textbook chapter, or website) can provide a quick and efficient means of introducing new ideas to students who process information quickly and abstractly, but it may be incomprehensible and overwhelming to students who have little background knowledge on which to build and to students who have learning disabilities. Also, many low-achieving students are apt to need considerable support during note-taking activities; for example, students with learning disabilities or attention-deficit hyperactivity disorder (ADHD) can benefit from lesson-specific note-taking forms and frequent hints about what things they should include in their notes.[29] An essential component of differentiated instruction is, of course, *regular assessment of students' progress*—just one example of the many ways in which instructional strategies and classroom assessment practices are intertwined (see Chapter 10).

Technology-based instructional strategies can be used to meet students' developmental needs.

Technology-based instructional strategies can be especially useful as a means of adapting instruction to students' unique ability levels. For example, math apps on mobile devices have been found to be effective for students with a range of ability levels, but especially for students diagnosed with one or more disabilities.[30] In addition, websites such as Khan Academy provide many short tutorials on specific topics in math, science, and other content domains. English-language tutorials and bilingual software for teaching basic skills are helpful when working with English learners.[31] And certain tools within computer software programs, such as the spell-check and grammar-check functions in word processing programs, can provide the extra support that some students may need (e.g., see Figure 6.4).

Figure 6.4 Darren, a fifth-grader who struggles with reading and writing, wrote this very cohesive paragraph with the help of a word processing program. A spell-checker enabled him to spell most, but not all, of the words correctly (he meant to use the words *very* and *sight*, not *vary* and *site*).

> When I was young it was almost impossible to read. One of my teachers told me I could learn to read if I worked hard. Learning to read was like climbing Mount Rushmore. It took a very long time but I finally got it. My Mom said she was vary proud. Reading was hard for me. It took five years for me to learn to read. Every day I would go to the learning center to learn my 400 site words. It was hard for me to learn these words but I did it. Reading is one of the most important things I have learned so far in my life.

[29] J. R. Boyle et al., 2015.
[30] Zhang et al., 2015.
[31] Egbert, 2009; Merrill et al., 1996.

6.2 Developmental Processes

Big Idea 6.2 **Cognitive development depends not only on brain maturation but also on stimulating physical, social, and cultural experiences and on children's natural inclinations to organize and try to make sense of those experiences.**

Knowledge Construction

As we discussed in Chapter 2, **individual constructivism** is a theoretical perspective that focuses on how learners each construct their own idiosyncratic meanings from their experiences. This perspective portrays children as actively trying to make sense of their world and constructing increasingly complex understandings and abilities with which to interpret and respond to experiences.[32] Inherited genes, the environment, and children's own behaviors all nudge children toward increasingly complex and sophisticated ways of thinking and behaving. The means by which they do so are reflected in the following principles.

Children have a natural tendency to organize their experiences.

Even as young infants, humans seem predisposed to make sense of and categorize their world.[33] This finding is consistent with a type of individual constructivism called *scheme-based or radical constructivism*. In his theory of cognitive development, Jean Piaget proposed that some things children learn and do are organized as schemes. A **scheme** is a mental structure that underlies physical or mental actions that are used repeatedly in response to the environment. Schemes are similar to, but different from, the *schemas* described in Chapter 2.[34] Both schemas and schemes are mental structures that help people organize their world, but schemas organize *facts* and schemes organize physical and mental *actions*. In general, schemes consist of three elements that allow people to make sense of their experiences: (1) a recognition template that starts a sequence of actions, (2) the actions, and (3) the results that are expected from completing the actions.[35]

Piaget suggested that *physical* schemes are based largely on sensory and behavioral responses to objects (e.g., grasping, hitting, kicking). For example, although infants are born with the reflex to suck an object that touches their lips, they have to learn how to bring objects to their mouth to suck on them. This organized pattern of behavior could be called a *putting-things-in-mouth scheme* because it can be used to put many different objects in the mouth when they are in many different positions (such as 10 inches in front of the mouth or 12 inches to the side of the mouth). Therefore, this scheme is a useful mental structure because it helps infants to get many different objects to their mouth from many different positions. Over time, children can combine and coordinate schemes to engage in more complex activities, such as grabbing a piece of candy, removing the wrapper, and putting it in their mouth.

People also have *mental* schemes that allow them to engage in mental actions, such as solving math problems. One type of mental scheme that children use to solve problems involving fractions is the *part–whole scheme*, which includes using the mental action of separating a whole into equal parts. Figure 6.5 provides an example of a part–whole scheme and how mental actions are necessary in the development of new schemes.

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[32] Arsalidou & Pascual-Leone, 2016.

[33] Gelman, 2003; Mandler, 2007; Quinn, 2007.

[34] Piaget distinguished between *schemes* and *schemas* (e.g., see Piaget, 1970, translator's footnote on p. 705), but neither concept is identical to the contemporary use of the term *schema*.

[35] von Glaserfeld, 1995.

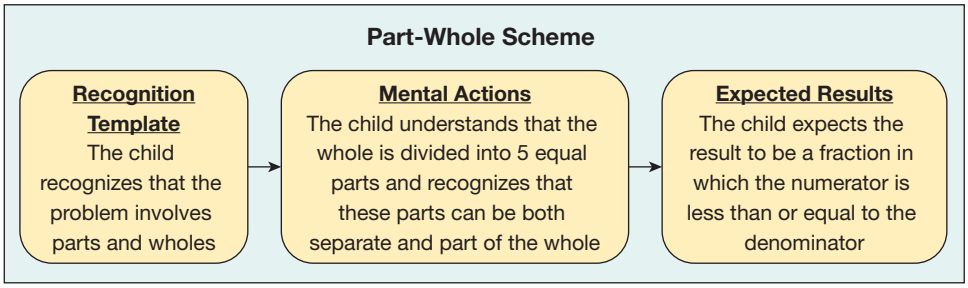
Figure 6.5 An example of a mental scheme and the mental actions necessary to develop new schemes

To determine whether fourth-grade students have developed a "part-whole" scheme, a teacher could ask students to solve the following problem.

You have a bar this long.

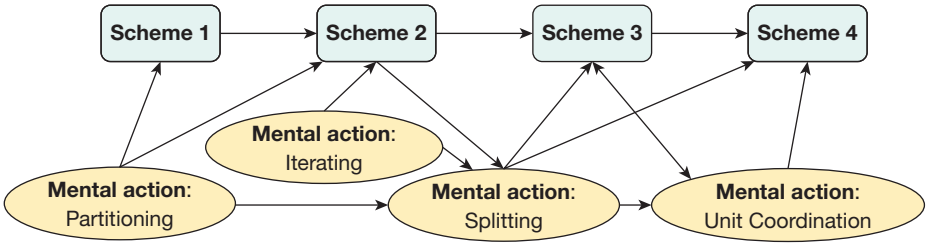
What fraction of the bar above is this smaller bar?

Children who have developed a part-whole scheme would provide the correct answer of 3/5 using their part-whole scheme, which is represented here as consisting of (1) a recognition template, (2) mental actions, and (3) expected results:



Children who have not developed the part-whole scheme might answer 3/3 or 3/8 because they lose track of the whole (which has 5 parts).

Researchers have identified four fraction schemes that children develop in progression: Scheme 1 (part-whole scheme), Scheme 2 (measurement scheme for unit fractions), Scheme 3 (measurement scheme for proper fractions), and Scheme 4 (generalized measurement scheme for fractions).



Before constructing a scheme, children must develop the mental actions that precede the scheme. The diagram shows that partitioning (dividing a whole into equal parts) is required to construct Scheme 1, partitioning and iterating (repeating a unit length to produce a whole) are needed to construct Scheme 2, splitting (simultaneously using partitioning and iterating) is needed to construct Scheme 3, and units coordination (maintaining relationships between the various levels of units) is needed to construct Scheme 4. The purpose of this diagram is not for you to understand the mathematical details of these mental actions, but rather, to provide you with an example of how mental actions are important in developing new schemes.

Some students might have developed Scheme 1, but not Scheme 2. To help students develop the *iterating* mental action that is needed for Scheme 2, teachers could ask students to work on tasks such as these:

1. You have a bar this long: **Make a bar that is three times as long as this bar.**

2. If this bar is 1/6 of the whole bar, show how long the whole bar is:

Completing these tasks can help students understand that repeating a unit of length produces a whole, which is the definition of iterating and is required to develop Scheme 2. This example shows that teachers can help students develop new schemes by providing appropriate activities.

Sources: Based on Norton & Wilkins, 2012; Wilkins & Norton, 2011; Wilkins & Norton, 2018.

Children are naturally inclined to make sense of and adapt to their environment.

Children are born with a natural curiosity about their world. Accordingly, they actively seek out information to help them understand and make sense of it. For example, young children often experiment with new objects, manipulating them and observing the effects of their actions. And they may ask a seemingly endless series of questions in their efforts to understand the things they observe around them.[36] For example, they're apt to ask questions such as: "How did the whole world start?" "How does the Internet work?" and "How do babies get in mommies' tummies?"

Piaget proposed that underlying children's curiosity is a desire to adapt to and be successful in their environment. Such adaptation occurs through two complementary processes, assimilation and accommodation. **Assimilation** entails responding to and possibly interpreting an object or event in a way that's consistent with an existing scheme. For example, infants may assimilate a new teddy bear into their putting-things-in-mouth scheme as they put the teddy bear's paw in their mouth. In this case, their existing scheme would work to achieve their goal of getting the paw into their mouth. Similarly, fourth-graders may assimilate a new math problem into their part–whole scheme as they work on solving math problems involving fractions.

But sometimes children can't easily relate to a new object or event using existing schemes. In these situations, one of two forms of **accommodation** occurs: Children either (1) modify an existing scheme to account for the new object or event or (2) form a new scheme to deal with it. For example, infants would have to modify their putting-things-in-mouth scheme if an object was too heavy to lift with one hand and required the use of both hands to bring the object to their mouth. And fourth-graders who cannot solve a math problem using their part–whole scheme would have to form a new scheme to incorporate new mental actions (as described in Figure 6.5).

Assimilation and accommodation work hand in hand as children develop their knowledge and understanding of the world. Children interpret each new event within the context of their existing knowledge (assimilation) but at the same time may modify their knowledge as a result of the new event (accommodation). Accommodation rarely happens without assimilation: Children can accommodate new experiences only when they can relate those experiences to their current knowledge and beliefs.

Inconsistencies between existing understandings and new events promote development.

We've just seen that children are naturally inclined to make sense of their environment. When children can comfortably address new events using what they've previously learned about the world, they're in a state that Piaget called **equilibrium**. But as children grow older and expand their horizons, they sometimes encounter situations for which their current knowledge and skills aren't helpful. Such situations create **disequilibrium** (also referred to as **cognitive dissonance** in Chapter 5), a sort of mental "discomfort" that spurs them to reexamine their current understandings. Through accommodation—in other words, by replacing, reorganizing, or better integrating certain schemes—children can better understand and address previously puzzling events. The movement from equilibrium to disequilibrium and back to equilibrium again is known as **equilibration**. Piaget suggested that equilibration and children's desire to achieve equilibrium promote the development of more complex levels of thought and knowledge.

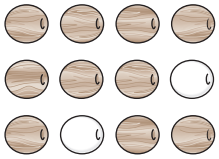
[36] Frazier et al., 2009; Kemler Nelson et al., 2004.

To better understand how thinking changes with age and discover the circumstances under which children might revise their thinking in light of new experiences, Piaget developed a variety of tasks that would reveal children's reasoning processes and in some cases create disequilibrium. As an example of such a task, try the following exercise.

See For Yourself

Wooden Beads

Here are 12 wooden beads—some brown and some white. Are there more wooden beads or more brown beads?



A ridiculously easy question, you might think. But in fact, young children often answer incorrectly, responding that there are more *brown* beads than wooden ones. Consider the following dialogue between a 6-year-old, whom we'll call "Brian,"[37] and an adult about a similar set of brown and white wooden beads:

Adult: Are there more wooden beads or more brown beads?

Brian: More brown ones, because there are two white ones.

Adult: Are the white ones made of wood?

Brian: Yes.

Adult: And the brown ones?

Brian: Yes.

Adult: Then are there more brown ones or more wooden ones?

Brian: More brown ones.[38]

During further questioning, Brian continues to assert that the brown beads outnumber the wooden beads. In an effort to help him see otherwise, the adult asks him to draw two necklaces, one made of the brown beads and another made of the wooden beads. Brian draws a series of black rings for the brown-beads necklace; he draws a series of black rings plus two white rings for the wooden-beads necklace.

Adult: Good. Now which will be longer, the one with the brown beads or the one with the wooden beads?

Brian: The one with the brown beads.[39]

Notice how the adult continues to probe Brian's reasoning to be sure he realizes that all the beads are wooden, but only some are brown. Even so, Brian responds that there are more brown beads than wooden ones. Piaget suggested that young children such as Brian have trouble with **class inclusion** tasks in which they must simultaneously think of an object as belonging to two categories—in this case, thinking of a bead as being both *brown* and *wooden* at the same time.

Notice, too, how the adult asks Brian to draw two necklaces, one made with the wooden beads and one made with the brown beads. The adult hopes that after Brian draws a brown-and-white necklace that's longer than an all-brown necklace, he'll notice

[37] Piaget identified children in his studies by abbreviations, in this case by the letters *BRI*.

[38] Dialogue from Piaget, 1952a, pp. 163–164.

[39] Dialogue from Piaget, 1952a, p. 164.

that his drawings are inconsistent with his statement that there are more brown beads. The inconsistency might lead Brian to experience disequilibrium, perhaps to the point that he'll reevaluate his conclusion and realize that, logically, there *must* be more wooden beads than brown ones. In this case, however, Brian is apparently oblivious to the inconsistency, remains in equilibrium, and thus has no need to revise his thinking.

Development builds on prior acquisitions.

Earlier we noted that children can typically accommodate to new stimuli and events only when they can also assimilate those new stimuli and events into their existing understandings. We previously encountered this idea—albeit using different terminology—in the discussion of *rote* versus *meaningful learning* in Chapter 2: Children learn more effectively when they can relate new information and experiences to what they already know. Furthermore, the idea underlies the notion of *stage theory* mentioned earlier in this chapter: Later stages build on the accomplishments of preceding ones. And the example of fraction schemes in Figure 6.5 demonstrates how development not only builds on prior knowledge, but in some cases, prior knowledge is necessary before students can develop further. In general, then, children rarely start from scratch. Instead, virtually all aspects of their development involve a continual process of refining, building on, and occasionally reconfiguring previous abilities and achievements.

Observations of the physical environment—and, ideally, frequent interactions with it—promote development.

Piaget believed that active experimentation with the physical world is essential for cognitive growth. By exploring and manipulating physical objects—for instance, fiddling with sand and water, playing games with balls and bats, and conducting science experiments—children see the effects of erosion, discover principles related to force and gravity, and so on. When interaction with the physical environment isn't possible, children must at least be able to *observe* various cause-and-effect relationships in their physical environment or perhaps by experimenting with various "objects" in a computer-simulated environment.[40]

Language development facilitates cognitive development.

Cognitive development is, of course, essential for the development of language: Children can only talk about things that they can in some way first *think* about. But language is equally important for children's cognitive development.[41] From Piaget's perspective, language provides a set of *symbols* through which humans can mentally represent external events and internal schemes. Using specific words from our language can help us during our thinking. For instance, when we think about pets, our thoughts are apt to include such words as *dog* and *cat*.

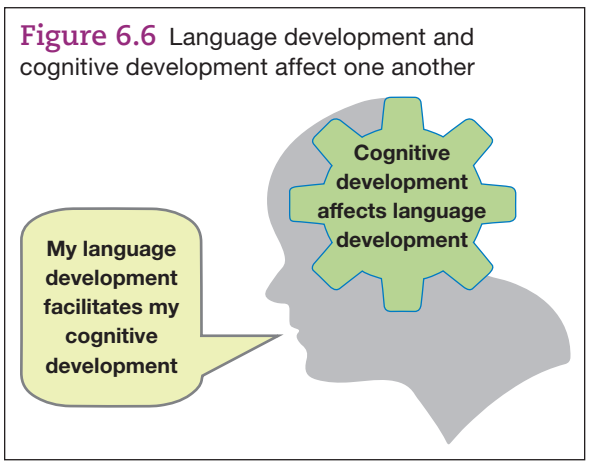


Figure 6.6 Language development and cognitive development affect one another

In Vygotsky's theory of cognitive development, thought and language are separate functions for infants and young toddlers. In these early years, thinking occurs independently of language, and when language appears, it's first used primarily as a means of communication rather than as a mechanism of thought. But sometime around age 2, thought and language become intertwined: Children begin to express their thoughts when they speak, and they begin to think in words. Their rapidly expanding vocabularies at this age enable them to represent and think about a wide variety of objects and events (see Figure 6.6).

[40] Bebko et al., 1992; Brainerd, 2003; de Jong, 2011; Sarama & Clements, 2009.

[41] For more discussions of language's roles in learning and cognitive development, see Ganea et al., 2007; K. Nelson & Fivush, 2004; Pinker, 2007; Q. Wang & Ross, 2007.

When thought and language first merge, children often talk to themselves—a phenomenon known as **self-talk**. Vygotsky suggested that self-talk plays an important role in cognitive development. By talking to themselves, children learn to guide and direct their own behaviors through difficult tasks and complex maneuvers in much the same way that adults may have previously guided them. With time and experience, self-talk gradually evolves into **inner speech**, in which children "talk" to themselves mentally rather than aloud. They continue to direct themselves verbally through tasks and activities, but others can no longer see and hear them do it.[42] Self-talk is hardly unique to young children, of course. As you undoubtedly know from your own experiences, even adults occasionally talk to themselves when they face new challenges (e.g., "OK, first I need to do this and then I can . . ."). Inner speech can help students self-regulate their learning strategies, which can ultimately improve their academic performance.[43]

Knowledge Construction Through Interaction with Others

As we noted in Chapter 4, **sociocultural theory** is a theoretical perspective that emphasizes the importance of society and culture in promoting learning and development. Sociocultural theorists emphasize the role of social interaction and children's cultural heritage in directing the course of development. Parents, teachers, and peers are especially instrumental, in that they pass along culturally prescribed ways of thinking about and responding to objects and events. As children gain practice in certain behaviors and cognitive processes within the context of social interactions, they gradually adopt and adapt these behaviors and processes as their own.

Interactions with other people promote development.

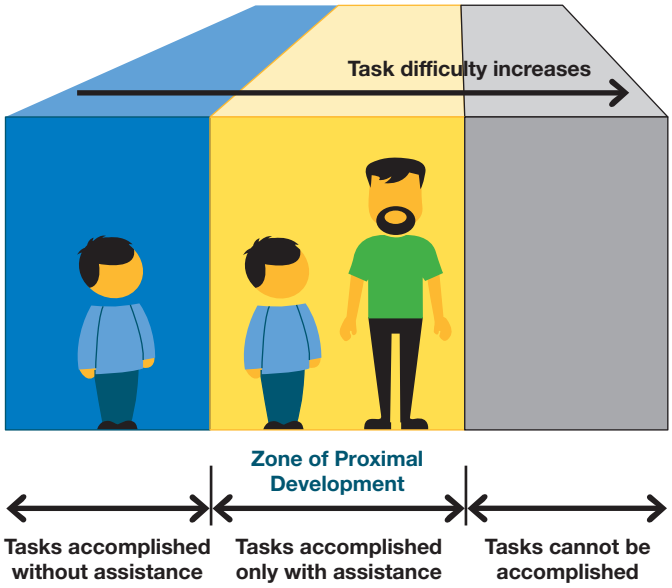
Language is used not only to facilitate cognitive development (as explained previously), but also to enable children to exchange ideas with adults and peers. Both Piaget and Vygotsky suggested that social interaction is critical for cognitive development. In Piaget's view, exchanging ideas with others helps children realize that other individuals see things differently than they do and that their own perspectives aren't necessarily completely accurate or logical ones. For example, 9-year-olds may recognize the logical inconsistencies in what they say only after someone else points them out. And through discussions with peers or adults about social and political issues, a high school student may modify some initially abstract and idealistic notions about how the world "should" be to reflect constraints that the real world imposes.

For Vygotsky, social interactions provide the very foundations for cognitive development. Consequently, Vygotsky's ideas are consistent with **social constructivism** because they focus on how learners construct their knowledge through their interactions with one or more people. One key idea discussed in Chapter 4 is the notion of *mediated learning experiences*: As adults interact with children, they often share the general meanings and interpretations they attach to objects, events, and human experience in general. A second key idea is *cognitive tools*: Not only do adults help children interpret new experiences, but they also share concepts, procedures, and strategies that enable children to deal effectively with complex tasks and problems (as discussed in Chapter 4). To the extent that specific cultures pass along unique interpretations, beliefs, concepts, ideas, procedures, strategies, and so on, children in different cultures will acquire somewhat different knowledge, skills, and ways of thinking. And a third key idea is **internalization**: Children first use complex processes in interactions with other people and gradually become able to use them

[42] Also see Berk, 1994; Winsler & Naglieri, 2003.
[43] Lee et al., 2020.

independently in their own thinking. An example is the progression from self-talk to inner speech: Over time, children gradually internalize directions from others so that they're eventually giving *themselves* directions. Yet keep in mind that children don't necessarily internalize *exactly* what they see and hear in social contexts; rather, internalization often involves transforming ideas and processes to make them uniquely one's own.[44] As an example, children frequently argue with one another about a variety of matters—how best to carry out an activity, what games to play, who did what to whom, and so on. Eventually, children internalize the arguing process, developing the ability to look at a situation from several different angles *on their own*.[45]

Figure 6.7 Tasks in a learner's zone of proximal development promote maximal cognitive growth



Challenging tasks promote development.

Children can typically do more difficult things in collaboration with adults or other, more advanced individuals than they can do on their own.[46] The range of tasks children cannot yet perform independently but *can* perform with other people's help and guidance is, in Vygotsky's terminology, the **zone of proximal development (ZPD)** (see Figure 6.7). We see an example in the opening case study: Two of Lupita's classmates can assemble puzzles only when Lupita provides assistance.

A child's zone of proximal development includes learning and problem-solving abilities that are just beginning to emerge. Naturally, children's ZPDs change over time: As some tasks are mastered, other, more complex ones appear on the horizon to take their place. Furthermore, ZPDs can vary considerably in "width": With assistance, some children may be able to stretch their existing abilities considerably, whereas others may be able to handle tasks that are only slightly more difficult than those they can currently do on their own.

Vygotsky proposed that children develop very little from repeating tasks they can already do independently. Rather, they develop primarily from taking on challenges that require support—that is, tasks within their ZPD. But children's ZPDs also set upper limits on what they're cognitively capable of doing and learning. Impossible tasks—those that children can't complete even with considerable structure and guidance—are of no benefit whatsoever.

Teaching Strategies: Facilitating Learners' Knowledge Construction

Teachers can do a variety of things to teach in ways that are consistent with the findings of developmental researchers, as summarized in the following recommendations.

Encourage play activities.

Vygotsky suggested that play is hardly a frivolous activity. Quite the contrary, play enables children to stretch their abilities in new ways.[47] Playing allows children to observe and actively interact with their environment in ways that give them the opportunity to make sense of it and adapt to it through assimilation and accommodation. For example, as a

[44] Thus, Vygotsky's theory, although primarily sociocultural in nature, also has a constructivist element to it.
[45] Vygotsky, 1978.
[46] Fischer & Immordino-Yang, 2002; Vygotsky, 1978.
[47] Vygotsky, 1978; also see Pellegrini, 2009.

kindergartner, the son of one of us authors often played "restaurant" with his friend Scott. In a corner of the basement, the boys created a restaurant "kitchen" with a toy sink and stove and stocked it with plastic dishes, cooking utensils, and "food" items. They created a separate dining area with child-sized tables and chairs and made menus for their customers. On one occasion they invited both sets of parents to "dine" at the restaurant, taking orders, serving "meals," and eventually leaving the bills. Fortunately, they seemed quite happy with the few pennies they were paid.

In their restaurant play, the two boys took on several adult roles (restaurant manager, waiter, cook) and practiced a variety of adult-like behaviors. In real life, such a scenario would be impossible: Very few 5-year-olds have the skills necessary to run a restaurant. Yet the element of make-believe brought these tasks within the boys' reach.

Furthermore, as children play, their behaviors must conform to certain standards or expectations. In the preschool and early elementary school years, children often act in accordance with how a father, teacher, or waiter would behave. In the organized group games and sports that come later, children must follow a specific set of rules. By adhering to such restrictions on their behavior, children learn to plan ahead, to think before they act, and to engage in self-restraint—skills critical for successful participation in the adult world.[48]

Play, then, is hardly a waste of time. Instead, it provides a valuable training ground for adult life, and perhaps for this reason, it's seen in virtually all cultures worldwide.

Scaffold students' early efforts at challenging tasks and assignments.

In the eyes of Vygotsky and many contemporary developmental psychologists, growing children gain the most from those tasks they can accomplish only with the guidance and support of others—that is, tasks within their zone of proximal development. Other people's guidance and support are known as **scaffolding**, a concept first presented in Chapter 4.

Now that we can see the importance of scaffolding from a developmental perspective, let's look more closely at what it might entail. Following are some forms scaffolding might take:[49]

- Help students develop a plan for accomplishing a complex new task.
- Demonstrate proper performance in a manner students can easily imitate.
- Divide a multifaceted task into several smaller, simpler tasks.
- Give specific guidelines for accomplishing the task (e.g., see Figure 6.8).
- Ask questions that encourage students to think about the topic or task in productive ways.
- Provide a calculator, computer software (word processing program, spreadsheet, etc.), or other technology that makes some aspects of the task easier.
- Remind students of what their goals are in performing the task (e.g., what a problem solution should look like).
- Give frequent feedback about how students are progressing.

Let's take a look at how this seventh-grade science teacher scaffolds her students' learning by asking questions.

> "I will ask them a question that they don't think that they know the answer to, and they will say, 'I don't know,' and then I will back up and I will ask them questions that they do know the answer to, and I will guide them to the answer that they think they don't know the answer to. And I try to do that with a lot of kids, and then I'll say 'well see how

[48] Coplan & Arbeau, 2009; A. Diamond et al., 2007.

[49] A. Collins, 2006; Hmelo-Silver, 2006; Kim et al., 2020; Lajoie & Derry, 1993; Lodewyk & Winne, 2005; Merrill et al., 1996; Rogoff, 1990; Rosenshine & Meister, 1992; D. Wood et al., 1976.

Figure 6.8 A checklist to scaffold ninth-graders' efforts to write a five-paragraph essay

ESSAY CHECKLIST

Use the following checklist each time you write an essay to make sure that you have completed the steps and have every part you need.

Introduction

☐ My first sentence is a Hook sentence.
☐ I have a clear Thesis sentence that answers the question of the assignment.
☐ I have a List sentence that introduces my three main body paragraphs.
☐ I have a Transition sentence at the end.

Main Body Paragraphs

☐ Each of my main body paragraphs talks about one main idea or point.
☐ Each of my main body paragraphs gives information that supports this point.

Conclusion

☐ My conclusion paragraph restates my List sentence in a different way.
☐ My conclusion paragraph restates my Thesis sentence.
☐ My conclusion paragraph connects my essay to me or to the world.

Source: Checklist by Jeffrey Ormrod. Copyright © by Jeffrey Ormrod. Reprinted with permission of the author.

> you, how much you really do know? See how smart you really are?'. . . it teaches them how to use the knowledge that they already do have, 'cause a lot of kids don't realize that they can think beyond what they think they know."[50]

Depending on their particular knowledge and ability levels, different students at any single grade level may need different kinds of scaffolding to support their success. As students become more adept at performing a new task, scaffolding is ideally modified to nurture newly emerging skills. And over time the scaffolding is gradually phased out (a process known as *fading*) until students can complete the task entirely on their own. In fact, providing *too much* scaffolding—more than a learner needs—can be an unwanted distraction.[51]

Scaffolding can come from other students as well as from teachers. In the opening case study, Lupita scaffolds two classmates' attempts at assembling puzzles. Furthermore, when several students work together on a difficult task, they may be able to accomplish something that none of them could accomplish on their own (recall our discussion of distributed cognition in Chapter 4). Cross-grade tutoring is yet another possibility, and students at both the giving and receiving ends of the instruction are likely to benefit. For example, when older children tutor younger ones in such basic subjects as writing and math, the children "teachers" gradually *internalize* the suggestions they give their "students" (e.g., "Make sure every sentence has a period," "Now carry that 1 to the tens column") and so are more likely to use those suggestions themselves.[52]

Teachers can help students to help one another by modeling and scaffolding effective strategies so that students eventually internalize the strategies. As an example, **reciprocal teaching** is an approach to teaching reading and listening comprehension strategies in which students learn to ask one another questions about textbook passages or literature (the steps involved in this approach are provided in Figure 6.9).[53] Reciprocal teaching has been used successfully with diverse students (ranging from first-graders to college students) who have a variety of ability levels, including struggling readers and English learners.[54]

[50] Schmidt et al., 2019, p. 23.
[51] van Merriënboer & Sweller, 2005.
[52] Biemiller et al., 1998; Graesser et al., 2011.
[53] A. L. Brown & Palincsar, 1987; Oczkus, 2018; Palincsar & Brown, 1984, 1989; Palincsar & Herrenkohl, 1999.
[54] Alfassi, 2004; Carter, 1997; Cooper et al., 2000; Fung et al., 2003; E. R. Hart & Speece, 1998; Hashey & Connors, 2003; Johnson-Glenberg, 2000; K. D. McGee et al., 2001; Palincsar & Brown, 1989; Reinking & Leu, 2008; Rosenshine & Meister, 1994; Slater, 2004; Sollars & Pumfrey, 1999.

Figure 6.9 The reciprocal teaching approach can be used to teach reading and listening comprehension strategies

Implementing the Reciprocal Teaching Approach

1. **Group reading:** Several students and their teacher meet in a group to read a piece of text, occasionally stopping to discuss and process the text aloud.
2. **Teacher modeling:** Initially, the teacher leads a discussion by asking questions that support effective reading comprehension strategies (such as predicting, questioning, clarifying, and summarizing) to promote understanding, elaboration, and comprehension monitoring.
3. **Teacher scaffolding:** Gradually, the teacher turns the role of "teacher" over to different students, who then take charge of the discussion and ask one another the kinds of questions their teacher has modeled.
4. **Student practicing:** Eventually, students can read and discuss a text almost independently of their teacher. They work together to construct meaning and check one another for comprehension and possible misunderstandings, and they become increasingly flexible in how they apply their newly acquired strategies.

Sources: Based on A. L. Brown & Palincsar, 1987; Oczkus, 2018; Palincsar & Brown, 1984, 1989; Palincsar & Herrenkohl, 1999.

In most instances of reciprocal teaching, students take turns reading sections of the text being discussed. Sometimes, however, the teacher reads the text, especially when working with novice readers. As an illustration, let's look at a reciprocal teaching session in which six first-graders and their teacher are discussing a text about snowshoe rabbits. The teacher has just read a description of a mother rabbit giving birth to and caring for several babies. In the discussion that follows, a student named Kam takes the role of "teacher."

Kam: When was the babies born?

Teacher: That's a good question to ask. Call on someone to answer that question.

Kam: Robby? Milly?

Milly: Summer.

Teacher: What would happen if the babies were born in the winter? Let's think.

[Several children make a number of responses, including: "The baby would be very cold." "They would need food." "They don't have no fur when they are just born."]

Kam: I have another question. How does she get the babies safe?

Kris: She hides them.

Kam: That's right but something else. . . .

Teacher: There is something very unusual about how she hides them that surprised me. I didn't know this.

Travis: They are all in a different place.

Teacher: Why do you think she does this?

Milly: Probably because I heard another story, and when they're babies they usually eat each other or fight with each other.

Teacher: That could be! And what about when that lynx comes?

[Several children comment that that would be the end of all the babies.]

Travis: If I was the mother, I would hide mine. I would keep them all together.

Kris: If the babies are hidden and the mom wants to go and look at them, how can she remember where they are?

Teacher: Good question. Because she does have to find them again. Why? What does she bring them?

Milly: She needs to bring food. She probably leaves a twig or something.

Teacher: Do you think she puts out a twig like we mark a trail?

[Several children disagree and suggest that she uses her sense of smell. One child, recalling that the snowshoe rabbit is not all white in the winter, suggests that the mother might be able to tell her babies apart by their coloring.]

Teacher: So we agree that the mother rabbit uses her senses to find her babies after she hides them. Kam, can you summarize for us now?

Kam: The babies are born in the summer. . . .

Teacher: The mother . . .

Kam: The mother hides the babies in different places.

Teacher: And she visits them . . .

Kam: To bring them food.

Travis: She keeps them safe.

Teacher: Any predictions?

Milly: What she teaches her babies . . . like how to hop.

Kris: They know how to hop already.

Teacher: Well, let's read and see.[55]

In this lesson the teacher models elaborative questions and connections to prior knowledge ("What would happen if the babies were born in the winter?" "Do you think she puts out a twig like we mark a trail?") and provides general guidance and occasional hints about how students should process the passage about snowshoe rabbits ("Kam, can you summarize for us now?" "And she visits them . . . "). Also notice in the dialogue how students support one another in their efforts to process what they are reading. Consider this exchange as an example:

Kam: I have another question. How does she get the babies safe?

Kris: She hides them.

Kam: That's right but something else. . . .

Involve students in age-appropriate ways in adult activities.

When you were a young child, did you sometimes help your mother, father, or an older sibling bake things in the kitchen? Did the cook let you pour, measure, and mix ingredients once you were old enough to do so? Did the cook also give you directions or suggestions as you performed these tasks?

Older family members often allow young children to perform household tasks (e.g., cooking, cleaning, or painting) while providing guidance about how to do the tasks appropriately. Likewise, teachers should introduce students to common adult activities within a structured and supportive context. For instance, students might take active roles in school fund-raisers, such as chili dinners or multifamily garage sales. They might assist with costume design and scenery construction for a school play. Or they might communicate with scientists or government officials through e-mail or teleconferences. When teachers get students actively involved in adult activities, they're engaging students in **guided participation** in the world of adults and, often, in those specific *communities of practice* described in Chapter 4.[56]

In some instances, adults work with children and adolescents in formal or informal **apprenticeships**, one-on-one mentorships in which the adults teach the youngsters new skills, guide their initial efforts, and present increasingly difficult tasks as proficiency improves and the zone of proximal development changes. Many cultures use apprenticeships

[55] Lesson courtesy of Annmarie Palincsar. Copyright © by Annemarie Palincsar. Reprinted with permission of the author.
[56] Rogoff, 2003.

as a way of gradually introducing children to particular skills and trades—perhaps sewing, weaving, or playing a musical instrument.[57]

When the expert in an apprenticeship not only guides the novice in how to perform a task but also provides guidance in how to *think about* the task, it's sometimes called a **cognitive apprenticeship**.[58] For instance, a student and a teacher might work together to accomplish a challenging task or solve a difficult problem (perhaps collecting data samples in biology fieldwork, solving a mathematical brainteaser, or translating a difficult passage from German to English). In the process of talking about various aspects of the task or problem, the teacher and student together analyze the situation and develop the best approach to take, and the teacher models effective ways of thinking about and mentally processing the situation. Although apprenticeships differ widely from one context to another, they typically involve the teacher and learner roles presented in Figure 6.10.[59]

Figure 6.10 Roles of the teacher and learner in apprenticeships

Teacher roles

- **Modeling**: The teacher demonstrates the task and simultaneously thinks aloud about the process while the student observes and listens.
- **Coaching**: As the student performs the task, the teacher gives frequent suggestions, hints, and feedback.
- **Scaffolding**: The teacher provides various forms of support for the student, perhaps by simplifying the task, breaking it into smaller and more manageable components, or providing less complicated tools.
- **Increasing complexity and diversity of tasks**: As the student gains greater proficiency, the teacher presents more complex, challenging, and varied tasks to complete, often within real-world contexts.

Learner roles (prompted by the teacher)

- **Articulation**: The student explains what he or she is doing and why, allowing the teacher to examine the student's knowledge, reasoning, and problem-solving strategies.
- **Exploration**: The student frames questions and problems on his or her own, thereby expanding and refining acquired skills.
- **Reflection**: The student compares his or her performance with that of experts or perhaps with an ideal model of how the task should be done.

6.3 Trends in Cognitive Development

Big Idea 6.3 **Children continually build on existing knowledge and skills to develop more advanced thinking and reasoning abilities.**

In our discussions of learning and cognition in previous chapters, we've already identified three noteworthy trends in cognitive development:

- With age and experience, children acquire more effective learning strategies and use them more intentionally (Chapter 2).
- Most learners become increasingly self-regulating over the course of childhood and adolescence (Chapter 3).
- Metacognitive knowledge and skills gradually improve with age (Chapter 3).

[57] A. Collins, 2006; D. J. Elliott, 1995; Lave & Wenger, 1991; Rogoff, 1990, 1991.
[58] J. S. Brown et al., 1989; A. Collins, 2006; Dennen & Burner, 2008; W. Roth & Bowen, 1995.
[59] A. Collins, 2006; A. Collins et al., 1989; Hmelo-Silver, 2006.

We now pull from the research of information processing theorists and cognitive-developmental theorists (including both Piaget and more contemporary researchers) to identify the following additional trends.

Development of Working Memory, Knowledge, and Thinking Processes

Developmental psychologists who take an information processing approach focus on how memory capabilities and specific cognitive processes change with age.[60] For example, some examine how an expanding working memory capacity enables more complex thought. Others consider how increasingly sophisticated metacognitive knowledge and beliefs spur more advanced and effective learning strategies. Still others explore the cognitive processes involved in children's social interactions with peers.

Children's growing working memory capacity enables them to handle increasingly complex cognitive tasks.

As you should recall from Chapter 2, working memory has a very limited capacity and learners can think about only so much at once. In fact, children ages 5 to 8 seem to have only about half of the working memory capacity that adults have.[61] Fortunately, as children grow older, their working memory capacity increases, and they can gradually handle bigger and more complex thinking and learning tasks. Some of this increase in capacity is likely due to an increase in the physical capacity of working memory. But as children grow, they also acquire more knowledge and strategies that allow them to process information more effectively, so it frees up more available "space."[62] As an analogy, if you think of working memory as a "box," two things happen as children get older: The box gets a little bigger, and children can "pack" it more effectively (see Figure 6.11).

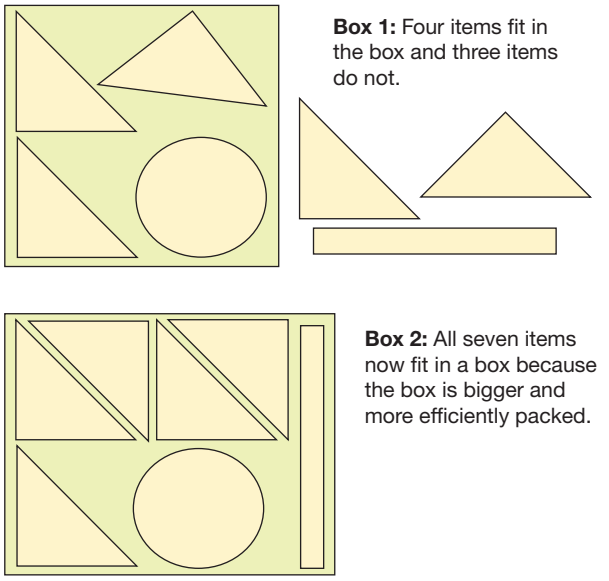


Figure 6.11 This "box" analogy can be used to understand why working memory capacity increases as children develop: Compared to Box 1 (which is analogous to the working memory of children), Box 2 (which is analogous to the working memory of adults) is larger and more efficiently packed, allowing more "items" to fit

Children's growing knowledge base enhances their ability to learn new things.

One key reason children use increasingly effective learning strategies with age is that they acquire an ever-expanding body of knowledge that can help them interpret, organize, and elaborate on new experiences. In cases where children have more knowledge than adults, the children are often the more effective learners.[63] For example, when one of us authors used to read books about lizards together with her son, her son always remembered more than she did because, even as a 6-year-old, he knew a great deal about reptiles, whereas his mom knew very little.

Children's knowledge, beliefs, and thinking processes become increasingly integrated.

Through such processes as knowledge construction, organization, and elaboration, children increasingly pull together what they know and believe about the world into cohesive wholes (e.g., recall

[60] Prominent developmental psychologists taking an information processing approach include John Flavell, Robert Siegler, Deanna Kuhn, Robbie Case, Kurt Fischer, Nicki Crick, and Kenneth Dodge.
[61] Cowan et al., 2015; Kharitonova et al., 2015.
[62] Ben-Yehudah & Fiez, 2007; Cowan et al., 2015; Kail, 2007; Van Leijenhorst et al., 2007.
[63] Chi, 1978; Rabinowitz & Glaser, 1985.

the discussion of children's *theories* about how the world operates in Chapter 2). Whereas the knowledge base of young children is apt to consist of many separate, isolated facts, the knowledge base of older children and adolescents typically includes many interconnections among concepts and ideas.[64]

Piaget suggested that not only children's knowledge but also their *thought processes* become increasingly integrated over time. In particular, their many "thinking" schemes gradually combine into well-coordinated systems of mental processes. These systems—which Piaget called *operations*—allow children to think in increasingly logical ways, as will be evident in the next section.[65]

Stages of Cognitive Development

Cognitive developmental theory proposes that one or more aspects of development can be characterized by a predictable sequence of stages.[66] Each stage builds on acquisitions from any preceding stages and yet has a structure that's qualitatively different from the structure(s) of the prior stages, as is explained in the next three developmental trends.

Thinking becomes increasingly logical during the elementary school years.

Piaget proposed that cognitive development proceeds through four distinct stages, which are summarized in Table 6.1. Children's thinking during the school years reflects characteristics of three of these stages—the preoperational, concrete operations, and formal operations stages—and so is relevant to our discussion here. Yet keep in mind that children's reasoning abilities appear to emerge more gradually than Piaget's stage theory might lead us to believe. Furthermore, many contemporary theorists believe—and Piaget himself acknowledged—that the four stages better describe how children and adolescents *can* think, rather than how they always *do* think, at any particular age.[67]

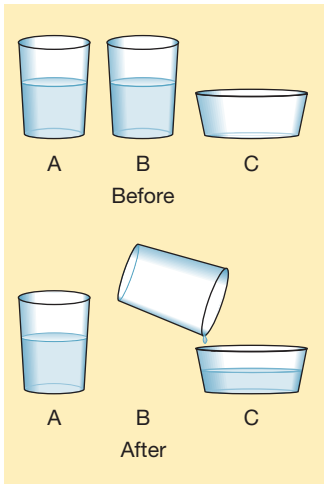
In Piaget's view, reasoning in the **preoperational stage** is somewhat illogical. As an example, recall 6-year-old Brian's insistence that in a set of 12 wooden beads, including 10 brown ones and 2 white ones, there are more brown beads than wooden ones. And consider the following situation:

> Five-year-old Nathan is shown the three "before" glasses depicted in Figure 6.12. He is asked whether Glasses A and B contain the same amount of water, and he replies confidently that they do. Then, the water is poured from Glass B into Glass C, and he is asked whether A and C have the same amount (depicted as the "after" glasses in Figure 6.12). Nathan replies, "No, Glass A has more because it's taller."

Nathan's response reflects lack of **conservation**: He doesn't realize that the amount of water in the two glasses must be equivalent because nothing has been added or taken away. Young children such as Nathan often confuse changes in appearance with changes in amount.

Piaget found that children as young as age 4 or 5 occasionally draw logically correct conclusions about class inclusion and conservation problems. However, he suggested that their reasoning is based on hunches and intuition rather than on any conscious awareness

Figure 6.12 Conservation of liquid: Do Glasses A and C contain the same amount of water?



[64] J. M. Alexander et al., 2006; Bjorklund, 1987; Fischer & Immordino-Yang, 2002; Flavell et al., 2002.
[65] For a more recent, neo-Piagetian perspective on how thinking processes might become integrated, see Kurt Fischer's discussions of *multiple, parallel strands* (e.g., Fischer & Immordino-Yang, 2002; Fischer et al., 1993).
[66] Prominent cognitive developmental theorists include Jean Piaget, Jerome Bruner, Robbie Case, Kurt Fischer, and Lawrence Kohlberg.
[67] Flavell, 1994; Halford & Andrews, 2006; Klaczynski, 2001; Morra et al., 2008; Tanner & Inhelder, 1960.

Table 6.1 Piaget's Four Stages of Cognitive Development

STAGE	PROPOSED AGE RANGE[a]	GENERAL DESCRIPTION	EXAMPLES OF ABILITIES ACQUIRED
Sensorimotor	Begins at birth	Schemes are based largely on behaviors and perceptions. Especially in the early part of this stage, children cannot think about things that are not immediately in front of them, and so they focus on what they are doing and seeing at the moment.	• *Trial-and-error experimentation with physical objects:* Exploration and manipulation of objects to determine their properties • *Object permanence:* Realization that objects continue to exist even when removed from view • *Symbolic thought:* Representation of physical objects and events as mental entities (*symbols*)
Preoperational	Emerges at about age 2	Thanks in part to their rapidly developing language and the symbolic thought it enables, children can now think and talk about things beyond their immediate experience. However, they do not yet reason in logical, adult-like ways.	• *Language:* Rapid expansion of vocabulary and grammatical structures • *Intuitive thought:* Some logical thinking based on hunches and intuition rather than on conscious awareness of logical principles (especially after age 4)
Concrete Operations	Emerges at about age 6 or 7	Adult-like logic appears but is limited to reasoning about concrete, real-life situations.	• *Class inclusion:* Ability to classify objects as belonging to two or more categories simultaneously • *Conservation:* Realization that amount stays the same if nothing is added or taken away, regardless of alterations in shape or arrangement
Formal Operations	Emerges at about age 11 or 12[b]	Logical reasoning processes are applied to abstract ideas as well as to concrete objects and situations. Many capabilities essential for advanced reasoning in science and mathematics appear.	• *Reasoning about hypothetical ideas:* Ability to draw logical deductions about situations that have no basis in physical reality • *Proportional reasoning:* Conceptual understanding of fractions, percentages, decimals, and ratios • *Separation and control of variables:* Ability to test hypotheses by manipulating one variable while holding other variables constant

[a]The age ranges presented in the table are *averages*; some children reach more advanced stages a bit earlier, others a bit later. Also, some children may be in *transition* from one stage to the next, displaying characteristics of two adjacent stages at the same time.

[b]Recent researchers have found much variability in when adolescents begin to show reasoning processes consistent with Piaget's formal operations stage. Furthermore, not all cultures value or nurture formal operational logic, perhaps because it is largely irrelevant to people's daily lives and tasks.

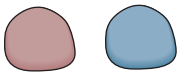
of underlying logical principles, and so they can't yet explain *why* their conclusions are correct. More recently, researchers have discovered that how logically young children think depends partly on situational factors, such as how task materials are presented, how questions are worded, and whether adults provide guidance about how to think about a problem.[68]

In any event, most children have mastered simple logical thinking tasks, such as those involving class inclusion and simple forms of conservation, by age 6 or 7—an age at which, in Piaget's view, they're now in the **concrete operations stage**. They continue to refine their newly acquired logical thinking capabilities for several years. For example, some simple forms of conservation, such as the conservation-of-liquid problem presented in Figure 6.12, appear at age 6 or 7. Others don't emerge until later. Consider the problem in Figure 6.13. Using a balance scale, an adult shows a child that two balls of clay have the same weight. One ball is removed from the scale and smashed into a pancake shape. Does the pancake weigh the same as the unsmashed ball, or are the weights different? Not until around age 9

[68] Halford & Andrews, 2006; Morra et al., 2008; Siegler & Svetina, 2006.

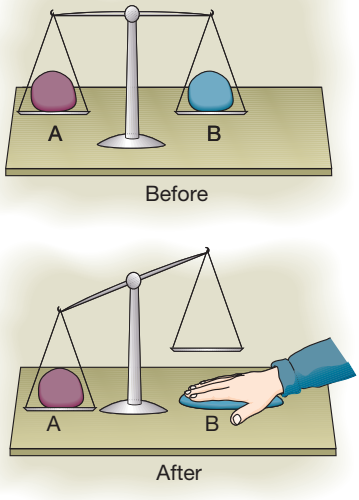
do children realize that the flattened pancake must weigh the same as the round ball it was previously.[69] And some conservation-of-weight tasks are difficult even for young adolescents. For instance, although most eighth-graders would acknowledge that a large block of Styrofoam has weight, they may claim that a tiny piece torn from the block has no weight at all.[70]

The ages at which students master the different forms of conservation can vary based on their prior experiences. As an example, imagine you have two equal-sized balls of clay, as shown here.



You change the shape of one ball by flattening it into a pancake shape. But instead of asking a child if the two pieces of clay *weigh* the same (this would be the conservation-of-weight task shown in Figure 6.13), you simply ask whether the two pieces have the same *amount*. On average, schoolchildren in Europe and North America master such *conservation of substance* with clay at around age 7. In one classic study, however, Mexican children whose families regularly made pottery mastered this task by age 6.[71] Making pottery requires children to make frequent judgments about needed quantities of clay, and these judgments must be fairly accurate regardless of the clay's specific shape. Yet in other cultures, especially in those where children neither attend school nor work at activities that require keeping track of quantity, conservation may appear several years later than it does in mainstream Western societies.[72]

Figure 6.13 Conservation of weight: Ball A and Ball B initially weigh the same. When Ball B is flattened into a pancake shape, how does its weight now compare with that of Ball A?



Thinking becomes increasingly abstract in the middle school and secondary school years.

In Piaget's theory, children in the concrete operations stage can reason only about concrete objects and events, and especially about things they can actually see. Once they acquire abilities that characterize the **formal operations stage**—perhaps at around age 11 or 12—they're capable of **abstract thinking**, which involves thinking about objects, principles, or ideas that are not concrete physical objects or experiences. For example, in mathematics, they should have an easier time understanding such concepts as *negative number*, *pi* (π), and *infinity*. In science, they should be able to think about *molecules* and *atoms* and understand how it's possible for temperatures to go below zero. In the arts, they should be able to think about the concept of *beauty*.

Once learners become capable of abstract thinking, they're able to look beyond the literal meanings of messages. Children in the early elementary grades often take the words they hear at face value—for instance, interpreting the expression "Your eyes are bigger than your stomach" quite literally (see Figure 6.14). And they have little success determining the underlying meanings of such proverbs as "Look before you leap" and "Don't put the cart before the horse." Students' ability to interpret proverbs in a generalized, abstract fashion continues to improve even in the high school years.[73]

In Piaget's theory, formal operational thought also involves **hypothetical reasoning**, thinking logically about things that may or may not be true. In some instances, such reasoning involves things that are definitely false. As an example, try the following exercise.

[69] Morra et al., 2008; Sroufe et al., 1992.
[70] C. L. Smith et al., 1997; Wiser & Smith, 2008.
[71] Price-Williams et al., 1969.
[72] Fahrmeier, 1978; Morra et al., 2008.
[73] Owens, 1996; Winner, 1988.

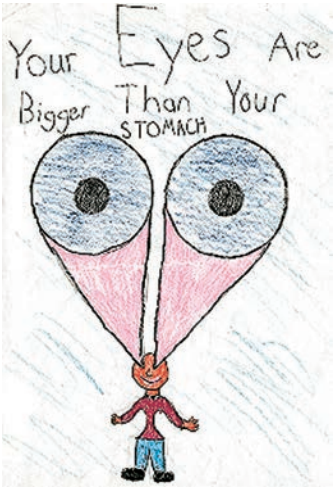


Figure 6.14 In this drawing, 8-year-old Jeff interprets the expression "Your eyes are bigger than your stomach" quite literally

See For Yourself

Beings and Basketballs

Take a moment to answer these two questions:

1. If all children are human beings,
   And if all human beings are living creatures,
   Then must all children be living creatures?
2. If all children are basketballs,
   And if all basketballs are jellybeans,
   Then must all children be jellybeans?

You probably responded fairly quickly that, yes, all children must be living creatures. The second question is trickier. It follows the same line of reasoning as the first but the conclusion it leads to (i.e., all children must be jellybeans) contradicts what's true in reality. Following rules of formal logic—that is, if we assume the first two premises to be true—the answer is yes, all children must be jellybeans. Such reasoning about hypothetical and perhaps contrary-to-fact ideas is taught and encouraged in many schools in mainstream Western societies, especially within the context of math and science instruction. But in numerous other cultures, including many modern Asian societies, logical reasoning tends to be rooted in people's everyday, concrete realities. Adults in these cultures may find little purpose in hypothetical and contrary-to-fact reasoning and so don't always nurture it in their schools or elsewhere.[74]

Abstract thinking and hypothetical reasoning processes seem to emerge earlier and more gradually than Piaget proposed. Children in the elementary grades occasionally show an ability to reason abstractly and hypothetically about certain topics.[75] And yet once children reach puberty, they may continue to struggle with some abstract subject matter. For instance, although many can understand some abstract scientific and mathematical concepts in early adolescence, they're apt to have trouble understanding abstract concepts in history and geography until well into the high school years.[76] In fact, some adolescents never do show much evidence of formal operational thinking, especially if their culture and schooling do little to encourage it.[77]

Another outcome of abstract and hypothetical thinking is the ability to envision how the world might be different from the way it actually is. In some cases, adolescents envision a world much *better* than the one they live in, and they exhibit considerable concern and idealism about social and political issues. Some secondary school students devote a great deal of energy to local or global problems, such as water pollution or animal rights. However, they may offer recommendations for change that aren't practical in today's world. For example, a teenager might argue that "all you need is love" to overcome racism or suggest that a nation should eliminate its weapons and armed forces as a way of moving toward world peace. Piaget proposed that adolescent idealism reflects an inability to separate one's own logical abstractions from the perspectives of others and from practical considerations. Only through experience do adolescents eventually begin to temper their optimism with some realism about what's possible with limited resources and the idiosyncrasies of human nature.

[74] M. Cole, 1990; J. G. Miller, 1997; Norenzayan et al., 2007.
[75] S. R. Beck et al., 2006; S. Carey, 1985; McNeil & Uttal, 2009; Metz, 1995.
[76] Kuhn & Franklin, 2006; Lovell, 1979; Tamburrini, 1982.
[77] Flieller, 1999; Lerner, 2002; Rogoff, 2003.

Several logical thinking processes important for mathematical and scientific reasoning improve considerably during adolescence.

In Piaget's view, several additional abilities accompany the advancement to the formal operations stage. One is *proportional reasoning*, which is the ability to understand and think logically about such proportions as fractions, decimals, percentages, and ratios. For example, if you can quickly and easily recognize that the following statement is true

$$\frac{2}{8} = \frac{6}{24} = 0.25 = 25\%$$

then you've demonstrated some basic knowledge of proportional reasoning.

Scientific reasoning skills also improve in adolescence. Two of them—*formulating and testing hypotheses* and *separating and controlling variables*—together enable learners to use the scientific method, in which several possible explanations for an observed phenomenon are proposed and tested in a systematic manner. As an example, consider the pendulum problem in the next exercise.

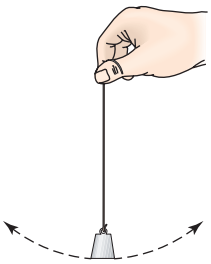
See For Yourself

Pendulum Problem

In the absence of other forces, an object suspended by a rope or string—a pendulum—swings at a constant rate. (A yo-yo and a playground swing are two everyday examples.) Some pendulums swing back and forth rather slowly, others more quickly. What characteristics of a pendulum determine how fast it swings? Jot down at least three hypotheses about the variable(s) that might affect a pendulum's oscillation rate.

Now gather several small objects of varying weights (e.g., a paperclip, a house key, a heavy bolt) and a piece of string. Tie one of the objects to one end of the string, and set your pendulum in motion. Conduct one or more experiments to test each of your hypotheses.

What can you conclude? What variable or variables affect the rate at which a pendulum swings?



What hypotheses did you generate? Four common ones involve the weight of the object, the length of the string, the force with which the object is pushed, and the height from which the object is released. Did you test each of your hypotheses in a systematic fashion? A person capable of formal operational thinking separates and controls variables, testing one at a time while holding all others constant. (This strategy should remind you of our discussion of *experimental studies* in Chapter 1.) For example, if you were testing the hypothesis that weight makes a difference, you might have tried objects of different weights while keeping constant the length of the string, the force with which you pushed each object, and the height from which you dropped or pushed it. Similarly, if you hypothesized that length was a critical factor, you might have varied the string length while continuing to use the same object and setting the pendulum in motion in a consistent manner. If you carefully separated and controlled variables, you should have come to the correct conclusion: Only *length* affects a pendulum's oscillation rate.

As early as first or second grade, children show signs that they can think about simple proportions.[78] And by the upper elementary grades, some can separate and control variables, especially if given guidance about the importance of controlling all variables except the one they're currently testing.[79] But by and large, the mathematical and scientific reasoning abilities just described don't develop significantly until puberty, and they continue to develop throughout adolescence.[80]

[78] Empson, 1999; Van Dooren et al., 2005.

[79] Barchfeld et al., 2005; Kuhn & Pease, 2008; Lorch et al., 2010.

[80] Barchfeld et al., 2005; Byrnes, 1988; Kuhn et al., 1995; Tourniaire & Pulos, 1985; Van Dooren et al., 2005; Zohar & Aharon-Kraversky, 2005.

The progression of logical reasoning processes shown in Table 6.2 draws on both Piaget's early work and more recent research findings. It also presents examples of teaching strategies that take these processes into account.

Developmental Trends

Table 6.2 Logical Thinking Abilities at Different Grade Levels

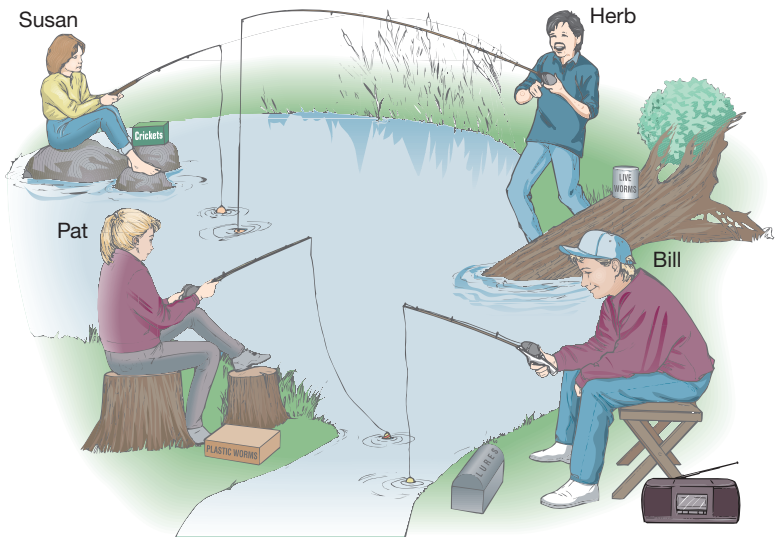
GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **Grades K–2**	• Emergence of class inclusion • Emergence of conservation in simple tasks • Increasing ability to explain and justify conclusions about logical reasoning tasks	Five-year-old Lucinda confidently and accurately declares that two rows of quarters each have five coins. But when an adult spreads the quarters in one row far apart, she declares that the longer row has more quarters because it's "like more far away . . . bigger."	• Use concrete manipulatives and experiences to illustrate new ideas. • Have students classify objects in multiple ways (e.g., by color, then by size). • Ask students whether a set of objects you've just rearranged has more or fewer objects than it did before. Also ask them to (1) explain their reasoning and (2) explain why someone else might think the amount hasn't changed.
JohnnyGreig/E+/Getty images **Grades 3–5**	• Emergence of conservation in more challenging tasks (e.g., conservation of weight), with full development of conservation continuing into adolescence • Ability to understand simple fractions (e.g., ½) that can be related to concrete objects and everyday events • Occasional abstract and hypothetical thinking	When fourth-graders are shown a pizza that's been cut into 12 slices, they easily identify one-half of the pizza (6 slices) and one-third of the pizza (4 slices). But when the lesson moves from concrete depictions of fractions to strictly symbolic representations, many begin to have trouble understanding.	• Supplement verbal explanations with concrete examples, pictures, and hands-on activities. • Introduce simple fractions by relating them to everyday objects (e.g., pizza slices, kitchen measuring cups). • Have students engage in simple scientific investigations, focusing on familiar objects and phenomena.
Photo by Unsplash **Grades 6–8**	• Increasing ability to reason logically about abstract, hypothetical, and contrary-to-fact situations • Some ability to test hypotheses and to separate and control variables, especially with scaffolding; conclusions sometimes reflect *confirmation bias* (see Chapter 2) • Increasing ability to understand and work with proportions • Some ability to interpret figurative language (e.g., proverbs, figures of speech)	A seventh-grade science teacher asks students to conduct experiments to determine which one or more of three variables—weight, length, and height of initial drop—affects a pendulum's oscillation rate. One group of four students consistently varies both weight and length in its experiments and ultimately concludes (erroneously) that a pendulum's weight is the deciding factor.	• Make abstract concepts concrete in some way (e.g., relate *gravity* to everyday experiences, show a diagram of an *atom*). • Ask students to speculate on the meanings of well-known proverbs (e.g., "Two heads are better than one"). • Assign problems that require the use of simple fractions, ratios, or decimals. • Have students conduct simple experiments to answer specific questions about cause and effect.
Photo by Unsplash **Grades 9–12**	• Increasing proficiency in the scientific method (e.g., formulation and testing of hypotheses, separation and control of variables); effects of confirmation bias still evident • Greater proficiency in interpreting figurative language • Idealistic (but not always realistic) views about how various aspects of society might be improved	When 14-year-old Alicia is asked to explain the proverb "A rolling stone gathers no moss," she offers an interpretation that goes beyond its literal meaning: "Maybe when you go through things too fast, you don't . . . collect anything from it."	• Study particular topics in depth; introduce complex and abstract explanations and theories. • Ask students to speculate on the meanings of unfamiliar proverbs (e.g., "Discretion is the better part of valor"). • Have students design some of their own experiments in science labs and science fair projects. • Encourage discussions about social, political, and ethical issues; elicit multiple perspectives on these issues.

Sources: Barchfeld et al., 2005; M. Donaldson, 1978; Elkind, 1981; Empson, 1999; Flavell, 1963; Fujimura, 2001; Halford & Andrews, 2006; Inhelder & Piaget, 1958; Karplus et al., 1983; Kuhn & Franklin, 2006; Lorch et al., 2010; Metz, 1995; Morra et al., 2008; Newcombe & Huttenlocher, 1992; Owens, 1996; Piaget, 1928, 1952b, 1959; Rosser, 1994; Siegler & Alibali, 2005; Siegler & Lin, 2010; Van Dooren et al., 2005; Wiser & Smith, 2008; Zohar & Aharon-Kraversky, 2005.

Children can think more logically and abstractly about tasks and topics they know well.

The ability to think logically about a situation or topic depends to some degree on learners' background knowledge and educational experiences. For example, 5-year-olds are more likely to solve class inclusion problems—such as whether a picture of three cats and six dogs has more animals than it has dogs—if an adult helps them think logically about such problems.[81] Children in the elementary grades can better understand fractions if they work with familiar concrete objects.[82] Young adolescents become increasingly able to separate and control variables if they have many experiences that require them to do so.[83] Middle school and high school students (and adults as well) often apply formal operational reasoning processes to topics about which they have a great deal of knowledge and yet think concretely about topics with which they're unfamiliar.[84]

Figure 6.15 What are some possible reasons that Herb is catching more fish than the others?



Source: Based on Pulos, S., & Linn, M. C. (1981). Generality of the controlling variables scheme in early adolescence. Journal of Early Adolescence, 1, 26–37.

As an illustration of how knowledge affects scientific reasoning processes, consider the fishing pond in Figure 6.15. In one study,[85] 13-year-olds were shown a similar picture and told, "These four children go fishing every week, and one child, Herb, always catches the most fish. The other children wonder why." If you look at the picture, it's clear that several variables might be involved, including the child's location, the kind of bait, and the length of the fishing rod. Adolescents who were avid fishermen more effectively separated and controlled variables for this situation than they did for the pendulum problem described earlier, whereas the reverse was true for nonfishermen.

True expertise comes only after many years of study and practice.

Some learners eventually acquire a great deal of information about a particular topic—say, lizards, World War II, auto mechanics, or computer programming—to the point that they're *experts*. Not only do experts know more than their peers, but their knowledge is also qualitatively different from that of others. In particular, their knowledge tends to be tightly organized, with many interrelationships among ideas and many abstract generalizations unifying more specific, concrete details.[86] Such qualities enable experts to retrieve the things they need more easily, to find parallels between seemingly diverse situations, and to interpret and solve problems more creatively.[87] Ideally, then, expertise is *adaptive*: It combines considerable knowledge and skills with open-mindedness and innovation.[88]

[81] Siegler & Svetina, 2006.
[82] Empson, 1999; Fujimura, 2001.
[83] Kuhn & Pease, 2010; Lorch et al., 2010; Schauble, 1990.
[84] Girotto & Light, 1993; M. C. Linn et al., 1989; Schliemann & Carraher, 1993.
[85] Pulos & Linn, 1981.
[86] J. M. Alexander et al., 2008; P. A. Alexander & Judy, 1988; Bédard & Chi, 1992; Horn, 2008; R. W. Proctor & Dutta, 1995.
[87] Chi et al., 1982; De Corte et al., 1996; Horn, 2008; Rabinowitz & Glaser, 1985; Voss et al., 1983.
[88] Bransford et al., 2009.

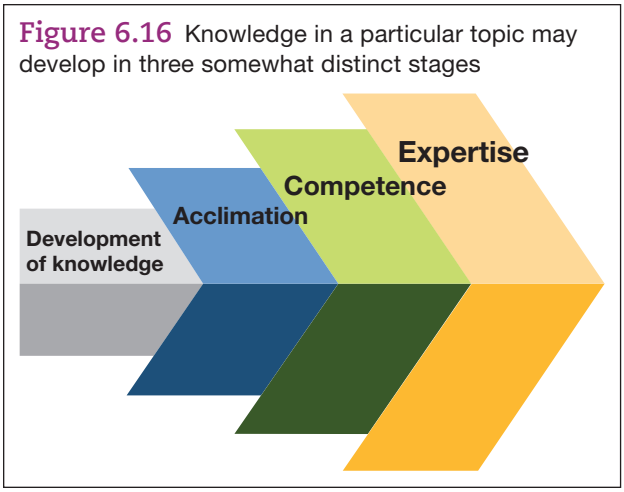


Figure 6.16 Knowledge in a particular topic may develop in three somewhat distinct stages

There may be three somewhat distinct stages in the development of knowledge related to a particular topic, as illustrated in Figure 6.16.[89] At the first stage, *acclimation*, learners familiarize themselves with a new content domain, much as someone might do by taking an introductory course in biology, European history, or economics. At this point, learners pick up a lot of facts that they tend to store in relative isolation from one another. As a result of such fragmented learning, they're likely to hold on to many misconceptions that they may have acquired before they started studying the subject systematically.

At the second stage, *competence*, learners acquire considerably more information about the subject matter, and they also acquire some general principles that help tie the information together. People develop competence only after studying a particular subject in depth, perhaps by taking several biology courses or reading a great many books about World War II. Because learners at the competence stage make numerous interconnections among the things they learn, they're likely to correct some of their earlier misconceptions.

At the final stage, **expertise**, learners have truly mastered their field. They know a great deal about the subject matter, and they've pulled much of their knowledge together—including, perhaps, a few persistent misconceptions—into a tightly integrated whole. At this point, they're helping to lead the way in terms of conducting research, proposing new ways of looking at things, solving problems, and, in general, making new knowledge. Expertise comes only after many years of study and practice in a particular field.[90] As a result, few learners ever reach this stage, and we're unlikely to see it before late adolescence or adulthood.

Teaching Strategies: Fostering Cognitive Development

The findings of Piaget and more contemporary cognitive developmental researchers yield the following strategies for fostering children's and adolescents' cognitive development.

Explore students' reasoning with problem-solving tasks and probing questions.

In his work with children and adolescents, Piaget pioneered a technique known as the **clinical method**. In particular, he would give a child a problem and probe the child's reasoning about it through a series of individually tailored follow-up questions. We saw an example of the clinical method in the interview with 6-year-old Brian presented earlier. An adult asked Brian whether a set of 12 wooden beads—some brown, some white—had more wooden beads or more brown beads. When Brian responded, "More brown ones," the adult continued to press Brian (e.g., by asking him to draw a brown-beads necklace and a wooden-beads necklace) to be sure Brian truly believed there were more brown beads and possibly also to create disequilibrium.

By presenting a variety of Piagetian tasks involving either concrete or formal operational thinking skills—for instance, tasks involving class inclusion, conservation, separation and control of variables, or proportional reasoning—teachers can gain valuable insights into how students think and reason. Typically, when teachers use the clinical method for assessment purposes, they don't give feedback about right and wrong answers.

[89] The stages described here are based on the work of P. A. Alexander, 1997, 1998, 2004.
[90] P. A. Alexander, 1997, 1998, 2004; Ericsson, 2003; Horn, 2008.

Instead, they simply ask a variety of questions to determine how a child interprets a situation. Sometimes they also ask the child to respond to alternative interpretations.[91] For example, if a child says that a tall, thin glass and a short, wider one contain the same amounts of water, a teacher might say:

> The other day a student told me that the tall glass contains more water because the water in that one is higher than it is in the short glass. What do you think about that?

The clinical method isn't limited to traditional Piagetian reasoning tasks, however. On the contrary, it can be used for a wide variety of topics and skills. For example, a teacher might present various kinds of maps (e.g., a road map of Arizona, a bus-route map for Chicago, a three-dimensional relief map of a mountainous area) and ask students to interpret what they see. Children in the primary grades (especially kindergartners and first-graders) are apt to interpret many map symbols in a concrete fashion, perhaps thinking that roads depicted in red are *actually* red. They might also have difficulty with the scale of a map, perhaps thinking that a line can't be a road because "it's not fat enough for two cars to go on" or that a mountain depicted by a bump on a relief map isn't really a mountain because "it's not high enough."[92] Understanding the concept of the *scale* of a map requires proportional reasoning—an ability that students don't fully acquire until adolescence—and so it's hardly surprising that young children would be confused by it.

Rely heavily on concrete objects and activities, especially in the early elementary grades.

As Piaget and many other researchers have discovered, children in the elementary grades often have trouble thinking and reasoning about ideas that are abstract, hypothetical, or contrary to fact. It's important, then, that elementary school teachers make classroom subject matter concrete for students. For example, in the primary grades teachers might have students use *manipulatives*—physical objects such as blocks, beads, and pennies—to acquire conservation of number and make sense of basic addition and subtraction facts.[93] In the middle elementary grades, paper- or computer-based illustrations can replace concrete objects to some extent, provided that mathematical concepts are still depicted in concrete terms—for instance, as pictures or diagrams.[94]

Virtually any academic discipline has its share of abstract ideas, and elementary teachers should either translate those ideas into concrete terms or else, if possible, postpone discussion of them until the upper elementary grades at the earliest. For example, in history, the very idea of historical *time*—whether it be a particular year (e.g., 1492) or a certain lengthy time span (e.g., 100 years)—is far beyond children's immediate experience. Accordingly, elementary school teachers conducting history lessons should probably minimize the extent to which they talk about specific years before the recent past.[95] Instead, especially in the primary grades, teachers might focus on important events in their nation's history—for example, showing photographs of covered wagons crossing the North American prairie—without much regard for the sequence of events over a long period. Such lessons may lead to a disjointed knowledge of history, but they provide a concrete foundation on which more abstract and integrated history lessons can later build.

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[91] diSessa, 2007.
[92] Liben & Myers, 2007, p. 202.
[93] Ginsburg et al., 2006; T. Martin, 2009; Sherman & Bisanz, 2009.
[94] Sarama & Clements, 2009.
[95] Barton & Levstik, 1996.

Present abstract ideas more frequently in the middle school and high school grades, but tie them to concrete objects and events.

Many of the concepts, symbols, and other useful cognitive tools that previous generations have passed along to us are fairly abstract. Yet as we've seen, abstract thinking emerges only gradually over the course of childhood and adolescence. Accordingly, abstract ideas should be introduced slowly at first, especially in the upper elementary and middle school grades, and they should be accompanied by concrete activities and illustrations as often as possible. Even in high school, actually *seeing* an abstract concept or principle in action can help students encode and remember it more effectively (recall the discussion of visual imagery in Chapter 2).

One way that teachers can help students *see* concepts or principles in action is by having students engage in **discovery learning**, in which students construct their own knowledge by interacting with some aspect of their environment. Piaget suggested that effective discovery learning should be largely a child-initiated and child-directed effort. Although children can learn by exploring their environment without much adult intervention, students usually benefit more from carefully planned and structured activities that help them construct appropriate interpretations.[96] Therefore, it's generally more effective for teachers to use a variation of discovery learning called *inquiry-based learning*, especially in formal school settings with specified standards and objectives for learning.

Inquiry-based learning is an approach to instruction in which students answer questions through investigations, such as by conducting experiments, making observations, or collecting information, with the ultimate goal of identifying underlying concepts or principles.[97] Inquiry-based approaches are particularly appropriate in science and mathematics. For example, to help students learn to separate and control variables in scientific investigations, a teacher might have them design and conduct experiments related to factors affecting how fast a pendulum swings or how far a ball travels after rolling down an incline.[98] Such activities can often promote more advanced reasoning skills, especially when combined with appropriate instruction and guidance.[99]

Although discovery and inquiry-based activities have considerable value, teachers should also keep in mind three potential downsides.[100] First, students don't always have sufficient metacognitive skills to effectively direct their explorations and monitor their findings. Second, students may be overwhelmed by the many facets and subfacets of what they're observing—so much so that they can't adequately think about and sort through all the data available to them.[101] And third, students may "discover" evidence that supports their existing misconceptions and ignore evidence that contradicts those misconceptions, reflecting *confirmation bias* (see Chapter 2). The Classroom Strategies box "Conducting Effective Discovery and Inquiry-Based Learning Activities" offers several guidelines that can help to minimize such problems. Probably the most important of its suggestions is to *structure and guide* the activity to some degree; for example, by posing specific questions students should try to answer or helping them identify variables that might be relevant to their investigation.[102]

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[96] Alfieri et al., 2011; Brown et al., 2009; Hardy et al., 2006; Shafto et al., 2011.
[97] Alfieri et al., 2011; Lazonder & Harmsen, 2016.
[98] Lorch et al., 2010.
[99] Alfieri et al., 2011; Eysink et al., 2009; Lorch et al., 2010; Monte-Sano, 2008.
[100] de Jong, 2011; Plass et al., 2010; B. White et al., 2009.
[101] M. C. Linn & Eylon, 2011; Sweller, 2010.
[102] M. C. Brown et al., 2009; Hardy et al., 2006; M. C. Linn & Eylon, 2011; B. Y. White & Frederiksen, 1998.

Classroom Strategies

Conducting Effective Discovery and Inquiry-Based Learning Activities

- **Identify a concept or principle about which students can learn something significant through interaction with their physical or social environment.**
  In a unit on erosion, a sixth-grade teacher sets a 4-foot-long tray at a slight incline at the front of the classroom. The tray contains quite a bit of sand at its higher end. In a series of experiments, students pour water into the tray's higher end and look at how varying water pressures and quantities differentially affect sand movement.
- **Make sure students have the necessary prior knowledge to make sense of what they observe.**
  A high school physics class studies basic principles of velocity, acceleration, and force. In a follow-up lab activity, students place metal balls of various weights and sizes at the top of an inclined plane and observe each ball's progress as it rolls down the slope. A computer attached to the plane enables the students to measure the rate of acceleration for each ball, thereby also enabling them to determine whether either weight or size influences acceleration. From the data, the students can draw conclusions about the effects of gravity.
- **Show puzzling results to create disequilibrium and arouse curiosity.**
  A fifth-grade science teacher shows her class two glasses of water. In one glass, an egg floats at the water's surface; in the other glass, an egg rests on the bottom. The students hypothesize that one egg has more air inside and is lighter as a result. But then the teacher switches the eggs into opposite glasses. The egg that the students believe to be heavier now floats, and the supposedly lighter egg sinks to the bottom. The students are quite surprised and demand to know what's going on. (Ordinarily, water is less dense than an egg, so an egg placed in it will quickly sink. But in this situation, one glass contains saltwater—a mixture denser than an egg and so capable of keeping it afloat.)
- **Structure and guide a discovery session so that students proceed logically toward discoveries you want them to make.**
  A seventh-grade science teacher asks students to speculate about variables that might influence the rate at which a pendulum swings. His students offer three possibilities: the length of the pendulum, the weight of the object at the bottom, and the angle at which the pendulum is initially dropped. The students work in small groups to test each of these hypotheses. When one group fails to separate and control variables, the teacher asks its members to look closely at their data: "What did you change between test one and test two? . . . Which caused the higher frequency [oscillation rate]? . . . Why can't you all come to a conclusion by looking at the numbers?" He continues to ask questions until the students realize they have simultaneously varied both length and weight in their experimentation.
- **Have students record their findings.**
  Students in a high school biology class collect data from a local stream and use handheld wireless computer-networking devices to send their findings to a central class computer. Once back in the classroom, the students analyze the data and graph it to look for general patterns.
- **Help students relate their findings to concepts and principles in the academic discipline they're studying.**
  After students in a high school social studies class have collected data on average incomes and voting patterns in different counties within their state, their teacher asks, "How can we interpret these data given what we've learned about the relative wealth of members of the two major political parties?"

Sources: Boxerman, 2009 (erosion example); M. C. Brown et al., 2009; Bruner, 1966; de Jong & van Joolingen, 1998; N. Frederiksen, 1984; Hardy et al., 2006; Kirschner et al., 2006; Klahr, 2009; Leach & Scott, 2008; M. C. Linn & Eylon, 2011; Lorch et al., 2010; Minstrell & Stimpson, 1996; Monte-Sano, 2008; Moreno, 2006; E. L. Palmer, 1965 (egg example); Pea & Maldonado, 2006 (stream example); D. L. Schwartz & Martin, 2004; B. Y. White & Frederiksen, 1998, 2005.

Initially introduce sophisticated reasoning processes within the context of familiar situations.

Piaget proposed, and other researchers have since confirmed, that sophisticated mathematical and scientific reasoning processes—for instance, proportional reasoning, formulating and testing hypotheses, and separating and controlling variables—don't fully emerge until adolescence. And even then, students are more likely to use these processes when they're dealing with topics they know well. To relate reasoning processes to topics students know well, a science teacher might initially ask students to separate and control variables related to a commonplace activity, perhaps fishing, growing sunflowers, or teaching new tricks to a family pet. A social studies teacher might ask students to use proportional reasoning to compute distances on a local city map drawn to a particular scale. A physical education teacher might ask students to formulate and test various hypotheses about the most effective way to throw a softball.

6.4 Intelligence

Big Idea 6.4 **Although children in any age group differ somewhat in intelligence, cognitive styles, and dispositions, appropriately supportive environments can significantly enhance these abilities and characteristics.**

The Nature of Intelligence

How do you know if someone is intelligent? Your answer will undoubtedly depend on your definition of intelligence. In this section, we answer the question: What exactly *is* intelligence?

Although psychologists and neuroscientists don't always agree on an exact definition of intelligence, most agree that there's no such thing as a general intelligence and, instead, intelligence has several distinctive qualities:[103]

- It's *adaptive*: It involves modifying and adjusting one's behaviors to accomplish new tasks successfully.
- It's related to *learning ability*: Intelligent people learn information more quickly and easily than less intelligent people.
- It *can vary by domain*: Someone can have a higher ability in one domain (e.g., mathematical ability) and a lower ability in another domain (e.g., verbal ability).
- It involves the *use of prior knowledge* to analyze and understand new situations effectively.
- It involves the complex interaction and coordination of *many different thinking and reasoning processes*.
- It's *culture specific*: "Intelligent" behaviors in one culture aren't necessarily intelligent behaviors in another culture.

With these qualities in mind, we offer an intentionally broad definition of **intelligence**: the ability to apply prior knowledge and experiences flexibly to accomplish challenging new tasks.

Regardless of the forms intelligence might take, most psychologists think of it as being somewhat distinct from what a child has actually learned (e.g., as reflected in school achievement). At the same time, intelligent thinking and intelligent behavior *depend* on prior learning. The more young learners know about the world in general and about the tasks they need to perform, the more intelligently they can behave. Intelligence, then, isn't necessarily a permanent characteristic that learners either "have" or "don't have." Instead, intelligence can change—and often *does* change—through experience, learning, and environmental support (recall the discussion about *growth mindset* in Chapter 5).

In some cultures (e.g., North America and western Europe), intelligence is thought of primarily as an ability that influences children's academic achievement and adults' professional success. Yet, in other cultures (e.g., Hispanic, African, Asian, and Native American) it may be more common to think of intelligence as also including social skills, such as maintaining harmonious interpersonal relationships, working effectively with others to accomplish challenging tasks, and so on.[104] And in Buddhist and Confucian societies in the Far East (e.g., China, Taiwan), intelligence also involves acquiring strong moral values and making meaningful contributions to society.[105]

Cultural groups differ, too, in the behaviors they believe reflect intelligence. For instance, on many traditional intelligence tests, speed is valued: Children score higher if

[103] Kovacs & Conway, 2019.
[104] Greenfield et al., 2006; J. Li & Fischer, 2004; Sternberg, 2004, 2007.
[105] J. Li & Fischer, 2004; Sternberg, 2003.

they answer questions quickly as well as correctly. Yet people in some cultures tend to value thoroughness over speed and may even be suspicious of tasks completed very quickly.[106] As another example, many people in mainstream Western culture consider strong verbal skills to be a sign of high intelligence. In contrast, many Japanese and many Inuit people of northern Quebec interpret excessive chattiness as a sign of immaturity or low intelligence.[107] One researcher working at an Inuit school in northern Quebec asked a teacher about a boy whose language seemed unusually advanced for his age group. The teacher replied:

> Do you think he might have a learning problem? Some of these children who don't have such high intelligence have trouble stopping themselves. They don't know when to stop talking.[108]

Later in the chapter, we identify reasons why intelligence tests are, at best, only imperfect measures of *any* learner's intellectual abilities, and so teachers must be extremely cautious in interpreting the scores these tests yield. Clearly, extra caution is warranted when children come from diverse cultural backgrounds. The following general principles summarize much of what researchers have learned about intelligence.

Intelligence can be measured only imprecisely at best.

Curiously, although psychologists can't pin down exactly what intelligence is, they've been trying to measure it for more than a century. In 1904, government officials in France asked Alfred Binet to develop a means of identifying students who were unlikely to benefit from regular school instruction and therefore needed special educational services. Binet devised a test that measured general knowledge, vocabulary, perception, memory, and abstract thought. In doing so, he designed the earliest general measure of cognitive functioning—something we now call an **intelligence test**. To get a sense of what intelligence tests are like, try the following exercise.

See For Yourself

Mock Intelligence Test

Answer each of these questions:

1. What does the word *penitence* mean?
2. How are a goat and a beetle alike?
3. What should you do if you get separated from your family in a large store?
4. What do people mean when they say, "A rolling stone gathers no moss"?
5. Complete the following analogy: is to as is to:

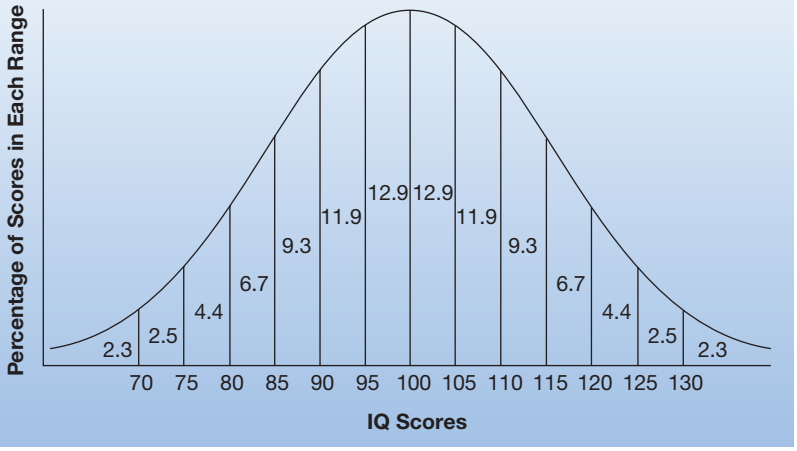
a. b. c. d.

These test items are modeled after items on many contemporary intelligence tests. Although intelligence tests have evolved considerably since Binet's time, they continue to measure many of the same abilities—such as general knowledge, vocabulary, and abstract thinking—that Binet's original test did.

Scores on intelligence tests were originally calculated using a formula that involves division. Hence, they were called "intelligence quotient" scores, or **IQ scores**. Although we still use the term *IQ*, intelligence test scores are no longer based on the old formula.

[106] Sternberg, 2007.
[107] Crago, 1988; Minami & McCabe, 1996; Sternberg, 2003.
[108] Crago, 1988, p. 219.

Figure 6.17 Percentage of IQ scores in different ranges



Instead, they're determined by comparing a child's performance on a test with the performance of others in the same age group. A score of 100 indicates average performance: Children with this score have performed better than half of their agemates on the test and not as well as the other half. Scores well below 100 indicate below-average performance on the test. Scores well above 100 indicate above-average performance.

Figure 6.17 shows the percentage of individuals getting scores at different points along the scale (e.g., 12.9% of individuals get scores between 100 and 105).[109] Notice how the curve is high in the middle and low at both ends, indicating that scores close to 100 are far more common than scores considerably higher or lower than 100. For example, if we add up the percentages in different parts of Figure 6.17, we find that approximately two-thirds of children (68%) score within 15 points of 100 (i.e., between 85 and 115). In contrast, only 2.3% of children score as low as 70, and only 2.3% score as high as 130. This symmetric and predictable distribution of scores happens by design rather than by chance: Psychologists have created a method of scoring intelligence test performance that intentionally yields such a distribution. You can learn more about the nature of IQ scores in the discussion of *standard scores* in Appendix B, "Understanding and Interpreting Standardized Test Results."

Modern intelligence tests have been designed, in part, with Binet's original purpose in mind: to predict how well students are likely to perform in school. Studies repeatedly show that performance on intelligence tests is correlated with school achievement.[110] On average, children with higher IQ scores do better on standardized achievement tests, earn higher course grades, and complete more years of education. In other words, IQ scores often *do* predict school achievement, albeit imprecisely. As a result, school psychologists and other specialists frequently use intelligence tests to help them identify students who have disabilities or other unique needs that require individualized education programs.

It's important to keep three points in mind about the relationship between students' IQ scores and their achievement. First, intelligence doesn't necessarily *cause* achievement; it's simply *correlated* with achievement. Even though students with high IQ scores typically perform well in school, we can't say conclusively that their high achievement is actually the result of their intelligence. Intelligence probably does play an important role in school achievement, but many other factors are also involved—factors such as motivation, quality of instruction, family and neighborhood resources, and peer-group expectations. Second, the relationship between IQ scores and achievement is an imperfect one, with many exceptions to the rule. For a variety of reasons, some students with high IQ scores don't perform well in school, and others achieve at higher levels than we'd predict from their IQ scores alone. Third and most important, we must remember that an IQ score simply reflects a child's performance on a particular test at a particular time—it's *not* a permanent characteristic etched in stone—and that some change is to be expected over time.

think about it

Did you have the misconception that IQ is a permanent number? If so, have you undergone conceptual change about the nature of IQ scores?

[109] If you have some background in descriptive statistics, it may help you to know that most intelligence tests have a mean of 100 and a standard deviation of 15.

[110] N. Brody, 1997; Deary et al., 2007; Gustafsson & Undheim, 1996; Nisbett et al., 2012.

To some degree, intelligence reflects the general speed, efficiency, and control of cognitive processing.

Whenever we use a single IQ score as an estimate of a learner's cognitive ability, we're buying into the notion that intelligence is a single, general ability that affects performance on many different tasks. Historically, considerable evidence has supported this idea. Although different intelligence tests yield somewhat different scores—especially when they have different kinds of content—people who score high on one test tend to score high on others as well.[111] One early psychologist, Charles Spearman, called this single "intelligence" entity a *general factor*, or **g**.[112] (You may sometimes see the term *Spearman's g*.)

Recall how, in the opening case study, Lupita finishes an assignment more quickly than many of her classmates. Some contemporary information processing theorists believe that underlying *g* may be a general ability to process information quickly and efficiently.[113] Other contemporary theorists suggest that effective use of working memory—especially its central executive component—and metacognitive abilities are also key factors in general intelligence.[114]

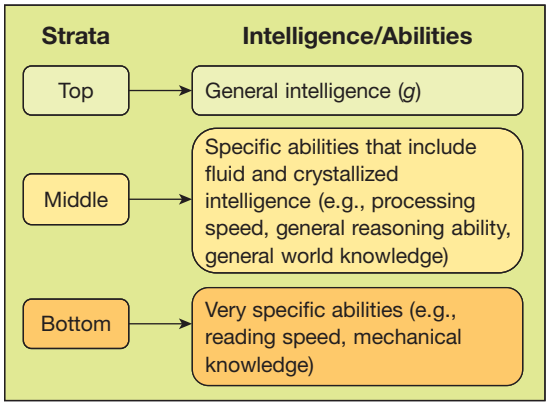
Several decades after Spearman introduced the concept of *g*, psychologist Raymond Cattell found evidence for two distinctly different components of general intelligence.[115] First, learners differ in **fluid intelligence**, their ability to acquire knowledge quickly and adapt to new situations effectively. Second, they differ in **crystallized intelligence**, the knowledge and skills they've accumulated from their personal experiences, formal schooling, and culture. Fluid intelligence is more important for new, unfamiliar tasks, especially those that require rapid decision making and involve nonverbal content. Crystallized intelligence is more important for familiar tasks, especially those that depend heavily on language and prior knowledge.

Intelligence also involves numerous specific processes and abilities.

Certainly, intelligence isn't just a matter of doing something quickly and efficiently. It also requires a variety of specific abilities that might be relevant to some tasks and activities but not to others.[116] As an illustration, let's return to the "Mock Intelligence Test" exercise presented earlier. Defining words such as *penitence* (Item 1) requires good verbal skills and considerable knowledge of English vocabulary. In contrast, finding analogies among geometric figures (Item 5) involves reasoning about nonverbal entities.

The **Cattell–Horn–Carroll theory of cognitive abilities** builds on Cattell's distinction between fluid and crystallized intelligence to suggest that intelligence has three layers called *strata* (see Figure 6.18).[117] The top stratum consists of general intelligence, which is referred to as *g*. Underlying it in the middle stratum are 9 or 10 specific abilities—processing speed, general reasoning ability, general world knowledge, ability to process visual input, and so on—that encompass fluid and/or crystallized intelligence to varying degrees. And underlying these abilities in the bottom stratum are more than 70 very specific abilities, such as reading speed, mechanical knowledge, and number and richness of associations in memory—all of which a particular child might have to

Figure 6.18 The three strata in the Cattell–Horn–Carroll theory of cognitive abilities



[111] McGrew et al., 1997; Neisser et al., 1996; Spearman, 1927.
[112] Beaujean & Benson, 2019; Spearman, 1904, 1927.
[113] Bornstein et al., 2006; N. Brody, 2008; Coyle et al., 2011; Haier, 2003.
[114] Cornoldi, 2010; Meinz & Hambrick, 2010; Nisbett et al., 2012; H. L. Swanson, 2008.
[115] Cattell, 1963, 1987; also see Nisbett, 2009.
[116] P. L. Ackerman & Lohman, 2006; Carroll, 2003; McGrew et al., 1997; Neisser et al., 1996; Spearman, 1927; Thurstone, 1938.
[117] P. L. Ackerman & Lohman, 2006; Carroll, 1993, 2003; D. P. Flanagan & Ortiz, 2001; Horn, 2008.

varying degrees. With its large number of specific abilities, the Cattell–Horn–Carroll theory is too complex to describe in detail here, but you should be aware that psychologists are increasingly finding it useful in predicting and understanding students' achievement in various content domains.[118] Consequently, many modern intelligence tests include measures of the cognitive abilities identified in the Cattell–Horn–Carroll theory.[119]

Learners may be more intelligent in some domains than in others.

Some theories of intelligence highlight the different ways in which people can be more or less intelligent. For example, psychologist Robert Sternberg has proposed the **triarchic theory of intelligence** in which people vary with respect to three relatively independent types of thinking.[120] *Analytical intelligence* involves making sense of, analyzing, contrasting, and evaluating the kinds of information and problems often seen in academic settings and on intelligence tests. *Creative intelligence* involves imagination, invention, and synthesis of ideas within the context of new situations (recall the discussion of creativity in Chapter 3). *Practical intelligence* involves applying knowledge and skills effectively to manage and respond to everyday problems and social situations.[121]

Another theory that highlights the different ways people can be intelligent is Howard Gardner's **multiple intelligences theory**, which suggests that intelligence is composed of eight relatively independent abilities (see Table 6.3).[122] (Gardner suggests that there may

Table 6.3 Gardner's Multiple Intelligences

TYPE OF INTELLIGENCE	EXAMPLES OF RELEVANT BEHAVIORS
Linguistic intelligence: Ability to use language effectively	• Making persuasive arguments • Writing poetry • Noticing subtle nuances in word meanings
Logical-mathematical intelligence: Ability to reason logically, especially in mathematics and science	• Solving mathematical problems quickly • Generating mathematical proofs • Formulating and testing hypotheses about observed phenomena[a]
Spatial intelligence: Ability to notice details of what one sees and to imagine and manipulate visual objects in one's mind	• Conjuring up mental images • Drawing a visual likeness of an object • Seeing subtle differences among visually similar objects
Musical intelligence: Ability to create, comprehend, and appreciate music	• Playing a musical instrument • Composing a musical work • Identifying the underlying structure of music
Bodily-kinesthetic intelligence: Ability to use one's body skillfully	• Dancing • Playing sports • Performing pantomime
Interpersonal intelligence: Ability to notice subtle aspects of other people's behaviors	• Reading other people's moods • Detecting other people's underlying intentions and desires • Using knowledge of others to influence their thoughts and behaviors
Intrapersonal intelligence: Awareness of one's own feelings, motives, and desires	• Discriminating among such similar emotions as sadness and regret • Identifying the motives guiding one's own behavior • Using self-knowledge to interact more effectively with others
Naturalist intelligence: Ability to recognize patterns in nature and differences among various life-forms and natural objects	• Identifying members of particular plant or animal species • Classifying natural forms (e.g., rocks, types of mountains) • Applying one's knowledge of nature in such activities as farming, landscaping, or animal training

[a]This example may remind you of Piaget's theory of cognitive development. Many of the stage-specific characteristics that Piaget described fall within the realm of logical-mathematical intelligence.

Sources: Gardner, 1983, 1999.

[118] J. J. Evans et al., 2001; L. Phelps et al., 2005; B. E. Proctor et al., 2005.
[119] McGill & Dombrowski, 2019; Roberts & Lipnevich, 2012.
[120] Sternberg, 1985, 2003.
[121] Sternberg, 1998, 2004; Sternberg et al., 2000.
[122] Gardner, 1983, 1998, 1999.

also be a ninth, *existential* intelligence dedicated to philosophical and spiritual issues, but he acknowledges that he's found only limited evidence for it,[123] and so the table doesn't include it.) Any one domain or field of study can involve several intelligences; for example, musical performance involves both musical intelligence and bodily-kinesthetic intelligence (and likely other intelligences depending on the type of musical performance). Furthermore, any one of the eight intelligences can be required in many different domains. For instance, spatial intelligence may be needed in solving math problems, sailing a boat, or drawing a picture (see Figure 6.19). Gardner's theory gives us optimism that most learners might be fairly intelligent in at least one area, perhaps showing exceptional promise in language, math, music, or athletics. In the opening case study, Lupita reveals an ability that Gardner would identify as *interpersonal intelligence*: She correctly interprets an adult's subtle message, persuades one classmate to finish his work, and skillfully assists two others as they struggle with puzzles.

Gardner presents some evidence to support the existence of multiple intelligences. For example, he describes people who are quite skilled in one domain (e.g., composing music) and yet have seemingly average abilities in other domains. Also, people who suffer brain damage may lose abilities related to only one intelligence (e.g., they lose only their language skills). And recent findings in neuroscience indicate that different parts of the brain are more important for some intelligences than others (and some parts of the brain are used for many intelligences).[124] However, some psychologists don't believe that Gardner's evidence is sufficiently compelling to support the notion of eight truly independent abilities, in part because of all the existing evidence for a *g* factor in intelligence.[125] Other psychologists agree that people might have a variety of relatively independent abilities but argue for different distinctions than those Gardner makes (e.g., recall the second-stratum abilities in the Cattell–Horn–Carroll theory). Still others reject the idea that abilities in certain domains, such as music or body movement, are really "intelligences" per se.[126]

Regardless of the exact structure of intelligence—if, in fact, a precise structure could ever be pinned down—two things are clear. First, intelligence is a very complex, multifaceted entity. And second, any single learner is likely to be more intelligent in some ways than in others.

Figure 6.19 Close attention to detail in 10-year-old Luther's drawing of a plant suggests some ability in *naturalist* intelligence and his artistic ability shows *spatial* and *bodily-kinesthetic* intelligence

Intelligence is a product of both inherited characteristics and environmental influences.

At least as it's measured by IQ tests, intelligence does appear to have some basis in the brain.[127] For example, compared with their average-IQ peers, children with high IQ scores show a prolonged period of development in the cortex. A high level of intelligence also seems to involve ongoing, efficient interactions among numerous brain regions. It's highly likely that these differences are partly the result of heredity and the maturational changes that genetics drives.[128] However, children don't inherit a single "IQ gene" that determines their intellectual ability. Instead, they inherit a variety of characteristics that in one way or another affect their cognitive development and intellectual abilities.[129]

[123] Gardner, 2000, 2003.
[124] Shearer & Karanian, 2017.
[125] N. Brody, 1992; Corno et al., 2002; Kail, 1998; Waterhouse, 2006.
[126] Bracken et al., 1999; Sattler, 2001.
[127] Burgaleta et al., 2014; Yokota et al., 2015.
[128] Jung & Haier, 2007; Kovas et al., 2014; Rizzi & Posthuma, 2013; Shaw et al., 2006.
[129] Kovas et al., 2007; Kovas & Plomin, 2007; Meinz & Hambrick, 2010; Shaw et al., 2006.

Environmental factors also influence intelligence, sometimes for the better and sometimes for the worse. Poor nutrition in the early years of development (including the months between conception and birth) leads to lower IQ scores, as does a mother's excessive use of alcohol during pregnancy.[130] Attending school has a consistently positive effect on IQ scores.[131] Moving a child from a neglectful, impoverished home environment to a more nurturing, stimulating one (e.g., through adoption or foster parenting) can result in IQ gains of 15 points or more.[132] Furthermore, researchers are finding that, worldwide, there has been a slow but steady increase in people's performance on intelligence tests—a trend that's probably the result of better nutrition, smaller family sizes, better schooling, increasing cognitive stimulation (through increased access to the Internet, reading materials, etc.), and other improvements in people's environments.[133]

How much of a role do heredity and environment each play in the development of intelligence? In previous decades this nature-versus-nurture question has been a source of considerable controversy. But in fact, as noted earlier in the chapter, genetic and environmental factors interact in their influences on cognitive development and intelligence in ways that are virtually impossible to separate. For example, as you should recall, genes require reasonable environmental support to do their work. In an extremely impoverished environment—one with a lack of adequate nutrition and stimulation—heredity may have little to say about children's intellectual growth, but under better circumstances, it can have a significant influence.[134]

Intelligence may take different forms at different age levels.

Some psychologists have suggested that not only is intelligence somewhat specific to particular domains, but also its basic nature changes with age and experience. From their perspective, the developmental course of exceptional abilities and talents might be as follows:[135]

1. Initially (typically in childhood), people show exceptional *potential* in a certain domain, perhaps in reading, math, or music.
2. With appropriate instruction, guidance, and practice opportunities, people show exceptional *achievement* in the domain.
3. If people continue to pursue the domain and practice domain-specific tasks over a lengthy time period (typically into adulthood), they may eventually gain considerable *expertise and eminence*, to the point that their accomplishments are widely recognized.

Here, then, we see a very dynamic view of intelligence: Although its roots may be in certain natural endowments, over the long run, intelligence requires both environmental nurturance and personal perseverance.[136]

Learners may have specific cognitive styles and dispositions that predispose them to think and act in more or less intelligent ways.

Most measures of intelligence focus on specific things that people *can* do (their abilities), with little consideration of what people are *likely* to do (their motivation). For instance, intelligence tests don't evaluate the extent to which learners are motivated to accomplish

[130] Benton, 2008; D'Amato et al., 1992; Neisser et al., 1996; Ricciuti, 1993.
[131] Ceci, 2003; Gustafsson, 2008; Nisbett et al., 2012.
[132] Duyme et al., 1999; Nisbett et al., 2012; Scarr & Weinberg, 1976; van IJzendoorn et al., 2005.
[133] Daley et al., 2003; Flynn, 2003, 2007; E. Hunt, 2008; Neisser, 1998b; Nisbett et al., 2012.
[134] Ceci, 2003; Nisbett et al., 2012; Turkheimer et al., 2003.
[135] Dai, 2010; Subotnik et al., 2011.
[136] Dai, 2010; Subotnik et al., 2011.

certain goals or willing to actively take charge of and self-regulate their own learning. Yet such inclinations are sometimes just as important as intellectual ability in determining success in academic and real-world tasks, as you will remember from Chapters 3 and 5.[137]

Students with the same intelligence levels often approach classroom tasks and think about classroom topics differently. Some of these differences are called **cognitive styles** because they refer to the individual differences in the ways that people perceive, think, solve problems, learn, and relate to others.[138] Since researchers began studying cognitive styles in the 1940s, they have identified many different types and categories, too many to list here. The cognitive styles that have been applied to education are typically called *learning styles* or *learning preferences* because they focus more specifically on learning processes. Other individual differences are called **dispositions**—general inclinations to approach and think about learning and problem-solving tasks in a particular way—that students intentionally bring to bear on their efforts to master school subject matter. Don't agonize over the distinctions between cognitive styles, learning styles, learning preferences, and dispositions because their meanings overlap considerably. All involve not only specific cognitive tendencies, but also personality characteristics. However, dispositions also have a motivational component, an I-*want*-to-do-it-this-way quality.[139]

One cognitive style potentially useful to teachers distinguishes between analytic and holistic thinking.[140] In *analytic* thinking, learners tend to break new stimuli and tasks into their component parts and to see these parts somewhat independently of their context (this style should remind you of Sternberg's analytical intelligence). In contrast, *holistic* thinking involves perceiving situations as integrated, indivisible wholes that are closely tied to their context. One way of thinking isn't necessarily better than the other; instead, the two cognitive styles are likely to be adaptive in different situations.

Researchers have observed that cultures differ somewhat in their focus on analytic versus holistic thinking. On average, people from mainstream Western culture tend to be analytic thinkers, whereas people from East Asian cultures think more holistically.[141] Certainly logical and scientific reasoning requires analytic thinking, but holistic thinking can help learners identify associations and relationships among seemingly very different phenomena. For example, holistically minded Chinese scientists identified the underlying cause of the ocean's tides—the moon's gravitational pull on any large body of water—many centuries before more narrowly focused, Earth-centered European scientists did.[142]

Another cognitive style that's sometimes referred to by educators is the distinction between visualizers and verbalizers, sometimes referred to as visual learners and verbal learners.[143] The basic idea is that some people are better at processing information visually through pictures, whereas others are better at processing information verbally through words. However, upon investigation, it becomes clear that this basic explanation is too simple. You may recall from Chapter 2 that people store and process visual information in their visuospatial sketchpad and verbal information in their phonological loop. Therefore,

[137] Duckworth & Seligman, 2005; Kuhn, 2006; Luciana et al., 2005; D. N. Perkins et al., 2000.
[138] Ausburn & Ausburn, 1978; Kozhevnikov, 2013; Witkin et al., 1977.
[139] Kuhn, 2001a; Messick, 1994; D. N. Perkins & Ritchhart, 2004; Stanovich, 1999; L.-F. Zhang & Sternberg, 2006.
[140] Cheng & Zhang, 2017; Norenzayan, Choi, & Peng, 2007; Riding & Cheema, 1991; L.-F. Zhang & Sternberg, 2006.
[141] Norenzayan et al., 2007; Park & Huang, 2010; Varnum, Grossmann, Kitayama, & Nisbett, 2010.
[142] Nisbett, 2009.
[143] Jonassen & Grabowski, 1993; Koć-Januchta, Höffler, Thoma, Prechtl, & Leutner, 2017; Sternberg & Zhang, 2001.

everyone stores and processes visual and verbal information. However, some people may *be better* at processing one type of information than the other. Others may be *more likely to* process information one way than the other when completing a particular task. Yet others may *prefer* to process information one way than the other in a given situation (which is why this cognitive style is sometimes called a learning *preference*).[144]

As you can see, it can be difficult to label someone as a visual or verbal learner without specifying exactly what is meant by these labels (i.e., Do they refer to actual abilities, the likelihood of use, or a preference?). And, visualizers don't typically perform better on tests when they receive visual rather than verbal methods of instruction, and vice versa, which is consistent with a more general finding about learning styles: *Tailoring particular instructional strategies to students' self-reported learning styles or preferences doesn't usually enhance academic achievement*.[145] In addition, the learning-style traits that researchers have identified and the instruments they've developed to assess these traits don't always hold up under the scrutiny of rigorous research.[146]

Compared to the difficulties encountered in researching cognitive and learning styles, researchers have had more success identifying *dispositions* that are clearly beneficial for classroom learning, such as those listed in Figure 6.20.[147] Such dispositions are often positively correlated with students' learning and achievement, and many theorists have suggested that they play a causal role in what and how much students learn. In fact, dispositions sometimes "overrule" intelligence in their influence on long-term achievement.[148] For example, learners with a high need for cognition learn more from what they read, are more likely to base conclusions on sound evidence and logical reasoning, and are

Figure 6.20 Dispositions that can benefit learners

Stimulation seeking	Eagerly interacting with one's physical and social environment in order to gain new experiences and information
Need for cognition	Frequently seeking and engaging in challenging cognitive tasks
Conscientiousness	Consistently addressing assigned tasks in a careful, focused, and responsible manner
Critical thinking	Regularly evaluating information or arguments in terms of their accuracy, credibility, and worth, rather than accepting them at face value
Open-mindedness	Flexibly considering alternative perspectives and multiple sources of evidence and suspending judgment for a time, rather than leaping to immediate conclusions

[144] Massa & Mayer, 2006; Mayer & Massa, 2003.
[145] Kozhevnikov et al., 2014; R. E. Massa & Mayer, 2006; Nieto & Bode, 2008; Pashler et al., 2009; Rogowsky et al., 2015; Willingham et al., 2015.
[146] Cassidy, 2004; Kirschner, 2017; Krätzig & Arbuthnott, 2006; Messick, 1994.
[147] Cacioppo et al., 1996; DeBacker & Crowson, 2009; Halpern, 2008; Hampson, 2008; Kardash & Scholes, 1996; P. M. King & Kitchener, 2002; G. Matthews et al., 2006; Raine et al., 2002; Southerland & Sinatra, 2003; Trautwein et al., 2006; R. F. West et al., 2008.
[148] Dai & Sternberg, 2004; Kuhn & Franklin, 2006; D. N. Perkins & Ritchhart, 2004.

more likely to undergo conceptual change when it's warranted.[149] And learners who critically evaluate new evidence and are open-minded about diverse perspectives show more advanced reasoning capabilities and achieve at higher levels.[150]

Researchers don't yet have a good understanding of how various cognitive styles and dispositions originate. Perhaps inherited temperamental differences (e.g., in stimulation seeking) are involved.[151] Epistemic beliefs about the underlying nature of knowledge—for instance, the belief that knowledge is fixed and unchanging, on the one hand, or dynamic and continually evolving, on the other—may also play a role.[152] And almost certainly teachers' actions and the general classroom atmosphere they create make a difference; for example, whether students are encouraged to pursue intriguing topics, take risks, and think critically.[153]

think about it
Which of these dispositions characterizes your own behaviors and thinking?

Learners act more intelligently when they have physical or social support for their efforts.

Implicit in our discussion so far has been the assumption that intelligent behavior is something that individuals engage in with little or no help from the objects or people around them. But let's return to the concept of *distributed cognition*, discussed previously in Chapter 4: Learners can think and perform more effectively when they can offload, or *distribute,* part of their cognitive load onto something or someone else. Some psychologists instead use the term **distributed intelligence** to refer to this idea; in many respects, the two terms are synonymous.[154] More specifically, learners can "distribute" a challenging task in at least three ways. First, they can use physical tools, especially technology (e.g., calculators, computers), to handle and manipulate large amounts of information. Second, they can mentally encode and manipulate the situations they encounter using various symbolic systems—words, charts, diagrams, mathematical equations, and so on—and other cognitive tools their culture provides. And third, they can work with other people to explore ideas and solve problems. When learners work together on complex, challenging tasks and problems, they often think more intelligently than any one of them could think alone. In fact, learners sometimes teach one another strategies and ways of thinking that can help each of them to think even *more* intelligently on future occasions.[155]

From a distributed-intelligence perspective, intelligence isn't an immutable characteristic that learners "carry around" with them, nor is it something that can be easily measured and then summarized with one or more test scores. Instead, it's a highly variable, context-specific ability that increases when appropriate environmental, cultural, and social supports are available (which is consistent with the *growth mindset* view of intelligence presented in Chapter 5).

Teaching Strategies: Teaching with a Consideration of Intelligence

Given our discussion of the nature of intelligence, we can now think about what teachers can do in their classes based on this information.

[149] Cacioppo et al., 1996; Dai & Wang, 2007; P. K. Murphy & Mason, 2006.
[150] DeBacker & Crowson, 2009; G. Matthews et al., 2006; Stanovich, 1999.
[151] Raine et al., 2002; Rothbart, 2007.
[152] P. M. King & Kitchener, 2002; Kuhn, 2001b; Mason, 2003.
[153] Flum & Kaplan, 2006; Gresalfi, 2009; Kuhn, 2001b, 2006.
[154] Barab & Plucker, 2002; Hutchins, 1995; Marsh & Rajaram, 2019; T. Martin, 2009; Pea, 1993; D. N. Perkins, 1995; B. Rhodes, 2008; Salomon, 1993.
[155] Applebee et al., 2003; A.-M. Clark et al., 2003; Salomon, 1993; Spörer & Brunstein, 2009.

Interpret intelligence test results cautiously.

As we've seen, intelligence tests are simply collections of questions and tasks that psychologists have developed and continue to revise over the years to get a handle on how well children and adolescents think, reason, and learn. These tests predict school achievement to some extent, but they're hardly magical instruments that can mysteriously determine a learner's true intelligence—if, in fact, such a thing as "true" intelligence even exists. Whenever teachers are aware of IQ scores that have been obtained for particular students, they should keep the following points in mind:[156]

- Different kinds of intelligence tests may yield somewhat different scores.
- A student's performance on any test is inevitably affected by temporary factors present at the time the test is taken—general health, mood, motivation, time of day, distracting circumstances, and so on. Such factors are especially influential for young children, who are apt to have high energy levels, short attention spans, and little interest in sitting still for more than a few minutes. (Here we're talking about a test's *reliability*, a concept we consider in Chapter 10.)
- Test items typically focus on skills that are important in mainstream Western culture, especially in school settings. The items don't necessarily tap into skills that might be more highly valued in other contexts or cultures.
- Some students may be unfamiliar with the content or types of tasks involved in particular test items and, as a result, perform poorly on those items.
- Students with limited English proficiency (e.g., recent immigrants) are at an obvious disadvantage when an intelligence test is administered in English.
- Some students (e.g., students of color who want to avoid being perceived as conforming to "White" culture) may not be motivated to perform at their best.
- IQ scores have a limited "shelf-life." They predict school achievement over the short run (e.g., over the next 2 to 3 years) but not necessarily over the long run, especially when the scores are obtained during the preschool or early elementary years.

Used within the context of other information, IQ scores can, in many cases, give a general idea of a student's current cognitive functioning. But as you can see from the limitations just listed, teachers should always maintain a healthy degree of skepticism about the accuracy of IQ scores, especially when students come from diverse cultural backgrounds, have acquired only limited proficiency in English, or were fairly young when the scores were obtained.

Look for signs of exceptional abilities and talents.

Earlier we discovered that a learner benefits most from tasks he or she can accomplish only with assistance—tasks that are in the learner's zone of proximal development. Because different students are at different points in their cognitive development, they're apt to have different ZPDs, and almost any classroom is likely to have one or more students whose ability levels far surpass those of their peers. Although experts disagree about how such **giftedness** should be defined and identified, it's probably the result of both genetic and environmental factors.[157]

Students who are gifted tend to be among our schools' greatest underachievers. When required to progress at the same rate as their nongifted peers, they achieve at levels far

[156] Bartholomew, 2004; Hayslip, 1994; Neisser et al., 1996; Ogbu, 1994; D. N. Perkins, 1995; Sattler, 2001; Stanovich, 2009; Sternberg, 2005, 2007; Zigler & Finn-Stevenson, 1992.

[157] Dai, 2010; Renzulli, 2002; Simonton, 2001; Winner, 2000b.

short of their capabilities. Furthermore, many students with special gifts and talents become bored or frustrated when school assignments don't challenge them, and others become so accustomed to the "easy A" that they have trouble coping with the mistakes they're likely to make when they venture into new areas.[158]

The traditional approach to identifying giftedness is to use IQ scores, perhaps with 125 or 130 as a cutoff point. Yet some students may be gifted in only one domain—say, in science or creative writing—and tests of general intelligence might not be especially helpful in identifying these students.[159] And for a variety of reasons, students from some minority-group backgrounds don't perform as well on intelligence tests as students raised in mainstream Western culture.[160] Students from some cultures may have had little experience with common intelligence test items, such as reasoning about self-contained logical problems (recall the children–basketballs–jellybeans problem) or finding patterns in geometric figures.[161] Other students may try to hide their talents in order to avoid ridicule by classmates who don't value academic achievement.[162]

It's critical, then, that educators not rely solely on intelligence tests to identify students who may need a more challenging curriculum than their peers. The following are examples of traits teachers might look for:[163]

- Advanced vocabulary, language, and reading skills
- Extensive general knowledge about the world
- Ability to learn more quickly, easily, and independently than peers
- Advanced and efficient cognitive processes and learning strategies
- Flexibility, originality, and resourcefulness in thinking and problem solving
- Ability to apply concepts and ideas to new, seemingly unrelated situations
- High standards for performance (sometimes to the point of unrealistic perfectionism)
- High motivation to accomplish challenging tasks; boredom during easy tasks
- Above-average social development and emotional adjustment (although a few extremely gifted students may have difficulties because they're so *very* different from their peers)

Researchers and expert teachers have found a variety of instructional strategies to be effective for students who are gifted. Common suggestions are presented and illustrated in the Classroom Strategies box "Working with Students Who Have Exceptional Abilities and Talents."

Consult with specialists if children show significant delays in development.

Whereas some children and adolescents show exceptionally advanced development, others show unusual *delays* in development. When delays appear only in a specific aspect of cognitive functioning, perhaps learners haven't had sufficient experience to develop it or perhaps a learning disability is present. In contrast, learners with a general

[158] Dai, 2010; Mendaglio, 2010; Parker, 1997.
[159] D. J. Matthews, 2009; Moran & Gardner, 2006.
[160] McLoyd, 1998; Neisser, 1998a; Walton & Spencer, 2009.
[161] Nisbett, 2009; Rogoff, 2003; Sternberg, 2005.
[162] Dweck, 2009; Ogbu, 2008.
[163] Cornell et al., 1990; Dai, 2010; Mendaglio, 2010; Parker, 1997; Shavinina & Ferrari, 2004; Steiner & Carr, 2003; Subotnik et al., 2011; Winner, 2000a, 2000b.

Classroom Strategies

Working with Students Who Have Exceptional Abilities and Talents

- **Individualize instruction in accordance with students' specific talents.**
  A middle school student with exceptional reading skills and an interest in Shakespeare is assigned several Shakespearean plays. After reading each play, he discusses it with his class's teaching intern, who is an English major at a nearby university.
- **Form study groups of students who have similar abilities and interests.**
  A music teacher provides weekly instruction to a quartet of exceptionally talented music students.
- **Teach complex cognitive skills within the context of specific school topics rather than separately from the regular school curriculum.**
  A teacher has an advanced science study group conduct a series of experiments related to a single topic. To promote scientific reasoning and critical thinking, the teacher gives the students several questions they should ask themselves as they conduct these experiments—questions that encourage them to separate and control variables, critically evaluate conclusions, and so on.
- **Provide opportunities for independent study.**
  A second-grade teacher finds a website that can be used by a mathematically gifted 8-year-old to study decimals, exponents, square roots, and other concepts.
- **Engage students in challenging, multifaceted public service projects (e.g., *service-learning projects*).**
  Three high school students collaborate to identify and collect information about several historical buildings and monuments in their community. They create a flyer that will be used by the local historical society and share it with their classmates as they lead them on a walking tour of these structures.
- **Encourage students to set high goals for themselves.**
  A teacher encourages a student from a lower socioeconomic background to consider going to college and helps the student explore possible sources of financial assistance for higher education.
- **Seek outside resources to help students develop their exceptional talents.**
  A student with an exceptional aptitude for learning foreign languages studies Russian at a local university.
- **Ask students to prepare part of a lesson.**
  A middle school teacher asks a high-ability student to prepare a presentation related to an upcoming class topic.

Sources: Ambrose et al., 1994; Dai, 2010; Hattie, 2009; J. A. Kulik & Kulik, 1997; Lubinski & Bleske-Rechek, 2008; Lupart, 1995; Piirto, 1999; Terry, 2003, 2008 (walking tour example).

intellectual disability show developmental delays in most aspects of their academic and social functioning.[164] More specifically, these learners exhibit *both* of the following characteristics:[165]

- *Significantly below-average general intelligence:* They have intelligence test scores that are quite low—usually no higher than 70, reflecting performance in the bottom 2% of their age group. In addition, they learn slowly and show consistently poor achievement in virtually all academic subject areas.
- *Deficits in adaptive behavior:* They typically behave in ways that would be expected of much younger children. Their deficits in *adaptive behavior* include limitations in practical intelligence (i.e., managing the ordinary activities of daily living) and social intelligence (i.e., behaving in culturally appropriate ways in social situations).

The preceding characteristics must be evident in childhood. Thus, a learner who shows them beginning at age 16, perhaps as the result of a serious head injury, would *not* be classified as having an intellectual disability.

[164] Many special educators now prefer the term *intellectual disability* over the term *mental retardation* (e.g., Luckasson et al., 2002), and in 2007 the American Association on Mental Retardation changed its name to the American Association on Intellectual and Developmental Disabilities.
[165] Luckasson et al., 2002.

Intellectual disabilities are often caused by genetic conditions. For example, they are common in children with Down syndrome, an inherited condition marked by distinctive facial features, shorter-than-average arms and legs, and poor muscle tone. Other intellectual disabilities are due to biological but noninherited causes, such as severe malnutrition or excessive alcohol consumption during the mother's pregnancy or prolonged oxygen deprivation during a difficult birth.[166] In still other situations, environmental factors, such as parental neglect or an extremely impoverished and unstimulating home environment, may be at fault.[167] Although usually a long-term condition, an intellectual disability isn't necessarily a lifelong disability, especially when its cause is environmental rather than genetic.[168]

Severe intellectual disabilities are usually identified long before children begin kindergarten or first grade. However, mild cases can go undetected until school age. Teachers who suspect that a student has significant delays in cognitive development and adaptive behavior should definitely consult with specialists trained in identifying and working with children who have special educational needs.

Some students with mild intellectual disabilities spend part or all of the school day in general education classrooms. They're apt to have poor reading and language skills, less general knowledge about the world, poor memory for new information, difficulty with abstract ideas, and few (if any) metacognitive skills.[169] Nevertheless, they can make considerable academic progress when instruction is appropriately paced and provides a lot of guidance and support. The Classroom Strategies box "Working with Students Who Have Significant Delays in Cognitive Development" offers suggestions for working effectively with these students.

Classroom Strategies

Working with Students Who Have Significant Delays in Cognitive Development

- **Introduce new material at a slower pace, and provide many opportunities for practice.**
  An elementary teacher gives a student only two new addition facts a week because any more than two seem to be overwhelming. Every day, the teacher has the student practice writing the new facts and review the facts learned in preceding weeks.
- **Explain tasks and expected behaviors concretely and in very specific language.**
  An art teacher gives a student explicit training in the steps needed at the end of each painting session: (1) Rinse the paintbrush out at the sink, (2) put the brush and watercolor paints on the shelf in the back room, and (3) put the painting on the counter by the window to dry. Initially, the teacher needs to remind the student of every step in the process. But with time and practice, the student eventually carries out the process independently.
- **Give students explicit guidance about how to study.**
  An elementary teacher tells a student, "When you study a new spelling word, it helps if you repeat the letters out loud while you practice writing the word. Let's try it with the word *house*. Watch how I repeat the letters—H . . . O . . . U . . . S . . . E—as I write the word. Now you try doing what I just did."
- **Encourage independence.**
  A middle school teacher teaches a student how to use her calculator to figure out what she needs to pay for lunch every day. The teacher also gives the student considerable practice in identifying the correct bills and coins to use when paying various amounts.
- **Provide technology that can enhance students' self-reliance.**
  Using a task organizer app on a smartphone (e.g., Visules, Picture Scheduler), a high school life skills teacher creates a sequence of step-by-step pictures that can help a student learn and remember how to cook a hard-boiled egg.

Sources: Feuerstein, Feuerstein, & Falik, 2010; K. L. Fletcher & Bray, 1995; Heward, 2009; Patton, Blackbourn, & Fad, 1996; Prout, 2009; Turnbull et al., 2010.

[166] Dorris, 1989; Keogh & MacMillan, 1996.
[167] Batshaw & Shapiro, 2002; A. A. Baumeister, 1989; D. A. Chapman et al., 2002.
[168] Hallahan et al., 2009; Landesman & Ramey, 1989; Ormrod & McGuire, 2007.
[169] Beirne-Smith et al., 2002; Butterfield & Ferretti, 1987; Heward, 2009; Kail, 1990; Turnbull et al., 2010.

Be optimistic that with appropriate guidance and support, all students can perform more intelligently.

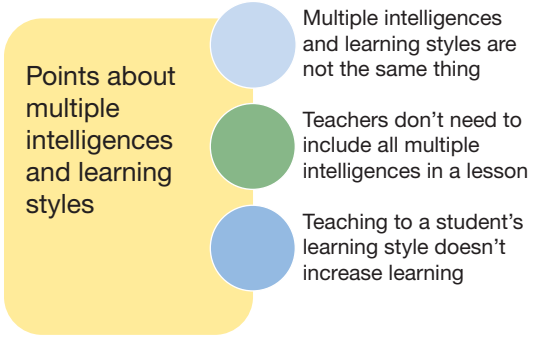
Contemporary views of intelligence give us reason to be optimistic about what children and adolescents can accomplish, especially when teachers actively nurture and support their cognitive growth. If intelligence is multifaceted (such as it is described in the Cattell-Horn-Carroll theory of cognitive abilities, in the triarchic theory of intelligence, and in multiple intelligences theory), then scores from any single IQ test can't possibly provide a complete picture of students' intelligence levels. In fact, teachers are likely to see intelligent behavior in many of their students—quite possibly in *all* of them—in one way or another. One student may show promise in mathematics, another may be an exceptionally gifted writer, and a third may show abilities in art or music. Furthermore, intelligent behavior draws on a variety of cognitive processes that can definitely improve over time with experience and practice. And the notion of distributed intelligence suggests that intelligent behavior should be relatively commonplace when students have the right tools, symbolic systems, and social groups with which to work.

Teachers must also remember that to the extent that intelligence is dependent on culture, intelligent behavior is apt to take different forms in students from different backgrounds.[170] In mainstream Western culture, children's intelligence may be reflected in their ability to deal with complex problems and abstract ideas. Among students who've been raised in predominantly African American communities, it may be reflected in oral language, such as in colorful speech, creative storytelling, or humor. In Native American cultures, it may be reflected in interpersonal skills or exceptional craftsmanship. Teachers must be careful not to limit their conception of intelligence only to students' ability to succeed at traditional academic tasks.

It's important, too, that teachers nurture the kinds of dispositions that will predispose students to think and act intelligently on a regular basis. Teachers can get students off to a good start by encouraging and modeling productive ways of thinking about classroom subject matter—for instance, by asking students to evaluate the quality of scientific evidence and consistently demonstrating open-mindedness about diverse perspectives.[171] The Classroom Strategies box "Promoting Productive Dispositions" presents examples of what teachers might do.

Ultimately, intelligent behavior depends not only on students' own thought processes but also on the supportive contexts in which students work. Therefore, rather than asking the question, "How intelligent are my students?" teachers should instead ask themselves, "How can I help my students think as intelligently as possible? What physical tools, cognitive tools, and social support systems can I provide?"

Figure 6.21 Teachers need to be careful as they apply multiple intelligences theory and learning styles to their teaching



Be cautious in applying multiple intelligences theory and learning styles to teaching.

There are many *misconceptions* about how to apply multiple intelligences theory and learning styles to teaching. Figure 6.21 lists three important points that address some of these misconceptions. First, let's be clear that multiple intelligences and learning styles are *different* things.[172] Multiple intelligences refers to the idea that intelligence is composed of many different abilities, whereas learning styles (or cognitive styles) refers to individual differences in the ways that people perceive, think, solve problems, learn, and relate to others. A person should exhibit the same

[170] Dai, 2010; Haywood & Lidz, 2007; Maker & Schiever, 1989; Nisbett, 2009; H. L. Smith, 1998; Sternberg, 2005.
[171] Halpern, 1998; Kuhn, 2001b; D. N. Perkins & Ritchhart, 2004.
[172] Gardner, 1995.

Classroom Strategies

Promoting Productive Dispositions

- **Communicate your own enthusiasm for learning about new topics.**
  In a unit on poetry, an English teacher says, "In our culture, we're accustomed to poems that rhyme and have a steady beat. But many centuries ago, the Japanese developed a very different form of poetry. This form, called *haiku*, is really cool. I'll give you some of my favorite examples, and then as a class, we'll create some new haiku."
- **Model open-mindedness about diverse viewpoints and a willingness to suspend judgment until all the facts are in.**
  In a hands-on activity, students in a second-grade class experiment with particles of different sizes—pouring them, piling them, trying to bury things with them, and so on. Then, in a whole-class discussion, their teacher solicits students' varying observations and conclusions about the nature of particles, all the while communicating respect for students' ideas.
- **Conduct learning activities in which students collaborate to address intriguing, multifaceted issues.**
  A few weeks before a national presidential election, a high school social studies teacher says, "Many of the campaign ads we see now are harshly criticizing opposing candidates, and some of them may be misrepresenting the facts. In your cooperative groups today, you'll fact-check the transcripts of three political ads. Find credible websites that can either confirm or disconfirm the claims made in the ads. Tomorrow, we'll compare the findings of various groups."
- **Ask students to evaluate the quality of scientific evidence and scaffold their efforts sufficiently that they can reach appropriate conclusions.**
  Students work in pairs to conduct online "experiments" that simulate the effects of various factors (amount of rainfall, rate of snowmelt, type of soil, etc.) on local flooding. The website guides students' investigations by prompting them to form and test specific hypotheses and, occasionally, it asks them if a particular series of tests has controlled for other potentially influential factors.

Sources: Strategies based on discussions by de Jong, 2011; Gresalfi, 2009; Halpern, 1998; Kuhn, 2001b; D. N. Perkins & Ritchhart, 2004; vanSledright & Limón, 2006.

learning style across all of the different multiple intelligences. Furthermore, the fact that someone has a strength in a certain type of multiple intelligence (such as linguistic intelligence) does not indicate what their learning style may be.

A second point is that teachers don't need to include all the multiple intelligences in one lesson. In fact, Howard Gardner noted that it's a waste of time to try to do so.[173] Although there are different ways to represent and think about knowledge and skills (linguistically, logically, mathematically, spatially, etc.), lessons should be taught in ways that meet the learning objectives without incorporating activities simply to include some of the multiple intelligences. For example, it's unnecessary to play music in the background of a social studies lesson to try to incorporate musical intelligence if music doesn't help students meet the lesson objectives.[174] However, it may be appropriate for students to sing or play songs from a historical time period if an objective is to understand the lived experiences of people during that time period. Perhaps the song lyrics provide another window into the feelings or experiences of those who lived during that time period, and thus these musical activities would directly relate to the learning objectives.

A final point is that teaching to a student's learning style doesn't increase learning.[175] For example, visualizers don't learn more effectively as compared to verbalizers when information is presented visually.[176] Instead, teachers should consider the content being taught and how it can be represented in different forms (e.g., visually, verbally) to help students learn most effectively. For example, adding pictorial aids to a text-based lesson can help both visualizers and verbalizers learn more effectively.[177] And as you will recall from Chapter 2, teachers can increase students' learning by fostering meaningful learning, organizing information, providing visuals, designing opportunities for elaboration, and allowing practice over time.

[173] Gardner, 1995.
[174] Gardner, 1995.
[175] Höffler et al., 2017; Kollöffel, 2012; Kozhevnikov et al., 2014; Willingham et al., 2015.
[176] Constantidinou & Baker, 2002; Massa & Mayer, 2006.
[177] Massa & Mayer, 2006; Mayer, 2014; Plass et al., 1998.

Summary

With our discussions of cognitive development and intelligence in mind, we can now summarize issues related to the Big Ideas presented at the beginning of the chapter.

6.1 General Principles of Development

Big Idea 6.1 As a result of ongoing interactions between biological and environmental influences, children show some similar patterns but also considerable diversity in their developmental pathways.

Although the brain changes in dramatic ways in the first few years of life, it continues to mature even after the teenage years. Developmental changes in the brain enable increasingly complex thought processes throughout childhood, adolescence, and early adulthood. The brain retains some plasticity throughout life, enabling people of all ages to acquire new knowledge and skills in most domains.

Children and adolescents reach various developmental milestones in a somewhat predictable sequence, although the ages at which they reach these milestones vary considerably from one individual to the next. The course of development is often uneven, marked by dramatic changes or qualitative shifts at some points and by slower, more gradual changes at others. Both genetic and environmental factors influence development, but because they interact in their effects and also because children's own behaviors also influence the development of various characteristics, the relative contributions of genetics and environment are often impossible to determine.

Effective teachers consider students' developmental levels by adjusting their instructional goals and strategies to meet students' unique knowledge, skills, and needs. Some computer-based instructional strategies can be useful in helping teachers as they adapt instruction to meet students' different characteristics.

6.2 Developmental Processes

Big Idea 6.2 Cognitive development depends not only on brain maturation but also on stimulating physical, social, and cultural experiences and on children's natural inclinations to organize and try to make sense of those experiences.

Young learners seem naturally inclined to learn about, organize, and adapt to their world, and they actively seek interactions both with their physical environment and with other people. Adults and other, more advanced individuals foster children's cognitive development by providing labels for experiences, modeling procedures for tackling problems, and in other ways passing along culturally appropriate interpretations and behaviors. Social interaction has an additional benefit as well: Children gradually internalize the processes they initially use with others and can eventually use those processes on their own. Ultimately, young learners benefit most from challenges, both those that call into question existing beliefs (those that create disequilibrium) and those that require the use of newly emerging abilities (those that lie within learners' zones of proximal development).

One important strategy is providing opportunities for pretend play, organized games and sports, and other play activities in which students practice adult-like skills and learn how to plan ahead and abide by certain rules for behavior. Teachers should structure and guide—that is, scaffold—students' early attempts at challenging tasks, gradually removing the scaffolding as students gain proficiency. And as ability levels improve, students should participate in meaningful ways in adult activities.

6.3 Trends in Cognitive Development

Big Idea 6.3 Children continually build on existing knowledge and skills to develop more advanced thinking and reasoning abilities.

Thanks in part to increases in working memory capacity and to an ever-expanding and better-integrated knowledge base, young learners become increasingly capable of logical and abstract thinking over the course of childhood and adolescence. In adolescence, several abilities emerge that enhance thinking about science and math, including logical reasoning about contrary-to-fact situations, separating and controlling variables, and proportional reasoning. Advanced reasoning processes continue to develop during the high school years, especially if a learner's culture encourages them, but true expertise in any field comes only after many years of study and practice.

Not only must teachers ascertain where students are currently "at" in their thinking and reasoning, but they must also take active steps to help every student make advancements in important cognitive abilities and skills. Instruction should rely heavily on concrete objects and activities in the early years but increasingly introduce abstract ideas and encourage sophisticated reasoning processes as students move through adolescence. Discovery and inquiry-based approaches to instruction can be used to help students identify important underlying concepts and principles.

6.4 Intelligence

Big Idea 6.4 Although children in any age group differ somewhat in intelligence, cognitive styles, and dispositions, appropriately supportive environments can significantly enhance these abilities and characteristics.

Virtually all children and adolescents continue to gain new cognitive abilities and skills with age, but learners in any single age group differ considerably in their general ability

levels. Most psychologists call this individual difference variable intelligence. Psychologists disagree, however, about the extent to which intelligence is a single entity that influences a wide variety of tasks, on the one hand, or a collection of distinct, semi-independent abilities, on the other. Intelligence tests provide a rough idea of how a child's general cognitive ability compares to that of his or her peer group, but they're imprecise measures at best, and the IQ scores they yield are apt to change somewhat over time. Furthermore, intelligent behavior depends on environmental factors, both those that may have nurtured or impeded a child's cognitive development in the past and those that may support or hinder a child's performance at present. Intelligent behavior also depends on cognitive styles and dispositions—analytic and holistic processing, critical thinking, open-mindedness, and so on—that predispose learners to think about new ideas and events in insightful and productive ways.

When considered within the context of other information, IQ scores can often give teachers a general sense of students' current cognitive functioning. But equally helpful are problems and questions that reveal how students think and reason about various situations and topics. Through such information and through careful observation of students' day-to-day behaviors, teachers may discover that some students have exceptional abilities and talents begging to be nurtured and that other students have developmental delays requiring the attention of specialists and special instructional accommodations. In general, teachers should remember that with appropriate guidance and support, virtually all students can learn to think and act in increasingly complex ways.

Case Study Practice Exercises

A Floating Stone

After lunch one day, first-grade teacher Mr. Fox calls his students to the carpet area so that he can show them a "curious thing." Once the children are all seated and attentive, he puts a large fishbowl in front of them and fills it with water. Then, out of his jacket pocket, he pulls a piece of granite a little smaller than a golf ball and holds the stone over the bowl.

"What's going to happen when I drop this stone into the water?" he asks the children. "Do you think it will float like a boat does?"

Several of the children shout, "No, it's gonna sink!" Mr. Fox drops the stone into the water and, sure enough, it sinks.

"You were right," Mr. Fox says. "Hmm, I have another stone in my pocket." He pulls out a much larger one—in this case, a piece of pumice (cooled lava) that is filled with tiny air pockets. "When I was traveling last summer, I found this at the bottom of an old volcano. Do you think this one will sink like the other one did?"

The children declare that it will definitely sink. Mr. Fox drops it into the fishbowl, where it momentarily submerges and then floats to the surface. "Hmm, what just happened?" he says as he looks inquisitively at his class.

Many of the children gasp with surprise. When a girl named Cora insists, "You didn't do it right!" Mr. Fox retrieves the pumice and drops it in the water again, with the same result. "No, no, that's impossible!" Cora yells. "Stones always sink—*always*!" She rubs and shakes her head, almost as if she's a bit upset. (Case based on similar lesson described by Hennessey & Beeth, 1993.)

1. Constructed-response question

Cora is noticeably surprised and possibly upset when she sees the pumice stone float.

A. Use one or more concepts from Jean Piaget's theory of cognitive development to explain why Cora reacts as strongly as she does to the floating pumice.

B. Again drawing on Piaget's theory, explain why Mr. Fox intentionally presents a phenomenon that will surprise the children.

2. Multiple-choice question

Imagine that you perform the same demonstration with high school students rather than first-graders. If you were to make use of Vygotsky's theory of cognitive development, which one of the following approaches would you be most likely to take in helping the students understand the floating pumice?

a. Before performing the demonstration, ask students to draw a picture of the fishbowl and two stones.

b. Drop several light objects (e.g., a feather, a piece of paper, a small sponge) into the fishbowl before dropping either stone into it.

c. Praise students who correctly predict that the larger stone will float, even if they initially give an incorrect explanation about why it will float.

d. Teach the concept of *density* and explain that an object's average density relative to water determines whether it floats or sinks.

Chapter 7

Personal, Social, and Moral Development

Photo by Pixabay

Big Ideas to Master in this Chapter

7.1 Students' personalities, sense of self, and identities are gradually shaped by traits, environmental contexts, and maturational changes in the brain.

7.2 Students must have good social skills and be able to interpret and respond to various social situations and problems in productive ways if they are to benefit fully from their interactions with peers.

7.3 Some signs of moral reasoning and prosocial behavior emerge early in life, but key components of morality continue to evolve over the course of childhood and adolescence.

7.4 Students who most need teachers' guidance and support are those who face exceptional personal or social challenges.

Case Study: The School Play

The eighth-graders at Fairview Middle School are sharply divided into two groups, the "popular" ones and the "unpopular" ones. The popular students have little time or tolerance for their low-status peers, and a few of them regularly pick on a small, friendless boy named William, usually by ridiculing him but occasionally by physically poking or shoving him.

Justifiably concerned about students' disrespectful behaviors toward certain classmates—and especially concerned about the bullying—members of Fairview's English department suggest that the annual eighth-grade play take a different form this year. Rather than holding tryouts and selecting only a handful of students as cast members (as has been done in previous years), all 103 eighth-graders will participate in some way, perhaps in the cast or perhaps in scenery construction, costume design, lighting, or marketing.

A humorous, two-act melodrama is selected, complete with a handsome but clueless hero, a resourceful heroine, a dastardly villain, and several other central characters, along with a 10-member chorus that will provide the occasional cheering and booing that any good melodrama requires. The often-bullied William is chosen to play Lucifer Nastybuns, the dastardly villain.

The students and many of their teachers work on the production throughout late winter and early spring. The sheer ambitiousness of the project and the fact that the class's efforts will be on public display on opening night instill a cohesiveness and class spirit that the faculty hasn't seen before. William surprises everyone with his spirited portrayal of Lucifer, and on opening night, his classmates give him rave reviews in their texts to one another: "Who knew William was so awesome?" "OMG, Will was fabulous!"[1]

Before you continue, please answer the following questions:

1. Middle school students often divide themselves into different social groups, with some groups having higher social status than others. Why might social groups be so important for young adolescents?
2. What benefits might the all-class school play have?

For many students, early adolescence can be a time of considerable anxiety. Students must grapple not only with the physiological changes of puberty, but also with disruptions of long-standing childhood friendships, more superficial interactions with teachers, and higher expectations for academic performance. Self-confidence may plummet, at least temporarily, and students are apt to look to their peers for emotional and moral support. Being in a high-status, "popular" group can be a source of comfort, but students can have high status only if some of their peers have *low* status. With the all-class school play, everything changes. Suddenly the students have a common goal, and only by working cooperatively with *all* of their classmates can any of them look good. Working together provides students with the opportunity to get to know each other better, which can help to foster new friendships and allow students to learn about others' abilities and strengths (which was the case when William's classmates discovered his acting skills).

School isn't just a place where children and adolescents acquire thinking skills and master academic subject matter. It's also a place where they acquire beliefs about themselves and strategies for getting along with other people. In other words, school provides a critical social and cultural context in which young people grow personally and socially as well as academically.

As we consider personal, social, and moral development in this chapter, we'll discover that with age and experience, young learners construct increasingly sophisticated beliefs about themselves, other people, and society as a whole. Thus, children's and adolescents' personal, social, and moral understandings, like their understandings of the physical world, are very much *self-constructions*.

[1] Based on a case described by M. Thompson & Grace, 2001.

Chapter Outline

Case Study: The School Play

7.1 Personal Development
- Personality
- Sense of Self and Identity
- Teaching Strategies: Fostering Personal Development

7.2 Social Development
- Peer Relationships
- Social Cognition
- Teaching Strategies: Encouraging Effective Social Cognition and Interpersonal Skills

7.3 Moral and Prosocial Development
- The Nature of Moral and Prosocial Development
- Teaching Strategies: Promoting Moral Reasoning and Prosocial Behavior

7.4 Students Who Face Exceptional Personal or Social Challenges
- Students At Risk for Academic Failure
- Teaching Strategies: Supporting Students Who Face Challenges

Summary

Case Study Practice Exercises: *The Scarlet Letter*

7.1 Personal Development

Big Idea 7.1 Students' personalities, sense of self, and identities are gradually shaped by traits, environmental contexts, and maturational changes in the brain.

All of us have unique qualities that make us different from the people around us. In this section, we focus on three aspects of personal development that differ across people: personality, sense of self, and identity. These factors can have a significant influence on students' adjustment at school and elsewhere. The principles in this section describe the nature, origins, and effects of these three overlapping and related aspects of personal development.

Personality

Teachers who refer to students as curious, dependable, sociable, patient, or self-confident are referring to students' **traits**—the typical ways in which a person behaves, thinks, and feels across situations and time.[2] These traits are combined to form one's overall **personality**. Children's and adolescents' traits are often referred to as *temperament traits*, while adults' traits are generally referred to as *personality traits*. For simplicity, we use the term *personality traits* in this chapter to refer to both temperament and personality traits. In this section, we identify some of these traits and the factors that affect them.

Personality traits can be grouped into five general categories.

To synthesize the many possible combinations of personality traits in children and adults, researchers have grouped the traits into five general categories—known as the "Big Five" personality traits—that are relatively independent of one another.[3] You can use the acronym *OCEAN* to remind you of the first letter of each of the Big Five categories: Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Table 7.1 provides a definition of each of the Big Five traits along with example descriptors for a person who is rated high or low on each trait.

Here are some important points about personality traits.

- Exhibiting a high degree of a trait isn't necessarily good or bad. For example, being highly extraverted and social may be beneficial when it's important to meet new people. But it may be more beneficial to be introverted and quiet when it's time to work on an activity alone, such as when reading or studying. And many people are between these two extremes and can be social sometimes and quiet at other times.
- In some situations, exhibiting a high degree of a trait can definitely be beneficial. As an example, students who are more conscientious tend to perform better in school because they're more organized and self-disciplined as they work toward their goals.[4] And students who are more agreeable tend to be more well liked by their peers.[5]
- Personality traits tend to be consistent over time, but not *totally* consistent.[6] Students can vary on these traits, especially when they move from one environment to a very

[2] Henry & Mõttus, 2020; McCrae & Sutin, 2018; Shiner, 2015.
[3] Caspi, 1998; DeYoung et al., 2010; G. Matthews et al., 2006; Saarni et al., 2006.
[4] de Vries et al., 2011; Dumfart & Neubauer, 2016; McAbee & Oswald, 2013.
[5] de Vries et al., 2020; Wolters et al., 2014.
[6] Graham et al., 2020; Hampson, 2008; Mendoza-Denton & Mischel, 2007.

Table 7.1 Personality Traits Organized into the Big Five OCEAN Categories

PERSONALITY TRAITS	DESCRIPTORS OF A PERSON WHO IS RATED HIGH OR LOW ON THIS TRAIT	
	Rated High	Rated Low
Openness to experience (vs. closedness): The extent to which one is curious about the world and receptive to new ideas and experiences	artistic, creative, curious, eager to learn, imaginative, innovative, varied interests, insightful, intellectual, perceptive, unconventional	close-minded, imperceptive, shallow, simple
Conscientiousness (vs. negligence): The extent to which one is careful, organized, self-disciplined, and likely to follow through on plans and commitments	dependable, efficient, ability to delay gratification, neat, organized, persistent at tasks, planful, reliable, responsible, thorough	careless, disorganized, impulsive, irresponsible, lazy, negligent, sloppy, unreliable
Extraversion (vs. introversion): The extent to which one is socially outgoing and seeks excitement	active, assertive, energetic, enthusiastic, expressive, forceful, joyful, optimistic, outgoing, reward-seeking, sociable, talkative	passive, quiet, reserved, shy, socially inhibited, introverted
Agreeableness (vs. antagonism): The extent to which one is pleasant, kind, and cooperative in social situations	appreciative, considerate, cooperative, empathetic, forgiving, generous, helpful, kind, patient with others, sympathetic, trusting, warm	aggressive, demanding, egotistical, hostile, hurtful, noncompliant, selfish, show-off, stubborn, unsympathetic, uncooperative, rude, mistrustful
Neuroticism (vs. emotional stability): The extent to which one is prone to negative emotions (e.g., anxiety, anger, depression) and general distress	concern about acceptance, anxious, fearful, low in frustration tolerance, insecure, irritable, jealousy, moody, nervous, not self-confident, self-pitying, tense, touchy, unstable, worrying	calm, content, resilient, emotionally stable, self-confident, well-adjusted

Sources: Digman, 1990; McCrae & Costa, 1987; Shiner, 2015.

different one. For example, a student might be outgoing and sociable with his close friends but shy and withdrawn with people he doesn't know very well. And, it's possible to *intentionally* change some personality traits.[7] As an example, teachers can help students become more conscientious about completing schoolwork by teaching them organizational strategies (e.g., how to use a "to-do" list) and teaching them that academic ability improves with effort and practice (i.e., conveying the importance of a growth mindset; see Chapter 5).[8]

- The Big Five personality traits can be divided into more specific traits. For example, *extraversion* includes at least two specific traits: (1) **sociability** is the extent to which one is eager to interact with others and (2) **activity level** is the extent to which one has a high level of physical activity.[9] And some specific traits can be divided even further into even *more* specific traits. An example is the **environmental sensitivity** trait, which is the extent to which people are able to perceive and process environmental stimuli. Some people are more sensitive than others to environmental conditions and these sensitivities can be categorized into three types.[10] People with a *low sensory threshold* are more sensitive to environmental stimuli and can find stimuli such as bright lights and loud noises to be very unpleasant. People with *aesthetic sensitivity* are more aware of aesthetics and tend to enjoy good music and nice tastes and smells (and dislike bad sounds, tastes, and smells). Finally, people with *ease of excitement* are easily overwhelmed by external and internal demands and may respond negatively to having a lot going on (an external demand) or being very hungry (an internal demand).

[7] Stieger et al., 2020.
[8] Belfiore & Hornyak, 1998; Dweck, 2008.
[9] Shiner, 2015; Strelau & Zawadzki, 2012; Thomas & Chess, 1977.
[10] Lionetti et al., 2018; Pluess, 2015; Pluess et al., 2018.

Personality traits are influenced by genetic and environmental contexts.

To some extent, traits have genetic, biological origins and are present from birth. Therefore, some traits emerge early in life and often persist into adolescence and adulthood.[11] However, traits also interact in many ways with the environment.[12] For example, students who are energetic and adventuresome are likely to seek out a wider variety of experiences than those who are quiet and restrained (e.g., recall the discussion of niche-picking in Chapter 4). Students who are naturally sociable and outgoing typically have more opportunities than shy children to learn social skills and establish rewarding interpersonal relationships. Consequently, as children grow older, the many interactions among their genetics and environmental contexts lead them to have unique and fairly stable personality traits.

One personality trait, effortful control, doesn't fully mature until adulthood.

Beginning quite early in life, children show differences in their ability to regulate their behaviors. Some of this variability is the result of differences in a specific personality trait within the conscientiousness category known as **effortful control** (sometimes called *self-control*)—the extent to which one can sustain attention, inhibit impulses, and engage in planning. Some children are better able than others to consciously restrain themselves from making impulsive responses when other, less dominant responses might be more productive.[13] As children grow older, those who show high levels of effortful control can better plan ahead, focus their attention where they need to, and keep inappropriate emotional reactions in check. Such children also tend to be better behaved in class and to achieve at higher levels than their classmates with less self-control.[14]

Effortful control is a critical ingredient in the effective functioning of the *central executive*—the take-charge component of working memory introduced in Chapter 2. Accordingly, its biological underpinnings appear to be in the prefrontal cortex, which doesn't fully mature until early adulthood—well after the teenage years. But long before this—beginning with the onset of puberty—certain other changes occur both in the brain and in hormone levels that can heighten young people's desires for enjoyable activities and immediate rewards. The unfortunate result is that many adolescents have trouble planning ahead and controlling their impulses.[15] Furthermore, they tend to make choices based on emotions ("This will be fun") or faulty assumptions ("This will make me look grown-up") rather than on logic and sound judgment ("There's a high probability of a bad outcome").[16] As you might guess, adolescent risk taking is most common in social contexts, where having fun is typically a high priority and it's easy to get swept away by what peers are doing or suggesting.[17]

Even though adolescents look and behave like adults in so many ways, it's important to remember that in one very important respect they're still children: They have trouble saying "No" to enticing opportunities that aren't necessarily in their long-term best interests. Hence, many middle school and high school students need considerable structure and prompting related to homework completion and other independent learning activities. And they're more likely to steer clear of potentially dangerous activities if they can find just as much pleasure in safer, more prudent ones.

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[11] Bates & Pettit, 2007; Kagan, 2010; Kagan et al., 2007; M. Pfeifer et al., 2002; Rothbart, 2011; A. Thomas & Chess, 1977.

[12] Avinun, 2020; Manuck & McCaffery, 2014.

[13] Bates & Pettit, 2007; Rothbart, 2011; Rothbart et al., 2007.

[14] Blair & Razza, 2007; Liew et al., 2008; Valiente et al., 2008.

[15] Figner & Weber, 2011; Shulman et al., 2016; Somerville et al., 2010; Steinberg, 2009.

[16] Luna et al., 2013; V. F. Reyna et al., 2012; Shulman et al., 2016.

[17] Albert et al., 2013; Galván, 2012; Knoll et al., 2015.

Parenting styles can affect children's personality traits and behaviors.

Genetic differences in traits are only *predispositions* to behave in certain ways, however, and environmental conditions can point different children with the same predispositions in somewhat different directions.[18] One influential environmental factor is the parenting style that mothers, fathers, and other primary caregivers use in raising children. Parenting styles can be categorized according to (1) how *responsive* parents are to children's emotional and developmental needs and (2) how *demanding* they are in controlling children's behavior (see Figure 7.1).[19]

Figure 7.1 Parenting styles can be categorized according to the extent that parents are responsive and demanding

Responsive parents respond to children's emotional and developmental needs.
Demanding parents control their children's behavior and have high expectations.

	Less Responsive	More Responsive
More Demanding	Authoritarian	Authoritative
Less Demanding	Uninvolved	Permissive

In mainstream Western culture, the ideal situation seems to be **authoritative parenting**, which combines affection and respect for children with reasonable restrictions on behavior. Authoritative parents provide a loving and supportive home, communicate high standards for performance, explain why certain behaviors are unacceptable, enforce household rules consistently, involve children in decision making, and provide age-appropriate opportunities for autonomy. Children from authoritative homes tend to be self-confident, energetic, socially skillful, and compassionate. They listen respectfully to others, follow reasonable rules for behavior, are relatively independent and self-regulating, and strive for academic achievement.[20] For the most part, such characteristics are consistent with the values espoused by mainstream Western culture.

Authoritative parenting isn't universally "best," however. Certain other parenting styles may be better suited to particular cultures and environments. For instance, in **authoritarian parenting**, parents expect complete and immediate compliance; they neither negotiate expectations nor provide reasons for their requests. In many families, high demands for obedience are made within the context of close, supportive parent–child relationships. Underlying the "control" message is a more important message: "I love you and want you to do well, but it's equally important that you act for the good of the family and community."[21] Authoritarian parenting is more common in impoverished economic environments. When families live in neighborhoods where danger potentially lurks around every corner, parents may better serve their children by being very strict and directive about activities.[22] And when children have temperaments that clash with parental expectations or cultural norms, they're apt to evoke negative reactions in others and lead parents to use a more controlling, authoritarian parenting style.[23]

[18] Hollenstein & Lougheed, 2013; Keogh, 2003; Rothbart, 2011.
[19] Baumrind, 1989, 1991.
[20] Barber et al., 2005; Baumrind, 1989, 1991; M. R. Gray & Steinberg, 1999; Stright et al., 2008; J. M. T. Walker & Hoover-Dempsey, 2006; Zhou et al., 2008.
[21] Bornstein & Lansford, 2010; X. Chen & Wang, 2010; Halgunseth et al., 2006; McLoyd, 1998; Rothbaum & Trommsdorff, 2007.
[22] McLoyd, 1998.
[23] Bates & Pettit, 2007; N. A. Fox et al., 2001; J. R. Harris, 1998; Keogh, 2003; Maccoby, 2007; Rothbart, 2011; Scarr, 1993.

In **permissive parenting**, parents are responsive and caring but are less demanding and have fewer expectations for their children. Consequently, their children tend to be immature, compulsive, and unmotivated. And because they're used to getting their own way, children of permissive parents can lack conscientiousness and become disagreeable, which can lead to difficulties in interacting with peers. Finally, in **uninvolved parenting**, parents are less responsive and have few expectations for their children. Their children tend to be sad, lonely, at risk for abuse, and less able to handle life's challenges. Permissive and uninvolved parenting styles are not ideal and can be harmful to children.[24]

Keep in mind, however, that parenting styles have, at most, only a *moderate* influence on children's personalities.[25] Many children and adolescents thrive despite their caregivers' diverse parenting styles, provided that the caregivers aren't severely neglectful or abusive.[26]

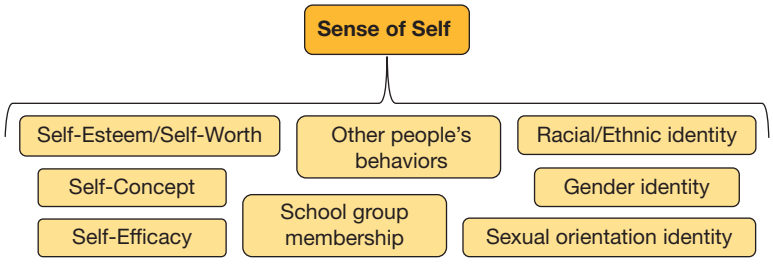
Cultural environments influence the development of personality traits.

Although children's personalities are partly the result of differences in personality traits, culture also plays a significant role in molding their personality characteristics by encouraging (i.e., *socializing*) certain kinds of behaviors.[27] For example, many Asian children are raised to be shy and reserved, whereas many children in North America and some European countries are raised to be outgoing, assertive, and independent. Furthermore, some cultural groups explicitly nurture different characteristics in males and females. For instance, some Hispanic groups encourage boys to be strong and assertive (*machismo*) while urging girls to be demure and nurturing (*marianismo*). Keep in mind, however, that such characteristics are only *average* group differences and can change significantly from one generation to the next if families move to a very different cultural environment—for example, if they move from the Far East to North America.[28]

Sense of Self and Identity

Individuals are constantly constructing their **sense of self**—perceptions, beliefs, judgments, and feelings about who they are as a person. Factors such as those shown in Figure 7.2 contribute to a person's sense of self and each of these factors is discussed in this section. As individuals develop over time, they draw on their self-perceptions to form an **identity**—a self-constructed definition of who they think they are, what they find

Figure 7.2 Some of the factors that contribute to forming an individual's sense of self



[24] Briere et al., 2017; Spera, 2005.
[25] W. A. Collins, et al., 2000; Weiss & Schwarz, 1996.
[26] Belsky & Pluess, 2009; J. R. Harris, 1998; Scarr, 1992.
[27] For a good theoretical discussion of this issue, see Mendoza-Denton & Mischel, 2007.
[28] L. Chang et al., 2011; X. Chen et al., 2009; Goldston et al., 2008; Huntsinger & Jose, 2006; Rothbart, 2011; Rubin et al., 2010; Tamis-Lemonda & McFadden, 2010.

important (their values), and what they want to accomplish in life (their goals).[29] Sense of self and identity are important to students because they're related to students' academic, physical, and social successes in school.[30] The principles in this section highlight many of the factors that affect children and adolescents' sense of self and identity over time.

Children construct increasingly multifaceted understandings of their sense of self over time.

Take a minute to complete the following exercise and reflect on different aspects of your "self."

See For Yourself

Your Sense of Self

Rate your level of agreement with each of the following items using this scale:

1	2	3	4	5
Not True		Somewhat True		Absolutely True

1. It's easy for me to understand things in mathematics. _____
2. I'm good at swimming. _____
3. Overall, I feel that I have a number of good qualities. _____
4. I feel that I am a person of worth. _____

Your responses to these types of questions tell you something about your sense of self. The first two items in this exercise assess aspects of your **self-concept**—your self-perceptions of competence in a particular domain, such as in mathematics or swimming.[31] People who rate these types of items high have high perceptions of competence in that domain. As you answered these first two items, what factors affected your responses? Most people form their self-concepts in domains by (1) comparing their current performance to their past performance (Did you think about how good you are at math now as compared to when you were younger?), (2) comparing their performance in one domain to their performance in another domain (Did you consider how easy or hard it is to understand things in math compared to English or social studies?), and (3) comparing their performance against others (Did you compare your swimming ability to an Olympic swimmer's ability or to some of your friends' abilities?).[32] Students' domain self-concepts are good predictors of their grades in that domain.[33]

Items #3 and #4 in the previous exercise assess your **self-esteem** (also referred to as your *self-worth*)—an emotional reaction to your overall evaluation of yourself as a person of worth.[34] People who rate these types of items high have a high self-esteem, which means that they feel good about themselves because they believe that they are a significant, successful, and worthy person. We've encountered these ideas before in Chapter 5 when we noted that humans seem to have a basic need to feel competent and worthy (recall *self-worth theory*). Compared to students with higher self-esteem, students with lower self-esteem are more likely to be depressed and have poorer relationships with others.[35]

[29] Kaplan & Garner, 2017; Kroger, 2007; Marcia, 1991.
[30] Marsh et al., 2004, 2018; Osborne & Jones, 2011.
[31] Marsh et al., 2018, 2019.
[32] Möller et al., 2020; van Zanden et al., 2015.
[33] Lauermann et al., 2020.
[34] Coopersmith, 1967; Rosenberg, 1979.
[35] Harris & Orth, 2019; Rieger et al., 2016.

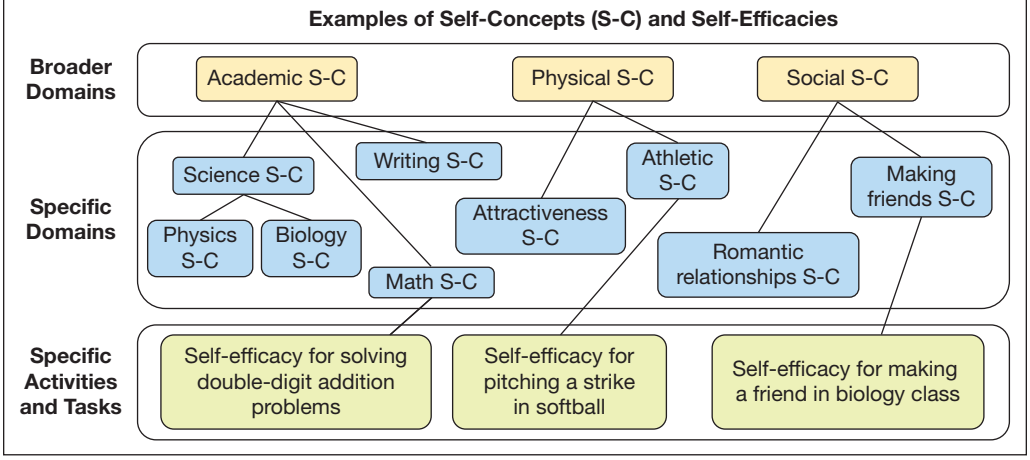
In Chapter 5, we also noted that people realize they're more likely to be successful in some activities than others; that is, they have a higher *self-efficacy* for some activities than other activities. People's self-efficacies for various activities also contribute to their more general sense of self.[36] Self-efficacy addresses the question "How confident am I that I can do a specific activity?" Thus, self-efficacy describes a student's confidence in being able to complete a specific activity within a domain (e.g., write a haiku, describe the properties of elements using the periodic table). In comparison, self-concept describes students' perceptions of competence in a domain (e.g., writing, chemistry). And self-esteem refers to students' overall feelings about themselves as worthy people (see Figure 7.3).

Figure 7.3 Three student statements that exemplify different types of *self* beliefs

Self-Efficacy: "I'm confident I can succeed at that activity."
Self-Concept: "I'm good at that subject."
Self-Esteem/Self-Worth: "I feel good about myself."

In their overall self-assessments, young children tend to make distinctions between two general domains: how competent they are at day-to-day tasks (including schoolwork) and how well they are liked by family and friends. As they grow older, children make finer and finer distinctions in their self-concepts; for instance, they realize that they may be competent in some general domains (academic subjects, athletic activities, social situations) but not so competent in other domains.[37] And even within general domains, students may find that they are competent in some specific domains (physics, math, softball, making friends), but not as competent in others (biology, writing, gymnastics, romantic relationships). These ideas are captured in Figure 7.4, which shows that self-concept is multidimensional (there are many different self-concepts) and somewhat hierarchical (broader self-concepts can be divided further into specific domains, which can be divided further into specific activities and tasks).[38] Each self-concept and self-efficacy may have a greater or lesser influence on students' overall sense of self. For some students, having a high academic self-concept may be very important to their overall sense of self, whereas for others, physical attractiveness or popularity with peers may be more important to their sense of self.[39]

Figure 7.4 Examples of possible self-concepts and self-efficacies that demonstrate their multidimensional and hierarchical structure



[36] Bong & Skaalvik, 2003; McInerney et al., 2008; Schunk & Pajares, 2004.
[37] Arens et al., 2011; Bracken, 2009; Byrne, 2002; Davis-Kean & Sandler, 2001; Harter, 1999; Möller et al., 2020; Yun et al., 2010.
[38] Marsh, 1990; Marsh & Craven, 2006.
[39] Crocker & Knight, 2005; D. Hart, 1988; Harter, 1999.

With age, self-perceptions become more realistic, abstract, and stable.

In the preschool and early elementary school years, children tend to think of themselves in terms of concrete, easily observable characteristics and behaviors—for instance, they may talk about their age, gender, and favorite activities.[40] At this point in their development, most of them have a generally positive sense of self.[41] Often they believe they're more capable than they really *are* and that they can easily overcome initial failures. Such optimism is probably due to their tendency to base self-assessments on their continuing improvements in "big kid" tasks. But as children have more opportunities to compare themselves with peers during the elementary school years—and also become cognitively more able to *make* such comparisons—their self-assessments become increasingly realistic.[42] They also start to pull together their many self-observations into generalizations about the kinds of people they are (e.g., "friendly," "good at sports," "smart," "dumb") and, for good or for bad, such generalizations lead to increasingly stable self-concepts.[43]

As children reach adolescence and gain greater capability for abstract thought, they're even more likely to think of themselves in terms of general, fairly stable traits (see Figure 7.5). Consider 12-year-old Tina's self-description when she was in sixth grade:

> I'm cool. I'm awesome. I'm way cool. I'm 12. I'm boy crazy. I go to Brentwood Middle School. I'm popular with my fans. I play viola. My best friend is Lindsay. I have a gerbil named Taj. I'm adopted. I'm beautiful.

Although Tina listed a few concrete characteristics (e.g., her musical instrument and best friend), she had clearly developed a fairly abstract self-perception. Tina's focus on coolness, popularity, and beauty, rather than on intelligence or academic achievement (or, we might add, modesty), is fairly typical: Social acceptance and physical appearance are far more important to most young adolescents than academic competence.[44] In girls especially, dissatisfaction with one's physical appearance can have a significant negative impact on self-esteem and lead to bouts of depression.[45]

Adolescents increasingly reflect on their characteristics and abilities and begin to struggle with seeming inconsistencies in their self-perceptions, perhaps wondering, "Who is the *real* me?" Eventually (perhaps around 11th grade), they integrate their various self-perceptions into a complex, multifaceted self-concept that reconciles apparent contradictions. For instance, they may realize that diverse emotions mean that they're "moody" and that their inconsistent behaviors on different occasions mean that they're "flexible."[46]

As children reach puberty, they understand that they are unique individuals, but they may overestimate their uniqueness.

Young teenagers often believe themselves to be unlike anyone else—a phenomenon known as the **personal fable**.[47] They may think their own feelings are completely unique (those around them have never experienced such emotions) and so no one else, least of all parents and teachers, can possibly know how they feel.

Figure 7.5 In spelling her name, 12-year-old Melinda describes herself using several abstract characteristics, including musical, lovable, imaginative, noble, and animal-lover

[40] D. Hart, 1988; Harter, 1983.
[41] Harter, 1999; Lockhart et al., 2002; Robins & Trzesniewski, 2005.
[42] R. Butler, 2008; J. W. Chapman et al., 2000; Davis-Kean et al., 2008.
[43] D. A. Cole et al., 2001; Harter, 1999.
[44] D. Hart, 1988; Harter, 1999.
[45] C. G. Campbell et al., 2007; Stice, 2003; E. J. Wright, 2007.
[46] Harter, 1999.
[47] Elkind, 1981; Lapsley, 1993.

Figure 7.6 In this self-portrait, 10-year-old Sarah characterizes herself as a nerd

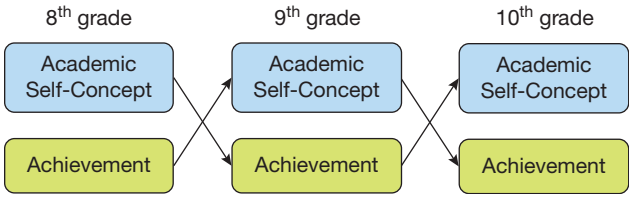
For some adolescents, the personal fable can include a sense of invulnerability and immortality, leading them to believe themselves immune to the normal dangers of life and exacerbating any risk-taking tendencies. When warned of potentially dire consequences of experimenting with drugs and alcohol, having unprotected sexual intercourse, or driving at high speeds, they're apt to think, "It won't happen to me."[48] The personal fable and risk-taking behaviors both decline in the later adolescent years, but they don't entirely disappear.[49] Hence they are—and must be—a source of concern to parents and teachers of older adolescents as well as younger ones.

Self-perceptions influence students' behaviors, and vice versa.

Children and adolescents tend to behave in ways that mirror their beliefs about themselves (see Figure 7.6). For example, if they see themselves as good students, they're more likely to pay attention in class, follow directions, persist at complex math problems, and enroll in challenging courses. If they see themselves as friendly and socially desirable, they're more likely to seek the company of their classmates and perhaps run for a position in student government. If they see themselves as physically competent, they'll more eagerly pursue extracurricular athletics.

If learners assess themselves fairly accurately, they're in a good position to choose age-appropriate activities and work toward realistic goals.[50] A slightly inflated self-assessment can be beneficial as well because it may give learners the self-confidence they need to take on new challenges.[51] However, self-concepts that are *too* inflated may give some students an unwarranted sense of superiority over classmates and lead them to bully or in other ways act aggressively toward peers.[52] And as you might guess, significant *under*estimates lead learners to avoid the many challenges that are apt to enhance their cognitive, social, and physical growth.[53]

Figure 7.7 The reciprocal effects model explains that academic self-concept and achievement affect each other over time (for example, from 8th grade to 10th grade)



In general, learners who have positive self-perceptions are more likely to succeed academically, socially, and physically, and such successes serve to maintain or enhance those positive self-perceptions.[54] But an interplay between self-perceptions and behavior exists for less flattering self-perceptions as well, creating a vicious cycle: A poor sense of self leads to less productive behavior, which leads to fewer successes, which perpetuates the poor sense of self.[55] As an example, the **reciprocal effects model** is the theory that academic self-concept affects achievement, and then, achievement affects self-concept in a reciprocal manner over time (see Figure 7.7).[56]

Other people's behaviors affect students' sense of self.

The social context—more specifically, *other people's behaviors*—also influences students' self-perceptions in at least two ways. For one thing, as children get older (and especially as they reach adolescence), how they evaluate themselves depends partly on how their

[48] DeRidder, 1993; Dodge et al., 2009; Jacobs & Klaczynski, 2002; B. Mills et al., 2008; Nell, 2002.
[49] Frankenberger, 2000; Nell, 2002; V. F. Reyna & Farley, 2006.
[50] R. F. Baumeister et al., 2003; Harter, 1999.
[51] Assor & Connell, 1992; Lockhart et al., 2002; Pajares, 2009.
[52] R. F. Baumeister et al., 2003; Menon et al., 2007; Thomaes et al., 2008.
[53] Marsh & O'Mara, 2008; Schunk & Pajares, 2004; Steuer & Dresel, 2011; Zimmerman & Moylan, 2009.
[54] Arens et al., 2011; M. S. Caldwell et al., 2004; Marsh et al., 2018; Valentine et al., 2004; T. Williams & Williams, 2010.
[55] M. S. Caldwell et al., 2004; Ma & Kishor, 1997; Marsh & Craven, 2006; Thomaes et al., 2009; Valentine et al., 2002.
[56] Arens et al., 2017; Huang, 2011; Marsh, 1990; Marsh et al., 2018.

own performance compares to that of their peers.[57] Those who see themselves achieving at higher levels than others are apt to develop a more positive sense of self than those who consistently find themselves falling short. Thus, comparisons with peers can dampen high-ability students' sense of self when they attend classes made up largely of students who have similarly high ability.[58]

In addition, learners' self-perceptions are affected by how other people behave *toward* them, which indirectly sends messages about strengths and weaknesses.[59] For example, adults influence children's sense of self by holding high or low expectations for academic performance and by drawing attention to the various things that children do well or poorly. Meanwhile, peers communicate information about social and athletic competence, perhaps by seeking out a child's companionship or ridiculing the child in front of others. In the opening case study, when William initially has trouble making friends and the allegedly "popular" students pick on him, he may understandably have low self-esteem. Fortunately, the school play allows him to showcase one of his talents, and his classmates see him in a new light (suddenly he's "fabulous"). Such reactions from his classmates, if they continue for any length of time, should enhance his social self-confidence.

In early adolescence, many students have a heightened concern about what others think of them. They may initially go to extremes, thinking that in any social situation, everyone else's attention is focused squarely on them—a phenomenon known as the **imaginary audience**.[60] Because they believe themselves to be the center of attention, young teenagers (especially girls) are often preoccupied with their physical appearance and can be quite self-critical. To some degree, this heightened concern about what other people might think of them appears to be linked to maturational changes in certain areas of the brain, including in areas that underlie self-focused emotions such as shame and embarrassment.[61]

Group memberships affect students' sense of self and identity.

If you think back to your own school years, perhaps you can recall taking pride in something your entire class accomplished, feeling good about a community service project completed through an extracurricular club, or being proud of your sports team winning a big game or championship. These examples illustrate how membership in one or more in-school or out-of-school groups can impact students' sense of self.[62] In general, students are more likely to have high self-esteem if they're members of successful or prestigious groups.

As students participate in groups over time, they begin to think of themselves as having the characteristics of the group—a process described in *self-categorization theory*.[63] Consequently, memberships in groups can become a part of a person's identity and the person can begin to think and behave like members of the group. To illustrate, the son of one of us authors got a blister on his foot when he was 9 years old. When he was asked if it hurt, he replied, "It hurts, but I'm a wrestler, I'm tough, I don't care." Clearly, after wrestling for a few years (he started young) part of his identity was as a wrestler, and he was beginning to think and behave in ways that he thought that wrestlers would think and behave.

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[57] Dijkstra et al., 2008; Seaton et al., 2010; Trautwein et al., 2008.
[58] Chiu, 2012; Köller et al., 2008; Liem et al., 2013.
[59] Bukowski et al., 2007; M. S. Caldwell et al., 2004; Crosnoe, 2011; Dweck, 2000; M. J. Harris & Rosenthal, 1985; Rudolph et al., 2005; Pajares, 2009.
[60] Elkind, 1981; R. M. Ryan & Kuczkowski, 1994; Somerville, 2013.
[61] Somerville et al., 2013.
[62] Brewer & Yuki, 2007; B. B. Brown et al., 2008; Eccles, 2009; Harter, 1999; Thorkildsen et al., 2008; Wigfield et al., 2006.
[63] Turner et al., 1987; Turner & Reynolds, 2012.

Figure 7.8 In this self-portrait drawn at age 7, Tina showed her awareness of physical features consistent with her Hispanic and Native American genetic heritage. Notice how her classmates in the background all have lighter skin and blonde hair.

In some cultures, children see their group membership and connections with other individuals as central parts of who they are as human beings. For example, this is the case in many Middle Eastern and Far Eastern countries, in Māori communities in New Zealand, and in many Native American communities in the Western Hemisphere. Such cultural groups encourage children to take pride in accomplishments that contribute to the greater good of the family or larger community as well as, or perhaps *instead of*, their own accomplishments.[64]

Ethnic and racial identities also affect students' sense of self and identity.

Students' membership in a particular racial or ethnic group can also be a significant aspect of their sense of self and overall identity (see Figure 7.8). In fact, many young people have a strong **ethnic-racial identity**—they're both aware and proud of their ethnic/racial group and willingly adopt some of the group's behaviors. Occasionally a strong ethnic-racial identity can lead them to reject mainstream Western values; for instance, students of color may accuse high-achieving students of *acting White*, a label that essentially means "you're not one of us."[65] For the most part, however, students with a strong and positive ethnic identity do well in school both academically and socially.[66] Furthermore, pride in one's ethnic heritage can serve as an emotional buffer against other people's prejudicial insults and discrimination.[67] The following statement by a Black high school student provides an example:

> I say [being Black] is important because as a race, we've been through a lot. We show that stereotypes are rampant: "We don't care about school and we do drugs. We end up in prison." . . . We've been overcoming the stereotypes for a while. We just have to try really hard to overcome the stereotypes. We're equal with everyone else. We're equal with White people and everybody else with equal rights in the world. I care about everybody being equal because everybody *is* equal.[68]

However, not all children and adolescents affiliate strongly with their cultural and ethnic-racial groups. Some young people (especially those with multiple racial or cultural heritages) fluctuate in the strength of their ethnic-racial identity depending on the context and situation.[69] In addition, older adolescents may experiment with varying forms of an ethnic identity—perhaps initially adopting an intense, inflexible, and hostile one before eventually settling into a more relaxed, open-minded, and productive one.[70]

Gender plays a role in students' sense of self and identity.

To understand the role of gender in educational settings, it's important to recognize the difference between gender and sex. *Gender* is socially constructed and refers to the roles, behaviors, activities, and attributes that are considered appropriate for boys and men or girls and women in a particular society.[71] In contrast, *sex* is assigned at birth and refers to one's biological status as either male or female based on chromosomes, hormone

[64] Banks & Banks, 1995; P. M. Cole & Tan, 2007; Kağitçibaşi, 2007; Macfarlane et al., 2014; M. Ross & Wang, 2010; Whitesell et al., 2006.
[65] Bergin & Cooks, 2008; O'Connor et al., 2011; Ogbu, 2008a.
[66] Altschul et al., 2006; Chavous et al., 2003; Mandara et al., 2009; Nasir et al., 2009; Smokowski et al., 2009.
[67] L. Allen & Aber, 2006; P. J. Cook & Ludwig, 2008; Goodnow, 2010; Pahl & Way, 2006.
[68] Smith & Hope, 2020, p. 557.
[69] Hitlin et al., 2006; Y. Hong et al., 2007; Yip & Fuligni, 2002.
[70] Cross et al., 1999; Nasir et al., 2009; Seaton et al., 2006.
[71] American Psychological Association, 2014.

prevalence, and anatomy. Therefore, while gender can vary across different cultures, sex does not.

At a relatively young age, and sometimes as early as age 3 or 4, individuals begin to form a more stable sense of their **gender identity**—their internal sense of being male, female, somewhere in between, a combination of both, or neither.[72] The term *cisgender* is used to refer to people whose gender identity matches their biological sex. People whose gender identity or behavior does not conform to that typically associated with their biological sex are referred to generally as *transgender*, although more specific gender identity labels are also used, such as *gender fluid* (shifting between male and female, both, or neither), *genderqueer*, or *nonbinary* (a mix of male and female, both, or neither), among others (e.g., agender, bigender, third gender, androgyne).[73] Transgender individuals often face discrimination and, as a result, may try to hide their gender identity to avoid bullying, harassment, or victimization. In fact, transgender adolescents are more likely than cisgender students to be victims of violence, experience depression, abuse substances, harm themselves, and attempt suicide.[74]

Educational researchers have typically studied differences in males and females based on biological sex, not gender. Therefore, when we report findings in this text related to differences between boys and girls, we are referring to students' biological sex because doing so is consistent with the way in which the researchers conducted those studies (i.e., students were categorized as either boys or girls). More recently, as awareness of the importance of understanding students' gender has increased, researchers are examining gender in more nuanced ways that avoid limiting students' gender to only male and female categories; for example, by asking individuals to place themselves on a continuum ranging from 100% masculine to 100% feminine.[75]

As young children become increasingly aware of the gender characteristics and behaviors of males and females, they gradually pull together their knowledge into self-constructed understandings, or **gender schemas**, of how males and females differ. These gender schemas, in turn, provide guidance about how to behave, such as how to dress, what toys to play with, and what interests and academic content domains to pursue.[76] For example, some boys believe that working hard at school is a "girl" thing, and their motivation to do well in academic tasks suffers as a result.[77]

Because gender schemas are self-constructed, their contents are apt to vary considerably from one individual to another.[78] For example, some adolescent girls incorporate into their "female" schema the unrealistic standards for beauty presented in popular media (social media, websites, movies, etc.). As they compare themselves to these standards, they almost invariably come up short, which can lead them to think that they are less attractive. Consequently, some girls fall victim to eating disorders in an effort to achieve the super-thin bodies they believe to be ideal.[79] Meanwhile, some teenage boys go out of their way to meet self-constructed "macho" standards for male behavior by putting on a tough-guy act at school and bragging (perhaps accurately, but more often not) about their sexual conquests.[80] Fortunately, many adolescents' gender schemas become more flexible in the high school years, allowing greater freedom in behavior choices.[81]

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[72] American Psychological Association, 2014; Rafferty et al., 2018; Tate et al., 2014.
[73] Galupo et al., 2017.
[74] Johns et al., 2019; Rafferty et al., 2018.
[75] Bittner & Goodyear-Grant, 2017; Hyde et al., 2019.
[76] Bem, 1981; Eccles, 2009; Leaper & Friedman, 2007; Ruble et al., 2006.
[77] Elmore & Oyserman, 2012.
[78] Crouter et al., 2007; Liben & Bigler, 2002.
[79] S. Moore & Rosenthal, 2006; Stice, 2003; Weichold et al., 2003.
[80] Pollack, 2006; K. M. Williams, 2001a.
[81] Eccles, 2009; Elmore & Oyserman, 2012; M. Rhodes & Gelman, 2008.

Some researchers have found differences between boys and girls in overall self-esteem—especially in adolescence—with boys rating themselves more favorably than girls. This difference appears to be partly due to boys' tendency to *over*estimate their abilities and possibly also to girls' tendency to *under*estimate theirs.[82] Most adolescent boys' and girls' self-perceptions tend to be consistent with stereotypes about what males and females are "good at." Even when actual ability levels are the same—and for academic topics, ability levels usually *are* quite similar—on average, boys rate themselves more highly in mathematics, whereas girls rate themselves more highly in reading and social studies. On average, too, adolescent boys rate their athletic ability and physical appearance more positively than girls do.[83]

Sexual orientation influences one's sense of self and identity.

Another important aspect of an individual's sense of self and identity is **sexual orientation identity**—a component of identity that is based on an enduring pattern of emotional, romantic, and sexual attractions to males, females, or both sexes.[84] Sexual orientation identity is most often categorized as either heterosexual (having attractions to members of the other sex), gay or lesbian (having attractions to members of one's own sex), or bisexual (having attractions to both males and females). Don't confuse sexual orientation identity with gender identity (which we discussed in the previous section), these identities are different, and they develop separately.

Gay, lesbian, and bisexual adolescents, when compared to heterosexual adolescents, are more likely to be the victims of cyberbullying, experience depression, and attempt suicide.[85] These negative outcomes can be the result of the discrimination and prejudice that they face in and out of school. For example, lesbians are more likely than heterosexual girls to be suspended or expelled from school.[86] We discuss some of the ways that teachers can support students of all sexual orientations in an upcoming section.

Despite the influence of others, growing children define and socialize *themselves* to a considerable degree.

Young people get many messages—sometimes consistent, sometimes not—from parents, teachers, peers, and others about who they are, what they should think, and how they should behave. But rarely do they passively adopt others' ideas and opinions as their own. Instead, they evaluate the information they get, choose some role models over others, weigh the pros and cons of going along with the crowd, and gradually develop their own views about what their strengths and weaknesses are and which behaviors are and are not appropriate for themselves. Before long, much of the pressure to behave in particular ways comes from within rather than from outside—a phenomenon called **self-socialization**.[87]

The decisions young people make about which individuals and sources of information to take seriously depend on their developmental levels and life experiences.[88] Parents are dominating forces in the lives of most children in the primary grades, and most parents continue to be influential with respect to core beliefs and values throughout their children's

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[82] Hyde, 2007; Lundeberg & Mohan, 2009; Pajares, 2005.

[83] D. A. Cole et al., 2001; Hattie, 2009; Herbert & Stipek, 2005; Hyde et al., 2008; Köller et al., 2008; Stice, 2003; Wigfield et al., 2006.

[84] American Psychological Association, 2014; Rafferty et al., 2018.

[85] Luk et al., 2018; Raifman et al., 2020.

[86] Mittleman, 2018.

[87] B. B. Brown, 1990; Crosnoe, 2011; Nuemi, 2008; Prinstein & Dodge, 2008b.

[88] Bukowski et al., 2008; Cauce et al., 1994; Furman & Buhrmester, 1992; Galambos et al., 2003; Nestemann & Hurrelmann, 1994.

middle school and secondary school years. Nevertheless, growing children increasingly look to their peers for ideas about how to behave—for instance, what music to listen to, how to spend leisure time, and whether bullying and other forms of aggression are acceptable.

In forming their identity, it's important for adolescents to explore alternative beliefs, values, and career goals.

As adolescents pull their numerous self-perceptions together, many begin to form an *identity* that defines who they are, what they find important (their values), and what they want to accomplish in life (their goals). In their ongoing search for a long-term identity, they may initially take on temporary identities, aligning themselves with a particular peer group, insisting on a certain style of dress, or updating their pictures on Instagram.[89] They may also have somewhat different identities in different contexts, depending on the traditional roles they've played in each context.[90] For example, a student might be a "loser" at school but a "star" in an out-of-school activity or a "leader" in a neighborhood gang.

One developmental psychologist, James Marcia, has found that for adolescents to form an identity, it is important for them (1) to have the opportunity to *explore* alternative beliefs, values, and career goals, and then (2) to *commit* to them.[91] He described four modes of identity resolution that are called the *identity statuses* (these statuses do not necessarily occur in a developmental sequence):[92]

- **Identity diffusion:** The individual has made no commitment to a particular career path or ideological belief system. Some haphazard experimentation with particular roles or beliefs may have taken place, but the individual hasn't yet embarked on a serious exploration of issues related to self-definition.
- **Foreclosure:** The individual has made a firm commitment to an occupation, a particular set of beliefs, or both. The choices have been based largely on what other people (especially parents) have prescribed, without an earnest exploration of other possibilities.
- **Moratorium:** The individual has no strong commitment to a particular career or set of beliefs but is actively exploring and considering a variety of professions and ideologies. In essence, the individual is undergoing an identity crisis.
- **Identity achievement:** After going through a period of exploration during moratorium, the individual has emerged with a clear choice of occupation, a commitment to particular political or religious beliefs, or both.

think about it
Which of these four terms best describes your current status in your identity development?

For most young people, the ideal outcome seems to be to work through a period of moratorium (which may be a struggle and exhausting). This exploration is likely to continue into adulthood before they finally commit to a clear identity.[93] Adolescents who have achieved foreclosure may be superficially content, but they may have ruled out more productive alternatives. Probably the least satisfying alternative is identity diffusion, which can leave young people feeling scattered, without a clear sense of direction in life, and possibly feeling depressed and empty.

Table 7.2 summarizes developmental trends in children's and adolescents' sense of self. It also offers ideas for how teachers can enhance students' sense of self at different grade levels.

[89] Alemán & Vartman, 2009; Greenhow et al., 2009; Seaton et al., 2006.
[90] Eccles, 2009; Faircloth, 2012; Vadeboncoeur et al., 2011.
[91] Marcia, 2010; Marcia et al., 1993.
[92] Marcia, 1980, 1991; also see Berzonsky & Kuk, 2000; Seaton et al., 2006.
[93] Kroger, 2007; Luyckx et al., 2008; Seaton et al., 2006; Sinai et al., 2012.

Developmental Trends

Table 7.2 Sense of Self at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **Grades K–2**	• Self-descriptions largely limited to concrete, easily observable characteristics • Some tendency to overestimate abilities and chances of future success, especially in domains in which one has little or no prior experience	When 6-year-old Jeff is asked to describe himself, he says, "I like animals. I like making things. I do good in school. I'm happy. Blue eyes, yellow hair, light skin." He mentions nothing about his shyness, sense of humor, and ability to work and play independently—characteristics that would require considerable self-reflection and abstract thought to identify.	• Encourage students to stretch their abilities by tackling the challenging tasks they think they can accomplish. • Provide sufficient scaffolding to make success possible in various domains. • Praise students for the things they do well; be specific about the behaviors you're praising.
JohnnyGreig/E+/ Getty images **Grades 3–5**	• Increasing awareness of and differentiation among particular strengths and weaknesses • Association of such emotions as pride and shame with various self-perceptions	When Kellen begins fifth grade at his neighborhood middle school, his class work rapidly deteriorates, despite individualized instruction in reading and spelling. At home one day his mother finds him curled in a ball under his desk, crying and saying, "I can't do this anymore!" Alarmed, Mom takes him to a series of specialists, who diagnose severe dyslexia. Kellen's parents eventually find a school that provides considerable structure and scaffolding for students with learning disabilities. There Kellen shows dramatic improvement in virtually every area of the curriculum, and his self-esteem skyrockets.	• Focus students' attention on their improvement over time. • Encourage pride in individual and group achievements, but be aware that students from some ethnic groups may prefer that recognition be given only for group achievements. • Provide opportunities for students to look at one another's work only when *everyone* has something to be proud of.
Photo by Unsplash **Grades 6–8**	• Increasingly abstract self-conceptions • For many, a decline in self-esteem after the transition to middle or junior high school (especially for girls) • Excessive belief in one's own uniqueness, sometimes accompanied by risk taking and a sense of invulnerability to normal dangers (personal fable) • Heightened concern about others' perceptions and judgments of oneself (imaginary audience)	Meghan describes a recent event in her eighth-grade algebra class: "I had to cough but I knew if I did everyone would stare at me and think I was stupid, hacking away. So I held my breath until I turned red and tears ran down my face and finally I coughed anyway and everyone *really* noticed then. It was horrible."	• After students make the transition to middle school or junior high, be especially supportive and optimistic about their abilities and potential for success. • Provide safe outlets for risk-taking behavior; show no tolerance for potentially dangerous behaviors on school grounds. • Be patient when students show extreme self-consciousness; give them strategies for presenting themselves well to others.
Photo by Unsplash **Grades 9–12**	• Search for the "real me" and an adult identity; experimentation with a variety of possible identities • Increasing integration of diverse self-perceptions into an overall, multifaceted sense of self • Gradual increase in self-esteem • Continuing risk-taking behavior (especially for boys)	Sixteen-year-old Kayla often revises her profile on social media and regularly changes the photo that appears at the top of her profile. Sometimes she displays a happy Kayla, at other times a more sullen one; an early photo shows her in her basketball uniform, but a later one shows her in a skimpy party dress.	• Give students opportunities to examine and try out a variety of adult-like roles. • Encourage students to explore and take pride in their cultural and ethnic heritages, but *without* communicating the message that their own heritages are somehow superior to those of others. • When discussing the potential consequences of risky behaviors, present the facts but don't make students so anxious or upset that they can't effectively learn and remember the information (e.g., avoid scare tactics).

Sources: Bracken, 2009; R. Butler, 2008; Davis-Kean et al., 2008; Dweck, 2000; Elkind, 1981; Figner & Weber, 2011; Greenhow et al., 2009; Harter, 1999; Liem et al., 2013; Lockhart et al., 2002; Marcia, 1980, 1991; T. M. McDevitt & Ormrod, 2007 (Kellen example); Nell, 2002; Nuemi, 2008; O'Mara et al., 2006; Orenstein, 1994, p. 47 (Meghan example); Pajares, 2009; Robins & Trzesniewski, 2005; Seaton et al., 2006; Sinai et al., 2012; Somerville et al., 2013; Spear, 2007; Tatum, 1997; Whitesell et al., 2006.

Teaching Strategies: Fostering Personal Development

The characteristics students bring with them to school—including their distinct personalities and their beliefs about who they are as individuals—are apt to have a significant influence on their classroom performance. The following strategies for fostering students' personal development should enhance their academic and social success in the classroom.

Accommodate students' diverse personality traits.

To some degree, students' typical ways of behaving—for instance, their energy levels, attentiveness, sociability, and ability to keep impulses in check—reflect differences in personality traits that aren't entirely within their control. On the one hand, teachers need to acknowledge that because personality traits are the result of one's genetic makeup, some traits are more difficult to change than others. Teachers can design their instructional activities and classroom environment to accommodate these differences. On the other hand, many traits are susceptible to change through the help of others, and teachers can help students use strategies to strengthen their "weaknesses" (e.g., helping less conscientious students by reminding them to create and update their "to-do" list). Although many personality traits affect students' engagement and learning, there's no single "best" combination of traits that maximizes classroom success.[94] Instead, students are more likely to succeed at school when there's a **goodness of fit**, rather than a mismatch, between classroom expectations and students' natural inclinations and typical behaviors.[95] For example, when teachers want students to participate actively in group discussions and projects, highly energetic, outgoing children often shine, but quieter students might feel anxious or intimidated. However, when teachers require a lot of independent seatwork, quieter children may do better while some energetic children may be viewed as disruptive. The Classroom Strategies box "Accommodating Students' Diverse Personality Traits" presents several examples of how teachers can translate this goodness-of-fit idea into effective classroom practices.

Create a warm, supportive environment with clear standards for behavior and explanations of why some behaviors are unacceptable.

An *authoritative* environment—one that combines affection and respect for children with reasonable restrictions on their behavior—seems to be important not only in parenting but also in teaching.[96] Warm teacher–student relationships can help students meet their need for relatedness, and positive feedback about students' strengths and successes can enhance their sense of self. At the same time, teachers must let students know in no uncertain terms which behaviors are and are not acceptable in the classroom. Behaviors that jeopardize the rights, safety, or psychological well-being of others—such as stealing, aggression, and comments that ridicule a particular individual, gender, or ethnic group—must be immediately addressed and suppressed.

When teachers discipline students for unacceptable behavior, they can also help students to learn from their misbehavior and foster students' long-term development by accompanying the discipline with **induction**—an explanation of *why* a behavior is unacceptable.[97] For example, a teacher might describe how a behavior harms another student either physically ("Having your hair pulled the way you just pulled Mai's can be really painful") or emotionally ("You hurt John's feelings when you call him names like that"). Alternatively, a teacher might explain how an action has caused someone else inconvenience ("Because you ruined Marie's jacket, her parents are making her do extra chores to

[94] Keogh, 2003; Rothbart, 2007; Saudino & Plomin, 2007.
[95] Keogh, 2003; Rothbart, 2011; A. Thomas & Chess, 1977.
[96] For example, see J. M. T. Walker & Hoover-Dempsey, 2006.
[97] Hoffman, 2000; Rothbart, 2011.

Classroom Strategies

Accommodating Students' Diverse Personality Traits

- **Minimize downtime for students with high energy levels.**
  As a way of letting a chronically restless third-grader release pent-up energy throughout the school day, his teacher gives him small chores to do (e.g., erasing the board, sharpening pencils, cleaning art supplies) and shows him how to complete the chores quietly so as not to disturb classmates.
- **Provide regular opportunities for highly extraverted and sociable students to interact with classmates.**
  In a unit on colonial America, a fifth-grade teacher assigns a project in which students must depict a typical colonial village in some way (e.g., by writing a research paper, drawing a map on poster board, or creating a miniature three-dimensional model). The students can choose to work on the project alone or with one or two classmates, with the stipulation that students who work with peers must undertake more complex projects than students who work alone.
- **Be especially warm and attentive with very shy and introverted students and identify contexts in which they feel comfortable interacting with peers and openly expressing their ideas.**
  Lida transfers to a new school midway through the school year. She doesn't participate in conversations with peers before, during, or after class, and the teacher concludes that she doesn't have any friends at the school yet. The teacher assigns a small-group, cooperative learning project and places Lida in a group with three other students who he knows will welcome her in a friendly and helpful manner.
- **When students have trouble adapting to new circumstances, give them advance notice of unusual activities and provide extra structure and reassurance.**
  A kindergarten teacher has discovered that two children in his class do well when the school day is orderly and predictable but often become anxious or upset whenever the class departs from its usual routine. To prepare the children for a field trip to the fire station on Friday, the teacher begins talking about the trip on Monday, explaining what the class will do and see during the visit. He also recruits the father of one of the anxiety-prone children to serve as a parent assistant that day.
- **If students seem to be overwhelmed by noisy or chaotic situations, locate or create a more calm and peaceful environment for them.**
  Several middle school students find the school cafeteria loud and unsettling. Their math teacher offers her classroom as a place where they can occasionally eat instead. On some days she eats with them. At other times she sits at her desk and grades papers, but the students know that she'll gladly stop to talk if they have a question or concern.
- **Teach self-regulation strategies to students who act impulsively or who are not very conscientious.**
  A high school student often acts impulsively by shouting out comments and opinions in her history class. One day the student's teacher takes her aside after school and gently explains that her lack of restraint is interfering with classmates' ability to participate in discussions. To sensitize the student to the extent of the problem, the teacher asks her to keep a daily tally of how many times she talks without first raising her hand. A week later the two meet again, and the teacher suggests a self-talk strategy that can help the student actively participate without dominating discussions.

Sources: Some strategies based on suggestions by M.-L. Chang & Davis, 2009; Keogh, 2003.

earn the money for a new one"). Still another approach is to explain someone else's perspective, intention, or motive ("This science project you've just ridiculed may not be as fancy as yours, but I know that Cameron spent many hours working on it and is quite proud of it").

Induction is victim centered: It helps students focus on the distress of others and recognize that they themselves have been the cause. The consistent use of induction in disciplining children, especially when accompanied by *mild* punishment for misbehavior, appears to promote cooperation with rules and foster the development of prosocial behavior.[98]

Help students get a handle on who they are and who they want to become.

Students who have a healthy sense of self tend to believe that (1) they can successfully tackle certain challenging tasks within different domains (reflecting high self-efficacy and self-concept) and (2) in general, they are good and capable people (reflecting high overall self-worth). We identified several ways of enhancing students' sense of self-efficacy and self-worth in Chapter 5, and many additional ones appear earlier in this chapter in the

[98] G. H. Brody & Shaffer, 1982; Hoffman, 2000; Nucci, 2001; Spinrad & Eisenberg, 2009; Turiel, 2006.

right-most column of Table 7.2. Undoubtedly, the most effective strategy is to *help students be successful*, not only at academic tasks but also in social situations.

Of course, not all students can achieve at superior levels in the classroom, nor can they all be superstar athletes. Students are more likely to have a positive sense of self if they find one or more activities—perhaps singing, student government, or competitive jump-roping—in which they can shine.[99] And when students have long-standing difficulties in certain domains, discovering that their failures are due to a previously undiagnosed disability (e.g., dyslexia or attention-deficit hyperactivity disorder) can help repair some of the damage to self-esteem.[100] Such a discovery helps students make sense of *why* they haven't been able to perform certain tasks as well as their peers. It can also spur them and their teachers to identify effective coping strategies. In the following reflection, one student reveals how, in coming to terms with his dyslexia, he's acquired a healthy sense of self despite his disability:

> Dyslexia is your brain's wired differently and there's brick walls for some things and you just have to work either around it or break it. I'm dyslexic at reading that means I need a little bit more help. If you have dyslexia the thing you have to find is how to get over the hump, the wall. Basically you either go around it and just don't read and get along in life without it or you break down the wall.[101]

Notice that the student doesn't resign himself to inevitable failure—instead, he talks about *getting over the hump, the wall.* This phrase should remind you of the discussion of attributions in Chapter 5: He's attributing his difficulties to controllable factors such as effort and new strategies, leading to an optimistic, incremental view of his reading ability.[102]

Yet equally important for enhancing students' sense of self and identity is to help them gain an understanding of who they are as people—their goals in life, their strengths and weaknesses, likes and dislikes, hopes and fears, and so on—and who they might ultimately want to become.[103] Teachers can help students to develop their identity by allowing them to use their out-of-school knowledge and experiences in school and by making connections between in-school learning and their out-of-school life.[104] These ideas are consistent with the suggestions in Chapter 5 related to demonstrating the usefulness of activities and relating activities to students' individual interests.

Channel adolescents' risk-taking tendencies into safe activities.

Especially at the middle school and high school levels, teachers must be aware of adolescents' propensity to engage in dangerous, high-risk behaviors. Yet scare tactics—perhaps talking about peers who have died from drug overdoses or been killed in high-speed chases—typically have little effect on teenagers' behavior. Nor do rational explanations of probabilities—such as the likelihood of getting pregnant in a single sexual encounter—make much of a difference. When adolescents get together in recreational activities, common sense and reason seem to be ignored. Teachers, administrators, parents, and other community members must all work together to keep adolescent risk taking in check. For instance, many communities now hold all-night after-prom parties in the school building or other supervised location as a way of keeping students from drinking alcohol and driving. Another strategy is to provide outlets for *reasonable* risk taking, such as climbing walls, skateboard parks, and small-group, supervised wilderness trips.[105]

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[99] Bracken, 2009; Harter, 1999; Jenlink, 1994.
[100] MacMaster et al., 2002; Zambo, 2003.
[101] Zambo, 2003, p. 10.
[102] For example, see Yeager & Dweck, 2012.
[103] Sinai et al., 2012; Thorkildsen et al., 2008.
[104] Verhoeven et al., 2019.
[105] Spear, 2007; Steinberg, 2005.

Sometimes adolescents engage in risky behaviors in an attempt to project an adult-like image, to be "cool" and "with it."[106] Think about teens who grab a carton of ice cream at the store, lick it, and post the video on Twitter (#IceCreamChallenge). There are much healthier ways to show one's coolness and with-it-ness, some of which teachers can encourage at school; gaining competence and prestige in music, theater, athletics, and community service are just a few of the many possibilities.

Create a positive learning environment in which students of all gender identities and sexual orientation identities feel welcome.

Maintaining a caring and respectful classroom in which all students feel welcome and unthreatened is important for the well-being of students. However, it's especially important for transgender and sexual orientation minority youth because they're more likely than their peers to experience discrimination and victimization. In Chapter 9, we provide strategies to create a caring classroom and enhance a sense of classroom community; those strategies are relevant here as well. However, the following list provides some strategies especially helpful in promoting the inclusion of all students, regardless of gender or sexual orientation identity.[107]

- Explicitly and consistently communicate the message that all students deserve the kindness and respect of their classmates and are important members of the classroom community.
- Avoid hurtful and derogatory language and immediately address students who use such language.
- Use names and pronouns that align with a student's asserted gender and ask students for their pronouns if you're unsure.
- Include positive representations of transgender individuals and sexual orientation minorities in the curriculum.
- Avoid unnecessarily segregating students into "boy" and "girl" groups; for example, by giving girls a pink pencil and boys a blue pencil.
- Provide time for class discussions, perhaps at a class meeting, in which students can discuss different forms of diversity and allow students to describe their experiences and feelings.
- Help students identify school clubs or sports that are particularly supportive and welcoming of students with diverse identities.
- Be aware of your own beliefs and stereotypes about gender and sexual orientation and monitor how they may be affecting your behaviors toward students.

7.2 Social Development

Big Idea 7.2 **Students must have good social skills and be able to interpret and respond to various social situations and problems in productive ways if they are to benefit fully from their interactions with peers.**

As we've seen, students' academic engagement and learning depends not only on their cognitive and intellectual abilities, but also on their social and emotional competencies. For example, in Chapter 5, we explained how teachers could increase students' motivation

[106] J. P. Allen & Antonishak, 2008; Blanton & Burkley, 2008; Crosnoe, 2011.

[107] Some of these strategies may be difficult to implement in schools or U.S. states that explicitly forbid teachers from discussing issues related to sexual orientation. See Kahn, 2016; Kosciw et al., 2016; Rafferty et al., 2018.

by fostering caring teacher–student relationships. We also described how teachers could help students engage in **emotion regulation**—that is, monitor, evaluate, and modify their emotional reactions. And in Chapter 3, we explained how teachers could help students to become better self-regulating learners who monitor and control their motivation and emotions. Teachers can use these strategies to facilitate students' **social and emotional learning**, which involves developing students' social and emotional abilities that contribute to their academic success and personal well-being.[108] In this section, we build on these ideas by describing a variety of social skills and providing strategies that teachers can use to help students develop these skills.

Peer Relationships

For many students, interacting with and gaining the acceptance of peers—in some way *fitting in*—are more important than classroom learning and achievement.[109] Yet social success and academic success aren't an either–or situation. In fact, students who enjoy good relationships with their peers at school are *more* likely to achieve at high levels.[110] And, as you might guess, these students also have higher self-esteem and fewer emotional problems.[111]

In any classroom, the general quality of peer relationships can have a major impact on the overall psychological atmosphere, or **classroom climate**, in which students are studying and learning. Are students respectful of one another, and do they work cooperatively to help one another learn? Or do some students continually snub, belittle, or harass certain classmates based on, say, perceived "stupidity" or lack of "coolness"? Teachers cannot ignore the nature of students' interpersonal relationships; instead, they must work hard to nurture relationships that support every class member's academic and personal growth. The following principles summarize much of what researchers have learned about peer relationships in childhood and adolescence.

Peer relationships promote personal, social, and academic development in ways that adult–child relationships often cannot.

Peer relationships, especially friendships, serve several important functions in children's and adolescents' personal and social development.[112] For one thing, they provide an arena for learning and practicing a variety of social skills, including cooperation, negotiation, emotion regulation, and conflict resolution. They can also provide academic support, for instance, by helping one another with challenging academic tasks. In addition, peers—especially good friends—can provide companionship, safety, and emotional support: They become a group with whom to eat lunch, a safe haven from playground bullies, and shoulders to cry on in times of confusion or trouble (see Figure 7.9). Think of William in the opening case study, who is initially picked on by other students and has no friends to come to his assistance.

Many adolescents (especially girls) reveal their innermost thoughts and feelings to their friends.[113] Friends often understand a teenager's perspective—the preoccupation with physical appearance, concerns about the opposite sex, and so on—in a world of seemingly "clueless" adults. By sharing their thoughts and feelings with one another, teens may discover that they aren't as unique as they once thought, and thus the personal fable mentioned earlier may slowly fade from the scene.[114]

Figure 7.9 In this example, 7-year-old Andrew sees friends largely as companions and sources of entertainment. Yet he also recognizes that friends can occasionally be a source of support ("they walk you to the nursce")

Friends our for you when you are lonley and sad. they play with you, they are nice, they are mean, they tell stories and the things they do. they walk you to the nursce.

[108] Durlak et al., 2015; Elias et al., 1997; Weissberg, 2019; Wentzel, 2019; Wentzel & Ramani, 2016.
[109] Crosnoe, 2011; Dowson & McInerney, 2001; LaFontana & Cillessen, 2010.
[110] Wentzel et al., 2020.
[111] Bukowski et al., 2009; Gest et al., 2005; A. J. Martin & Dowson, 2009; Wentzel, 2009.
[112] Bukowski et al., 2009; Granic et al., 2014; Ladd et al., 2012; Laursen et al., 2007; Wentzel et al., 2018.
[113] Levitt et al., 1993; A. J. Rose & Smith, 2009.
[114] Elkind, 1981.

Most children and adolescents of all cultures value the company of agemates, but the extent to which they actually spend time with their peers is partly a function of their cultural group. For example, on average, Asian Americans spend less leisure time with friends than young people from other groups, and they're more likely to choose friends who value academic achievement.[115] Language differences also come into play here: Children who have recently immigrated from a non-English-speaking country to an English-speaking one may have relatively little interaction with peers because of their limited ability to communicate.[116]

Peers help define "appropriate" ways of behaving.

Not only do peers provide social and emotional support, but they can also be powerful socialization agents who both directly and indirectly encourage certain ways of behaving.[117] Peers define options for leisure time, perhaps forming study groups, playing video games, or hanging out at the skateboarding park. They serve as role models and provide standards for acceptable behavior, showing what's possible, admirable, and trending. And they sanction one another for stepping beyond acceptable bounds, perhaps through ridicule, gossip, or ostracism. Traditionally such influences have been known as *peer pressure*, but many of them are better described as **peer contagion**, in which certain behaviors "spread" from one child or adolescent to another through a variety of means.[118] Although overt peer pressure can definitely have an impact, a good deal of peer contagion is the result of self-imposed pressure—*self-socialization* at work. A common misconception is that peer influences always lead individuals to engage in *counterproductive* behaviors (e.g., cutting class, bullying certain students, or consuming alcohol or drugs).[119] However, many peers encourage desirable qualities, such as working hard in school, treating people kindly, and participating in community service.

Although peers' behaviors and values certainly have an impact, their effects have probably been overrated. Most children and adolescents acquire a strong set of values and behavioral standards from their families, and they don't necessarily discard these values and standards in the company of peers.[120] Furthermore, they tend to choose friends who are similar to themselves in motives, styles of behavior, academic achievement, and leisure-time activities, and they may gradually distance themselves from friends who are very different from them socially and academically.[121] In some cases, students lead "double lives" that enable them to attain academic success while maintaining peer acceptance. For example, although they attend class and do their homework faithfully, they may feign disinterest in scholarly activities, disrupt class with jokes or goofy behaviors, and express surprise at receiving high grades.[122] In addition, they may act tough when they're in public, saving their softer sides for more private circumstances, as one sixth-grader's explanation reveals:

> You'd still have to have your bad attitude. You have to act—it's just like a movie. You have to act. And then at home you're a regular kind of guy, you don't act mean or nothing. But when you're around your friends you have to be sharp and stuff like that, like push everybody around.[123]

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[115] Rubin et al., 2010; Steinberg, 1996.
[116] Ahn, 2005; Igoa, 2007.
[117] Rubin et al., 2010; A. M. Ryan, 2000; M. F. H. Schmidt & Tomasello, 2012; Wentzel & Watkins, 2011.
[118] Altermatt, 2012; B. B. Brown et al., 2008; Sandstrom, 2011.
[119] Hamm et al., 2012; Mayeux et al., 2011; Prinstein & Dodge, 2008b; Rambaran et al., 2020; Spinrad & Eisenberg, 2009.
[120] B. B. Brown, 1990; W. A. Collins et al., 2000; Galambos et al., 2003; Gniewosz & Noack, 2012.
[121] Hartl et al., 2015; Kindermann et al., 1996; Prinstein & Dodge, 2008a; A. M. Ryan, 2001.
[122] B. B. Brown, 1993; Grimes, 2002; Juvonen, 2006.
[123] Juvonen & Cadigan, 2002, p. 282.

On average, boys and girls interact with their peers in distinctly different ways.

Most children and young adolescents prefer to affiliate with peers of the same biological sex or gender.[124] For example, cisgender boys tend to affiliate with other cisgender boys.[125] Boys' and girls' play groups and friendships are different in key ways that affect their personal and social development. Boys tend to hang out in relatively large groups that engage in rough-and-tumble play, organized group games, and physical risk-taking activities.[126] They enjoy competition and can be fairly assertive in their efforts to achieve individual and group goals.[127] Especially as they get older, many prefer keeping some personal and emotional distance between themselves and their friends and often try to hide their true emotions in social situations.[128]

Compared to boys, girls seem to be more attuned to other people's mental states and exhibit greater sensitivity to the subtle, nonverbal messages—the body language—that others communicate.[129] They spend much of their leisure time with only a few close friends, with whom they may share certain secrets and confidences.[130] Although girls can certainly be assertive at times, they also tend to be concerned about maintaining group harmony, and so they may occasionally subordinate their own wishes to those of others.[131] And they're more concerned about resolving interpersonal conflicts than boys are, as 17-year-old Paul (a cisgender boy) explains:

> Normally with, like, my guy friends, we just get over it. There's no working it out, you just sit . . . like, "Fine, whatever," you know? And we get over it. Girl friends, you gotta talk to them and work it out slowly. Apologize for doing whatever you did wrong. There's a whole process.

Social groups become increasingly important in adolescence.

Most children establish friendships with one or more peers even before they reach school age. As they move through the elementary grades, some of them form larger social groups that often get together. Once children gel as a group, they prefer members of their group over nonmembers, and they may in some instances develop feelings of hostility and rivalry toward members of other groups.[132] Even in the early elementary grades, children are aware that social groups can vary considerably in social status, and hence their associations with one group or another can affect their self-esteem.[133]

As youngsters reach puberty, larger groups become an especially prominent feature of their social worlds. Researchers have identified several distinct types of groups during the adolescent years, as defined here:

- **Cliques**—moderately stable friendship groups for most voluntary social interactions (about four to eight individuals). Boundaries tend to be fairly rigid and exclusive and memberships in various cliques often affect social status.[134]
- **Crowds**—considerably larger than cliques and don't have the tight-knit cohesiveness and carefully drawn boundaries of a clique. Group members don't necessarily

[124] Best, 2010; Gülgöz et al., 2018; A. J. Rose & Smith, 2009.
[125] Gülgöz et al., 2018; Poulin & Pedersen, 2007.
[126] Best, 2010; Maccoby, 2002; Pellegrini et al., 2002.
[127] Benenson et al., 2002; Jonkmann et al., 2009; Leaper & Friedman, 2007; Maccoby, 2002.
[128] Best, 2010; N. Eisenberg et al., 1996; Lippa, 2002; K. M. Williams, 2001a.
[129] Bosacki, 2000; Deaux, 1984.
[130] Block, 1983; N. Eisenberg et al., 1996; A. J. Rose, 2002.
[131] Benenson et al., 2002; Leaper & Friedman, 2007; Maccoby, 2002.
[132] Bigler et al., 2001; Dunham et al., 2006; J. R. Harris, 1998; Nesdale et al., 2005.
[133] B. B. Brown et al., 2008; Dunham et al., 2006; Nesdale et al., 2005.
[134] Aikins & Litwack, 2011; B. B. Brown, 2011; Goodwin, 2006; Kindermann et al., 1996.

interact much with one another but they tend to share common interests, attitudes about academic achievement, and (occasionally) ethnic background. Some crowds are viewed more favorably than others; example labels include "popular students," "geeks," "jocks," "druggies," "goths," and "nerds."[135]

- **Subculture**—a group that resists a powerful dominant culture by adopting a significantly different way of life.[136] Some subcultures (e.g., emo, goth, hipster) are relatively benign, while others are more worrisome, such as those that endorse racist and anti-Semitic behaviors (e.g., "skinheads"). Adolescents are more likely to affiliate with troublesome subcultures if they feel alienated from the dominant culture—perhaps that of their school or that of society more generally—and want to distinguish themselves from it in some way.[137]
- **Gang**—a cohesive social group characterized by initiation rites, distinctive colors and symbols, ownership of a specific "territory," and feuds with one or more rival groups. Typically, gangs are governed by strict rules for behavior, with stiff penalties for rule violations. Adolescents (and occasionally also younger children) affiliate with gangs for a variety of reasons.[138] Some do so as a way of demonstrating loyalty to their family, friends, or neighborhood. Some seek the status and prestige—and occasionally also the physical protection—that gang membership brings. Some have poor academic records and perceive gang activity as an alternative means of gaining recognition for accomplishments. Many members of gangs have troubled relationships with their families or have been consistently rejected by peers, and so they turn to gangs to get the emotional support they can find nowhere else.

think about it
What distinct group labels did students at your high school identify?

In the upper secondary school grades, a greater capacity for abstract thought allows many adolescents to think of other people more as unique individuals and less as members of specific categories. They gain new awareness of the characteristics they share with people from diverse backgrounds. Perhaps as a result, ties to specific peer groups tend to dissipate, hostilities between groups soften, and young people become more flexible about the peers with whom they associate.[139]

Romantic relationships in adolescence can provide valuable practice for the intimate relationships of adulthood.

Even in the primary grades, children may talk of having romantic relationships with boyfriends or girlfriends (see Figure 7.10). But with the onset of adolescence, the biological changes of puberty bring on new, often unsettling feelings and sexual desires. Not surprisingly, then, romance is a frequent topic of thought and conversation in the middle and high school grades.[140] Young adolescents' romances tend to exist more in their minds than in reality; for instance, two students might be identified as "going out" even if they never actually date. Their romantic thoughts may also involve crushes on people who are out of reach—perhaps favorite teachers or movie stars.[141]

Eventually, many adolescents begin to date, especially if their friends are also dating. Early choices in dating partners are often based on physical attractiveness or social status, and dates may involve only limited and superficial interaction.[142]

Figure 7.10 For many children, thoughts of romance emerge early. Here is just one of many notes 5-year-old Isabelle wrote about a classmate named Will

[135] Crosnoe, 2011; Juvonen & Galván, 2008; D. Schwartz & Gorman, 2011.
[136] J. S. Epstein, 1998.
[137] Crosnoe, 2011; J. R. Harris, 1998.
[138] Dishion et al., 2008; Kodluboy, 2004; Petersen, 2004; Simons et al., 1991.
[139] Furman & Collins, 2009; Gavin & Fuhrman, 1989; Kinney, 1993.
[140] B. B. Brown et al., 1999; Furman & Simon, 2008.
[141] B. B. Brown, 1999; Eckert, 1989; B. C. Miller & Benson, 1999.
[142] B. B. Brown, 2011; Furman et al., 1999; Pellegrini, 2002.

As adolescents move into the high school grades, some form more intense, affectionate, and long-term relationships with members of the opposite sex, and these relationships often (but by no means always) lead to sexual intimacy.[143] The percentage of teenagers who have had vaginal sexual intercourse at least once has decreased during the last few decades (in 2015, this percentage was about 43%, down from about 55% in 1988).[144]

From a developmental standpoint, romantic relationships have definite benefits: They can address young people's needs for companionship, affection, and security, and they provide an opportunity to experiment with new social skills and interpersonal behaviors. At the same time, romance can wreak havoc with adolescents' emotions. Adolescents have more extreme mood swings than younger children or adults, and for many of them, this instability may be partly due to the excitement and frustrations of being romantically involved or *not* involved.[145]

As students reach high school (and occasionally earlier), some find themselves attracted to their own sex either instead of or in addition to the opposite sex. Adolescence can be a particularly confusing time for gay, lesbian, and bisexual individuals. Some struggle to make sense of their sexual orientation and may experience considerable peer rejection and depression. Yet many others enjoy good mental health, especially if their home and school environments communicate acceptance of diverse sexual orientations.[146]

Truly popular children have good social skills.

When the daughter of one of us authors was in junior high school, she sometimes said, "No one likes the popular kids." As self-contradictory as her remark might have been—and Mom always told her that it was—it's consistent with research findings. When students are asked to identify their most "popular" classmates, they identify peers who have dominant social status at school (perhaps those who belong to a prestigious social group) but in many cases are aggressive or stuck-up.[147] Fourteen-year-old Courtney's description of allegedly popular students at her school provides a good illustration:

> Nobody likes the popular kids. We all think they're bratty, they're mean. The only reason they're popular is because they'll make out with guys at the back of the bus. . . . They don't include anyone. They have their own parties that consist only of themselves. They can't branch out.

Contrary to Courtney's description, *truly* **popular students**—those whom many classmates select as people they'd like to do things with—may or may not hold high-status positions, but they're kind, trustworthy, and socially skillful. They also tend to show genuine concern for others—for instance, by sharing, cooperating, and empathizing with peers.[148]

In contrast to popular students, **rejected students** are those whom classmates select as being their *least* preferred social companions. Students with few social skills—for example, those who are impulsive or aggressive and those who continually try to draw attention to themselves—typically experience peer rejection.[149] Students who are noticeably overweight and those who, on the surface, appear to be gay or lesbian are also frequent targets of ridicule, harassment, and rejection.[150] And in many schools, students from racial-ethnic

[143] J. Connolly & Goldberg, 1999; Furman & Collins, 2009.
[144] Abma & Martinez, 2017.
[145] Davila, 2008; Furman & Collins, 2009; Larson et al., 1999; B. C. Miller & Benson, 1999.
[146] Darwich et al., 2012; Konishi et al., 2011; J. P. Robinson & Espelage, 2011; Savin-Williams, 2008.
[147] Cillessen & van den Berg, 2012; W. E. Ellis & Zarbatany, 2007; Hawley, 2014; Rodkin et al., 2015.
[148] Asher & McDonald, 2009; Cillessen & Rose, 2005; Mayeux et al., 2011; van der Wilt et al., 2019.
[149] Asher & McDonald, 2009; Pedersen et al., 2007; Rubin et al., 2010.
[150] Swearer et al., 2010.

minority groups can be regular objects of derogatory remarks and other forms of racism and discrimination, as can students from low-income families.[151] Especially when peer rejection and exclusion continue over a lengthy period, rejected students are at high risk for emotional problems, low school achievement, and poor school attendance.[152]

A third group, **controversial students**, elicit diverse reactions, in that some peers really like these students and others really *dis*like them. Controversial students can, like rejected students, be quite aggressive, but they also have sufficiently good social skills that they maintain close relationships with certain peers.[153] Many students whom classmates refer to as "popular" actually fall into this category.

And finally, **neglected students** are those whom peers rarely identify as someone they would either most like or least like to do something with.[154] Some neglected students prefer to be alone, others are quite shy or don't know how to go about initiating interaction, and still others are content with having only one or two close friends.[155] For some of these students, "neglected" status is a relatively temporary situation. Others are totally friendless for extended periods—such is often the case for recent immigrants and for students with disabilities—and these students are at higher-than-average risk for depression.[156]

Social Cognition

To be truly effective in interpersonal relationships, children and adolescents must engage in **social cognition**: They must consider how people around them are likely to think about, behave in, and react to various situations. By and large, those who regularly think about other people's thoughts and feelings tend to be socially skillful and make friends easily.[157] Some psychologists propose that social cognition is a distinctly human ability—which they call *emotional intelligence*—whereas others believe that it's simply an integral part of people's general intellectual and social functioning.[158]

To some degree, the human brain may be "prewired" for social cognition—in particular, through the **mirror neurons** described earlier in Chapter 4. Mirror neurons fire either when a person is performing a particular behavior or when the person watches *someone else* perform that behavior, and hence they enable quick identification of what another person is doing. Some mirror neurons are specifically involved in facial expressions associated with emotions such as anguish and disgust, enabling rapid detection of those emotions in others. However, competent social cognition also requires involvement of the prefrontal cortex—probably the most "thoughtful" part of the brain—in order to draw reasonable inferences about *why* other individuals are behaving and feeling in certain ways.[159]

Interpersonal behaviors can vary from culture to culture. For instance, some cultural groups (e.g., some groups in northern Canada and in the South Pacific) regularly use seemingly antisocial behaviors—especially teasing and ridicule—to teach children to remain calm and handle criticism.[160] In contrast, many Native Americans, many people of

[151] Banks & Banks, 1995; Graham & Hudley, 2005; McBrien, 2005; Phelan et al., 1994.
[152] Bellmore, 2011; Cillessen & van den Berg, 2012; Ladd et al., 2012.
[153] Asher & McDonald, 2009; Bukowski et al., 2007; Cillessen et al., 2011.
[154] Altogether, researchers have identified five groups of students. The fifth group, *average students*, are liked by some peers and disliked by others, but without the intensity of feelings that characterize controversial students.
[155] Asher & Renshaw, 1981; Gazelle & Ladd, 2003; Guay et al., 1999; McElhaney et al., 2008.
[156] Asher & Paquette, 2003; Gazelle & Ladd, 2003; Igoa, 2007; Laursen et al., 2007; Yuker, 1988.
[157] Bosacki, 2000; Cillessen & van den Berg, 2012; P. L. Harris, 2006; Izard et al., 2001.
[158] J. D. Mayer et al., 2008; Waterhouse, 2006; Zeidner et al., 2002.
[159] Gallese et al., 2011; Liu et al., 2009; Rizzolatti & Sinigaglia, 2008; Spunt & Lieberman, 2013.
[160] Rogoff, 2003.

Hispanic heritage, and certain African American communities place particular emphasis on group harmony, and many Asian groups strongly discourage physical and psychological aggression.[161] Children from these backgrounds may be especially adept at negotiation and peace making.

As children get older, they become increasingly aware of other people's thoughts and feelings.

In Chapter 3 you learned that metacognition improves over the course of development: With age and experience, children become increasingly aware of their own thought processes. As children learn more about their own thinking, they also become more adept at drawing inferences about what other people might be thinking. These skills help students to become better at social cognition through improved **perspective taking**—looking at a situation from someone else's viewpoint. More generally, children develop a **theory of mind** that encompasses increasingly complex understandings of human mental and psychological states, including people's thoughts, beliefs, feelings, and motives. A reasonably accurate theory of mind enables children to interpret and predict the behaviors of the important people in their lives and, as a result, to interact effectively with those individuals.[162]

Consistent with what Jean Piaget and other researchers have found to be true for cognitive development, young children tend to focus on other people's concrete, observable characteristics and behaviors. However, they do have some awareness of other people's inner worlds. As early as age 4 or 5, they realize that what *they* know might be different from what *others* know, and they have some ability to draw inferences about other people's mental and emotional states.[163] As they progress through the elementary grades, they begin to realize that people's actions don't always reflect their thoughts and feelings. For instance, someone who looks happy might actually feel sad.[164] They also begin to understand that people don't just observe events but also *interpret* events, and thus others might view a situation differently than they themselves do.[165] In other words, children increasingly understand that thinking and learning are active, constructive processes.

By early adolescence, children realize that people can have mixed feelings about events and other individuals.[166] And, courtesy of their expanding cognitive abilities, memory capacity, and social awareness, they become capable of **recursive thinking**.[167] That is, they can think about what other people might be thinking about them and eventually can reflect on other people's thoughts about themselves through multiple iterations (e.g., "You think that I think that you think . . ."). Adolescents don't always engage in such thinking, however (nor do adults, for that matter). As noted in the earlier description of the *imaginary audience*, focusing primarily on one's *own* perspective—without a realistic assessment of what others' perspectives are likely to be—is a common phenomenon in early adolescence.[168]

In the high school years, teenagers can draw on a rich body of knowledge derived from their many social experiences and, as a result, become ever more skillful at drawing inferences about people's psychological characteristics, intentions, and needs.[169] In addition, they're more attuned to the complex dynamics that influence behavior, not only

[161] X. Chen & Wang, 2010; Gardiner & Kosmitzki, 2008; Guthrie, 2001; Halgunseth et al., 2006; Rubin et al., 2010; Xu et al., 2006.
[162] Flavell, 2000; Gopnik & Meltzoff, 1997; Wellman & Gelman, 1998.
[163] P. L. Harris, 2006; Schult, 2002; Wellman et al., 2000.
[164] Flavell et al., 2002; Gnepp, 1989.
[165] Flavell et al., 1995, 2002; Wellman, 1990.
[166] S. K. Donaldson & Westerman, 1986; Flavell & Miller, 1998; Harter & Whitesell, 1989.
[167] Flavell et al., 2002; Oppenheimer, 1986; Perner & Wimmer, 1985.
[168] Tsethlikai & Greenhoot, 2006; Tsethlikai et al., 2007.
[169] N. Eisenberg et al., 1995; Paget et al., 1984.

thoughts, feelings, and present circumstances but also past experiences.[170] What we see emerging in the high school years, then, is a budding psychologist: an individual who can be quite astute in deciphering and explaining the motives and actions of others.

Children's cognitive processes in social situations influence their behaviors toward others.

Children and adolescents have a lot to think about when they consider what other people are thinking, feeling, and doing. Such **social information processing**—the mental processes involved in making sense of and responding to social events—is simply a more socially oriented version of the cognitive processes described in Chapter 2. Among other things, social information processing involves paying *attention* to certain behaviors in a social situation and trying to interpret and make sense of them through *elaboration*. For example, when children interact with peers, they might focus on certain remarks, facial expressions, and body language and try to figure out what a peer really means by, say, a thoughtless comment or sheepish grin. Children also consider one or more goals they hope to achieve during an interaction—perhaps preserving a friendship, on the one hand, or teaching somebody a "lesson," on the other. Then, taking into account both their interpretations and their goals, they draw on their previous knowledge and experiences to retrieve a number of possible responses and choose what is, in their eyes, a productive course of action.[171] The behaviors young people attend to, the ways in which they interpret those behaviors, and the particular goals they have for their social interactions have a considerable impact on how effectively they interact with others.

Aggressive behavior is often the result of counterproductive cognitive processes.

When we see or hear the word *aggression*, we're most likely to think about **physical aggression**, which can potentially cause bodily injury. For example, in the opening case study, a few of the "popular" (i.e., high-status) students occasionally poke or shove William. But more often the allegedly popular students ridicule William, perhaps by calling him derogatory names or making fun of certain things that he does. Such ridicule constitutes **psychological aggression**, an action intended to cause mental anguish or reduce self-esteem. In some cases, psychological aggression is specifically aimed at undermining friendships and other interpersonal relationships—for example, by spreading unkind rumors or ostracizing someone from a valued social group—in which case it's also called *relational aggression*. Boys are more prone to physical aggression than girls are, but girls can be quite adept at psychological aggression, especially in the middle school and high school years.[172]

Researchers have identified two distinct groups of aggressive children and adolescents.[173] Those who engage in **proactive aggression** deliberately initiate aggressive actions as a means of obtaining desired goals. In contrast, those who engage in **reactive aggression** behave aggressively primarily in response to frustration or provocation. Members of the former group who direct considerable aggression toward particular individuals (whether it be physical or psychological aggression) are known as **bullies**. Students who are immature, anxious, and socially isolated are frequent victims of bullies, as are students with nontraditional sexual orientations and students with disabilities.[174]

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[170] C. A. Flanagan & Tucker, 1999; Selman, 1980.

[171] Arsenio & Lemerise, 2004; Cillessen & van den Berg, 2012; Crick & Dodge, 1996; Dodge, 1986; Greenhoot et al., 2006; E. R. Smith & Semin, 2007.

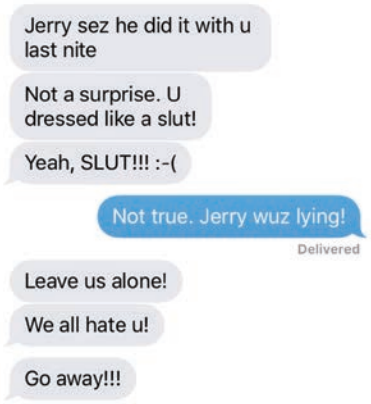
[172] Card et al., 2008; Crick et al., 2002; Goodwin, 2006; Pellegrini, 2011; A. J. Rose & Smith, 2009.

[173] Crick & Dodge, 1996; Poulin & Boivin, 1999; Vitaro et al., 1998.

[174] Hamovitch, 2007; McDougall & Vaillancourt, 2015; J. P. Robinson & Espelage, 2012; M. W. Watson et al., 2005.

Bullying certainly isn't limited to face-to-face interactions. Wireless technologies and the Internet provide vehicles for **cyberbullying**—electronically transmitting hostile messages, broadcasting personally embarrassing information, or in other ways causing someone significant psychological distress. For example, a student might upload a humiliating video or post unflattering (and possibly false) gossip on social media, or set up a website on which classmates can "vote" for their class's "biggest loser" or "easiest slut."[175] Cyberbullying can be more harmful than face-to-face bullying, in part because the perpetrators often remain anonymous (and thus can't be confronted) and in part because highly defamatory material can spread like wildfire through a large peer group.[176]

Unfortunately, smartphones and other digital technologies make bullying entirely too easy.



Some children and adolescents are genetically more predisposed to aggression than their peers, and others may exhibit heightened aggression as a result of neurological abnormalities.[177] Yet several cognitive and motivational factors also play a role in aggressive behavior, such as these:

- **Poor perspective-taking ability:** Many highly aggressive children have limited ability to look at situations from other people's perspectives or to empathize with their victims.[178]
- **Misinterpretation of social cues:** Children who are either physically or psychologically aggressive toward peers tend to interpret others' behaviors as reflecting hostile intentions, especially when those behaviors have ambiguous meanings. This **hostile attributional bias** is especially prevalent in children who are prone to *reactive* aggression.[179]
- **Prevalence of self-serving goals:** For most children and adolescents, establishing and maintaining interpersonal relationships are a high priority. For aggressive youngsters, however, more self-serving goals—perhaps maintaining an inflated self-image, seeking revenge, or gaining power and dominance—often take precedence.[180]
- **Ineffective social problem-solving strategies:** Aggressive individuals often have little knowledge of how to persuade, negotiate, or compromise, and so they resort to hitting, shoving, barging into play activities, and other ineffective strategies.[181]
- **Beliefs about the appropriateness and effectiveness of aggression:** Many aggressive children and adolescents believe that violence and other forms of aggression are acceptable ways of resolving conflicts and retaliating against others' misdeeds. Those who display high rates of *proactive* aggression are also apt to believe that aggressive action will yield positive results—for instance, that it will enhance social status at school or restore "honor" to one's family or social group. Not surprisingly, aggressive individuals tend to associate with one another, thereby confirming one another's beliefs that aggression is appropriate.[182]

Unless adults actively intervene, some aggressive children show a continuing pattern of aggression as they grow older, almost guaranteeing long-term maladjustment and difficulties with peers.[183] The victims of aggression certainly suffer as well. Children who are

[175] Shariff, 2008; Valkenburg & Peter, 2009; Willard, 2007.
[176] Kowalski & Limber, 2007; Rivers et al., 2011.
[177] Brendgen et al., 2008; Raine, 2008; van Goozen et al., 2008.
[178] Coie & Dodge, 1998; Damon & Hart, 1988; R. F. Marcus, 1980.
[179] E. Chen et al., 2004; Crick et al., 2002; Dodge et al., 2003; Rodkin et al., 2015.
[180] R. F. Baumeister et al., 1996; Menon et al., 2007; Pellegrini et al., 2011; Rodkin et al., 2015.
[181] Neel et al., 1990; D. Schwartz et al., 1998; Troop-Gordon & Asher, 2005.
[182] R. P. Brown et al., 2009; Crick et al., 2009; Dishion et al., 2008; Fontaine et al., 2008; Mayeux et al., 2011; Paciello et al., 2008; Pellegrini & Bartini, 2000; M. W. Watson et al., 2005.
[183] Crick et al., 2009; Dodge et al., 2003; Hampson, 2008; Pepler et al., 2008; Swearer et al., 2010.

frequent targets of bullying become anxious and depressed—sometimes suicidal—and their classroom performance can deteriorate as a result.[184] They may fear retaliation if they alert adults to their plight, and so they have little optimism that things will improve.[185] As one junior high school student put it, telling a teacher about bullying incidents "only gets me in more trouble from the bullies because they pick on me, they hit me, they call me names . . . They call me 'stink bomb,' 'stinky,' 'dirty boy,' and stuff like that."[186]

Even children who simply *observe* peer-on-peer aggression can suffer considerable psychological distress, especially if they don't intervene on the victim's behalf. Perhaps they feel guilty that they didn't come to the victim's assistance, or perhaps they worry that they themselves might soon be victimized. Furthermore, if they see bullying and other aggressive behaviors going unpunished, some may come to believe that such actions are perfectly acceptable.[187]

Teaching Strategies: Encouraging Effective Social Cognition and Interpersonal Skills

Teachers are in an excellent position to foster productive ways of thinking about social situations and to help students interact effectively with others. The following recommendations are based on research findings related to social cognition, social skills, and peer relationships.

Foster perspective taking and empathy.

Virtually any classroom offers many opportunities for perspective taking and empathy. One strategy is to talk frequently about people's thoughts, feelings, and motives, as is done in induction.[188] In doing so, teachers must, of course, use age-appropriate language; for instance, kindergarten teachers might use words such as *think*, *want*, and *sad*, whereas fifth-grade teachers could use words such as *misunderstanding*, *frustration*, and *mixed feelings*. Most high school students have the cognitive and social reasoning capabilities to understand fairly abstract and complex psychological terms, such as *being passive-aggressive* and *having an inner moral compass*.

Another, related strategy is to ask students to take an opposing party's perspective—that is, to put themselves in someone else's shoes—in times of disagreement or conflict.[189] An example is the use of **peer mediation**, in which students help one another solve interpersonal problems. In this approach, students learn how to mediate conflicts among classmates by asking opposing sides to express their differing viewpoints and then work together to devise a reasonable resolution.[190] In one research study involving several second- through fifth-grade classrooms,[191] students were trained to help peers resolve interpersonal conflicts by asking the opposing sides to do the following:

1. Define the conflict (the problem).
2. Explain their own perspectives and needs.
3. Explain the other person's perspectives and needs.
4. Identify at least three possible solutions to the conflict.
5. Reach an agreement that addresses the needs of both parties.

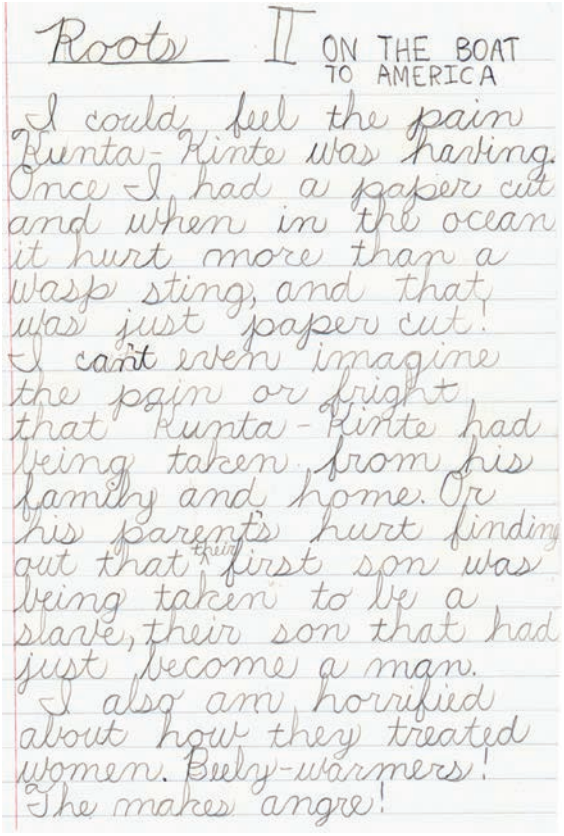
[184] Hoglund, 2007; Ladd et al., 2012; McDougall & Vaillancourt, 2015; P. K. Smith, 2011; Swearer et al., 2010.
[185] Holt & Keyes, 2004; R. S. Newman & Murray, 2005.
[186] Bergamo & Evans, 2005, p. 17.
[187] L. M. Jones et al., 2015; M. J. Mayer & Furlong, 2010; E. J. Meyer, 2009; Rivers et al., 2009.
[188] Ruffman et al., 2002; Woolfe et al., 2002.
[189] Adalbjarnardottir & Selman, 1997; Gehlbach et al., 2012.
[190] Deutsch, 1993; D. W. Johnson & Johnson, 1996, 2006.
[191] D. W. Johnson et al., 1995.

Students took turns serving as mediator for their classmates, such that everyone had experience resolving the conflicts of others. As a result, the students more frequently resolved their *own* interpersonal conflicts in ways that addressed the needs of all involved parties, and they were less likely to ask for adult intervention than were students in an untrained control group.

The benefits of peer mediation provide an example of Lev Vygotsky's proposal that sophisticated cognitive processes often have their roots in social interactions. In a peer mediation session, students model effective conflict resolution skills for one another, and they may eventually internalize the skills they use in solving others' problems to solve their *own* problems. Peer mediation is most effective when students of diverse ethnic backgrounds, socioeconomic groups, and achievement levels all serve as mediators. It's appropriate primarily for small, short-term interpersonal problems, such as hurt feelings or conflicts over use of limited resources. In comparison, even the most proficient of peer mediators may be ill prepared to handle conflicts that reflect deep-seated and emotionally charged attitudes and behaviors, such as conflicts that involve sexual harassment or homophobia.[192]

Opportunities for perspective taking and empathy may also arise in lessons about academic subject matter. For example, in discussions of current events, teachers might have different students take different countries' perspectives as they explore significant world problems, such as climate change or the proliferation of nuclear weapons.[193] In history lessons, teachers can ask students to imagine people's feelings or role-play events during particularly traumatic and stressful times.[194] Figure 7.11 shows a writing sample created during a history lesson about slavery in the pre–Civil War United States. This reaction paper was written by 10-year-old Charmaine, whose fifth-grade class had been watching *Roots*, a television miniseries about a young African man (Kunta Kinte) who is captured and brought to America to be a slave. Charmaine acknowledges that she can't fully grasp Kunta Kinte's physical pain. Even so, she talks about his "pain" and "fright" and about his parents' "hurt" at losing their firstborn son, and she is angered by some colonists' view of African women as little more than "beeby [baby] warmers."

Figure 7.11 Charmaine wrote a reaction paper that demonstrates perspective taking


Roots II ON THE BOAT TO AMERICA

I could feel the pain Kunta-Kinte was having. Once I had a paper cut and when in the ocean it hurt more than a wasp sting, and that was just paper cut. I can't even imagine the pain or fright that Kunta-Kinte had being taken from his family and home. Or his parents hurt finding out that first son was being taken to be a slave, their son that had just become a man. I also am horrified about how they treated women. Beby-warmers! She makes angre!

Talk with students about what it *really* means to be popular.

Especially in the middle school and high school grades, some students do things that aren't in their own or others' best interests in order to be part of the "popular" crowd.[195] For example, they may ridicule and bully peers whom they perceive to be odd or nerdy (a situation we saw in the opening case study). And they may abruptly abandon friendships that could undermine their image of "coolness," as 14-year-old Courtney explained when describing something that happened in a close-knit group of five girls:

> The five of us would hang out, sit at the same lunch table. Then Jamie became good friends with another group. They had parties, became the popular group, so Jamie left us. She had been Maggie's best friend, so Maggie was devastated. Jamie wouldn't talk to us, wouldn't even wave at us in the hallway.

[192] Casella, 2001; K. M. Williams, 2001b.
[193] Gehlbach et al., 2008.
[194] Brophy et al., 2009; M. Davison, 2011; P. Lee & Ashby, 2001.
[195] Cillessen et al., 2011; Cillessen & van den Berg, 2012.

One way teachers might discourage such behaviors is to act as *myth busters*, explicitly opening up conversations about what true popularity involves. For example, a teacher might begin by having students think of a few peers they genuinely like and then of a few peers they really *don't* like. These mental lists must remain only in students' own heads—*no names should be mentioned*—but by asking students to reflect on such questions as "What characteristics do people on your first list have in common?" and "Why don't you like the people on your second list?", qualities such as "kind" and "trustworthy" (for the first list) and "stuck-up" and "mean" (for the second list) might come to light. And to the extent that students are willing to share their perceptions and experiences related to the school's social-status hierarchy—again, *without naming names* or in some other way finger-pointing—they provide yet another opportunity for classmates to engage in perspective taking and empathy.

Provide frequent opportunities for social interaction and cooperation.

Schools and classrooms invariably involve complex social situations in which students can learn and practice new social skills. For instance, students' play activities—whether the fantasy play of preschoolers and kindergartners or the rule-based games of older children and adolescents—can promote cooperation, sharing, perspective taking, and conflict resolution skills.[196] Assignments and activities that require students to cooperate with one another to achieve a common goal (as the school play does in the opening case study) can foster leadership skills, reduce bullying, and promote a willingness to help and get help from peers.[197] Simply changing assigned seating arrangements on a regular basis enables students to get to know certain classmates better and perhaps discover common interests or similar senses of humor.[198] And extracurricular activities provide additional opportunities for students to interact and work cooperatively with a wide range of peers (see Figure 7.12).[199]

Figure 7.12 Extracurricular activities can foster productive peer relationships and a general "team spirit." They can also be a source of success for students who struggle with academic tasks. Here 7-year-old Danny, who has a learning disability, expresses his love of baseball.

Explicitly teach social skills to students who have trouble interacting effectively with others.

Because of their social isolation, rejected and neglected students have few opportunities to develop the good social skills that many of them desperately need.[200] When they do interact with peers, their behaviors may be counterproductive, leaving them more isolated than ever, as evidenced in this example of a seventh-grader named Michelle:

Michelle is an extremely bright student whose academic accomplishments have earned much teacher praise over the years. But despite her many scholastic successes, Michelle has few friends. To draw attention to herself, she talks incessantly about her academic achievements. Her classmates interpret such bragging as a sign of undeserved arrogance and insult her frequently as a way of knocking her down a peg or two. In self-defense, Michelle begins hurling insults at her classmates as soon as she sees them—beating them to the punch, so to speak.

[196] Coplan & Arbeau, 2009; Creasey et al., 1998; Gottman, 1986; Pellegrini & Bohn, 2005; Rubin, 1982.
[197] Certo, 2011; Y. Li et al., 2007; Van Ryzin & Roseth, 2018; Webb & Farivar, 1994.
[198] van den Berg et al., 2012.
[199] Feldman & Matjasko, 2005; Mahoney et al., 2003; A. J. Martin & Dowson, 2009.
[200] Bukowski et al., 2007; Coie & Cillessen, 1993; McElhaney et al., 2008.

When students routinely offend or alienate others (as Michelle does), their peers seldom give them constructive feedback that might help them improve their behavior on future occasions, and so it may be up to teachers and other adults to give them that guidance.

Teachers and other school personnel can teach students appropriate ways of interacting with others both through explicit verbal instructions and through modeling desired behaviors. Such instruction is especially effective when students also have an opportunity to practice their newly learned social skills (perhaps through role playing) and get concrete feedback about how well they're doing.[201]

Teaching social problem-solving skills can be helpful as well. Some students lack productive ways of solving social problems; for example, they might rudely snatch classroom materials that a classmate has been monopolizing or barge into a playground game without asking first. One effective approach in working with such students is to teach them the series of mental steps listed in Figure 7.13. Such steps—which you may recognize as involving social cognition—often help students with a history of interpersonal problems to develop more effective social skills.[202]

Figure 7.13 By teaching these steps, teachers can help students develop more effective social skills

Steps in Social Problem-Solving

1. Define the problem.
2. Identify several possible solutions.
3. Predict the likely consequences of each solution.
4. Choose the best solution.
5. Identify the steps required to carry out the solution.
6. Carry out the steps.
7. Evaluate the results.

Sources: S. N. Elliott & Busse, 1991; Meichenbaum, 1977; Shure & Aberson, 2006; Weissberg, 1985; Yell, Robinson, & Drasgow, 2001.

Explain what bullying is and why it cannot be tolerated.

Students and teachers alike often have misconceptions about bullying. Many think it involves only physical aggression, even though psychological aggression (e.g., name calling, deliberate social exclusion, defamatory online postings) constitutes bullying as well. Another common misconception is that the victims of bullies somehow deserve what they get, perhaps because they display immature behaviors or need to "toughen up" and learn to defend themselves. Thus, many students condone bullying and act as a supportive audience for the perpetrators.[203]

Certainly, a recommendation offered earlier—*foster perspective taking and empathy*—can go part of the way toward discouraging bullying. But in addition, all students must learn about the various forms bullying can take and the truly harmful effects it can have on its victims. Researchers and experienced educators have found the following schoolwide strategies to be helpful:[204]

- Explain that bullying doesn't necessarily involve physical aggression—that it can instead involve actions intended to cause psychological distress: taunts, threats, sexual harassment, unkind rumors, social exclusion, humiliating online postings, and the like.
- Use the mnemonic PIC to help students remember that bullying is:
  - **P**urposeful behavior ("He meant to do it")
  - **I**mbalanced ("That's not fair; he's bigger")
  - **C**ontinual ("I'm afraid to enter the classroom because she's always picking on me")
- Explicitly forbid name calling, including derogatory labels for a particular gender, racial/ethnic group, sexual orientation, or disability.
- Explain that even seemingly mild forms of bullying can have long-term adverse effects on students' personal and emotional well-being.

[201] Bierman & Powers, 2009; S. N. Elliott & Busse, 1991; K. L. Lane et al., 2011; Themann & Goldstein, 2001; S. Vaughn, 1991; D. E. Watkins & Wentzel, 2008.

[202] K. R. Harris, 1982; Meichenbaum, 1977; Yell et al., 2001.

[203] Salmivalli & Peets, 2009; Swearer et al., 2010.

[204] Ansary et al., 2015; Bradshaw, 2015; D. J. Connor & Baglieri, 2009; Frey et al., 2009; Horne et al., 2004, pp. 298–299; Juvonen & Galván, 2008; E. J. Meyer, 2009; Parada et al., 2008; S. W. Ross & Horner, 2009; Swearer et al., 2010; Willard, 2007; Yeager & Dweck, 2012.

- Communicate that stopping bullying isn't only a school expectation but also a moral imperative—that students must safeguard other people's physical and psychological well-being as well as their own.
- Also communicate optimism that *all* students—including chronic bullies and their victims—have the potential to change for the better. In other words, promote a growth mindset for personality development.
- Recruit well-respected students (e.g., student council members, members of school sports teams) to keep a lookout for bullying in stairways, bathrooms, and other places where school faculty members might not be present.
- Teach students effective skills for discouraging bullying incidents among peers (e.g., saying "Stop, you're being disrespectful" and escorting the victim from the scene).
- Prominently post a general code of conduct for student behavior throughout the school building.

As we'll discover in Chapter 9, mutual respect for one another's welfare and well-being both on and off campus is a key ingredient in the sense of community that's so important for students' school success.

Teachers can find some of the strategies just listed and many others at the U.S. government website www.stopbullying.gov. But despite such strategies, some bullying is likely to occur, and students may fear retaliation if they try to stand up to the bullies or inform a faculty member about the bullying.[205] It's important, then, that students have a mechanism through which they can report bullying incidents with anonymity.

Be alert for incidents of bullying and other forms of aggression, and take appropriate actions with both the victims and the perpetrators.

School faculty members *must* intervene when they see some students victimize others, and they must keep alert for other possible incidents of bullying.[206] Regular victims of bullies need social and emotional support from both their teachers and their classmates. Some may also need one or more sessions with a school counselor, perhaps to address feelings of vulnerability and depression or perhaps to learn social skills and help-seeking strategies that can minimize future victimization incidents.[207] One successful school program provided regular "lunch buddies" (college-student volunteers) who joined chronically bullied students in the cafeteria twice a week, indirectly conveying to peers the message that these students had many positive qualities.[208]

The perpetrators of aggression require intervention as well. They must be given appropriate consequences for their actions, of course, but they should also be helped to behave more productively. Specific strategies should be tailored to the thoughts and motives that underlie their aggression. Such strategies as encouraging perspective taking, helping students interpret social situations more productively, and teaching effective social problem-solving skills are all potentially useful in reducing aggression and other disruptive behaviors.[209] Putting students in situations where they must explicitly *help*, rather than harm, others (e.g., asking them to tutor younger children) can also be beneficial.[210]

Yet even when an aggressive student shows dramatic improvements in behavior, classmates may continue to steer clear, perhaps thinking "Once a bully, always a

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[205] L. M. Jones et al., 2015; R. S. Newman & Murray, 2005; Salmivalli & Peets, 2009.

[206] In the United States, taking action to address many forms of bullying is mandated by a 1999 Supreme Court decision; see *Davis v. Monroe County Board of Education*, 526 U.S. 629.

[207] Espelage & Swearer, 2004; Frey et al., 2009; R. S. Newman, 2008; Yeung & Leadbeater, 2007.

[208] Newgent et al., 2008.

[209] Cunningham & Cunningham, 2006; Dodge et al., 2013; Frey et al., 2009; Hudley & Graham, 1993.

[210] J. R. Sullivan & Conoley, 2004.

bully."[211] So when teachers and other adults work to improve the behaviors of aggressive students, they must work to improve the students' reputations as well. For example, teachers might encourage active involvement in extracurricular groups or conduct cooperative learning activities in which students can exhibit their newly developed social skills. Teachers should also demonstrate through words and actions that they like and appreciate every student, including formerly antisocial ones. When teachers do so, their attitudes are apt to be contagious.[212]

Ultimately, interventions with aggressive students are most likely to be effective if schools communicate the importance of acting kindly and respectfully toward all members of the school community, teachers and students alike.[213] Furthermore, the overall school climate must be a relatively peaceful one. At some schools, violence and aggression are commonplace, and students may believe that acting aggressively is the only way to ensure that they don't become victims of *someone else's* aggression. Unfortunately, they may be right: Putting on a tough, seemingly invulnerable appearance (sometimes known as "frontin' it") can be critical for their well-being.[214] Such a situation is, of course, hardly conducive to effective learning and academic achievement. We look at strategies for addressing schoolwide aggression and violence in Chapter 9.

Explicitly discourage inappropriate electronic communications and postings.

As we've seen, cyberbullying can be especially devastating. Threatening text messages can be sent at all hours of the day or night. And humiliating postings on social networking sites can be quickly "liked" by dozens of peers and "shared" with hundreds or thousands of others. Many school districts now have policies that prohibit student-to-student cyberbullying. Although cyberbullying often occurs beyond school walls, in many cases it's easily documented, perhaps by a victim who saves a harassing text message or by a concerned classmate who alerts school personnel to a disrespectful social media post. Furthermore, students who bully their peers in cyberspace tend to be the same ones who bully their peers at school, and students who are electronically bullied tend to be the same ones who are bullied in face-to-face interactions.[215] In any event, schools *must* address incidents of cyberbullying in the same ways they address on-site bullying, intervening on behalf of the victims and administering appropriate consequences to the perpetrators.[216]

Promote understanding, communication, and interaction among diverse groups.

Even when they're in the same building with a large number of peers, students frequently congregate in small cliques or groups with whom they spend much of their time (although some students are more likely than others to remain socially isolated, including recent immigrant students, newcomers to a school, and students with disabilities).[217] Often students divide themselves along racial-ethnic lines when they eat lunch and interact in the school yard. In fact, such self-imposed segregation *increases* once students reach the middle school grades. As young adolescents from racial-ethnic minority groups begin to look closely and introspectively at issues of racism and ethnic identity, they often find it helpful

[211] Bierman et al., 1987; Caprara et al., 2007; Juvonen & Weiner, 1993.
[212] L. Chang, 2003; L. Chang et al., 2004.
[213] Espelage & Swearer, 2004; E. J. Meyer, 2009; Parada et al., 2008; S. W. Ross & Horner, 2009.
[214] K. M. Williams, 2001a.
[215] E. J. Meyer, 2009; Raskauskas, 2010.
[216] In the United States, a ruling by the Fourth Circuit Court of Appeals supports a school's right to punish off-campus student-to-student bullying; see *Kowalski v. Berkeley County Schools*, 652 F. 3d 565 (2011).
[217] Hymel, 1986; Juvonen & Hiner, 1991; Olneck, 1995; Pérez, 1998; Schofield, 1995; Yuker, 1988.

to compare experiences and perspectives with other group members.[218] Furthermore, commonly held stereotypes and prejudices (either real or presumed) can exacerbate any apparent boundaries between diverse social groups.[219] And in some cases, students simply have little or no knowledge about a cultural group very different from their own.

To promote intergroup interaction, then, a necessary first step is to help students understand the customs, perspectives, and needs of their classmates. Especially as students get older and become cognitively capable of reflecting on their own and others' thoughts and feelings, they often benefit from heart-to-heart discussions about prejudice and racism in their own community and school. Some students from mainstream Western culture may initially feel uncomfortable talking about this topic with their minority-group peers, but once the ice is broken, greater cross-cultural understanding and communication can result.[220] And students are more likely to be accepting of classmates with disabilities if they understand the nature of those disabilities, *provided that* the students and their parents have given permission to share what might otherwise be confidential information.

It's equally important that schools give students many opportunities to form productive cross-group relationships. Teachers and school administrators can take a variety of proactive steps to broaden the base of students' social interactions (recall the strategies presented in Chapter 4 related to culture). Several possibilities are presented in the Classroom Strategies box "Encouraging Productive Interactions among Diverse Individuals

Classroom Strategies

Encouraging Productive Interactions among Diverse Individuals and Groups

- **Set up situations in which students can form cross-group friendships.**
  To help students get to know a greater number of their peers, a junior high school science teacher gives them assigned seats in her classroom and changes the seating chart once a month. She also decides how students will be paired for weekly lab activities.
- **Minimize or eliminate barriers to social interaction.**
  Students in a third-grade class learn basic words and phrases in American Sign Language so they can work and play with a classmate who is deaf.
- **Encourage and facilitate participation in extracurricular activities, and take steps to ensure that no single group dominates in membership or leadership in any particular activity.**
  When recruiting members for the scenery committee for the eighth grade's annual school play, the committee's teacher–adviser encourages both "popular" and lower-status students to participate. Later he divides the workload in such a way that students who don't know one another very well must work closely and cooperatively.
- **Conduct class discussions about the negative consequences of intergroup hostilities.**
  A high school English teacher in a low-income school district uses a lesson on Shakespeare's *Romeo and Juliet* to start a discussion about an ongoing conflict between two rival ethnic-group gangs in the community. "Don't you think this family feud is stupid?" she asks, referring to Shakespeare's play. When students agree, she continues, "The Capulets are like the Latino gang, and the Montagues are like the Asian gang. . . . Don't you think it's stupid that the Latino gang and the Asian gang are killing each other?" The students immediately protest, but when she presses them to justify their thinking, they gradually begin to acknowledge the pointlessness of a long-standing neighborhood rivalry whose origins they can't even recall.
- **Develop nondisabled students' understanding of students with disabilities, *provided that* the students and their parents give permission to share what might otherwise be confidential information.**
  In a widely publicized case, Ryan White, a boy who had contracted AIDS from a blood transfusion, met considerable resistance against his return to his neighborhood school because parents and students thought he might infect others. After Ryan's family moved to a different school district, school personnel actively educated the community about the fact that AIDS doesn't spread through casual day-to-day contact. Ryan's reception at his new school was overwhelmingly positive. Later Ryan described his first day at school: "When I walked into classrooms or the cafeteria, several kids called out at once, 'Hey, Ryan! Sit with me!'"

Sources: D. J. Connor & Baglieri, 2009; Dilg, 2010; Feddes et al., 2009; Feldman & Matjasko, 2005; Freedom Writers, 1999, p. 33 (Shakespeare example); Mahoney et al., 2003; A. J. Martin & Dowson, 2009; Schofield, 1995; Schultz et al., 2000; Sleeter & Grant, 1999; Tatum, 1997; van den Berg et al., 2012; R. White & Cunningham, 1991, p. 149 (Ryan White example).

[218] B. B. Brown et al., 2008; Schofield, 1995; Tatum, 1997.
[219] Black-Gutman & Hickson, 1996; G. L. Cohen & Garcia, 2008; Ogbu, 2008b.
[220] Schultz et al., 2000; Tatum, 1997.

and Groups"; additional strategies aimed specifically at reducing gang-related hostilities are presented in Chapter 9. When students from diverse groups interact regularly—and especially when they come together as equals, work toward a common goal, and see themselves as members of the same "team"—they're more apt to accept and possibly even *value* one another's differences.[221]

7.3 Moral and Prosocial Development

Big Idea 7.3 Some signs of moral reasoning and prosocial behavior emerge early in life, but key components of morality continue to evolve over the course of childhood and adolescence.

The Nature of Moral and Prosocial Development

Some interpersonal behaviors, such as sharing, helping, and comforting, are aimed at benefiting others more than oneself. These **prosocial behaviors**, plus such traits as honesty, fairness, and concern for other people's needs and rights, fall into the domain of **morality**. By and large, children and adolescents who think and behave in moral and prosocial ways gain more support from their teachers and peers and, as a result, achieve greater academic and social success over the long run.[222]

Morality and prosocial behavior are complex entities that appear to involve multiple parts of the brain. Certainly, mirror neurons are involved because they partially underlie children's perspective-taking abilities. But moral and prosocial actions also require certain emotions and reasoning capabilities, and these reside in distinctly different brain regions.[223]

Several general principles describe the nature of moral and prosocial development over the course of childhood and adolescence.

Children begin applying internal standards for behavior at a very early age.

Well before their first birthday, children show they value prosocial behavior over antisocial behavior, and by age 3 they have some understanding that behaviors causing physical or psychological harm are inappropriate.[224] By age 4 most children understand that causing another person harm is wrong regardless of what authority figures might tell them and regardless of what consequences certain behaviors may or may not bring.[225]

Children increasingly distinguish between moral and conventional transgressions.

Virtually every culture discourages some behaviors—**moral transgressions**—because they cause damage or harm, violate human rights, or run counter to basic principles of equality, freedom, or justice. For example, most cultures espouse the importance of both individual rights and fairness (i.e., an *ethic of justice*) and compassion for others (i.e., an *ethic of caring*). A culture typically discourages other behaviors—**conventional transgressions**—that, although not unethical, violate widely held agreements about how people should act (e.g., children shouldn't talk back to adults).

[221] Dovidio & Gaertner, 1999; Oskamp, 2000; J. H. Pfeifer et al., 2007; Ramiah & Hewstone, 2013.
[222] Caprara et al., 2000; Ladd et al., 2012; Spinrad & Eisenberg, 2009.
[223] Decety & Cowell, 2014; Gallese et al., 2011; Moll et al., 2007; Young & Saxe, 2009.
[224] Hamlin, 2013; Hamlin & Wynn, 2011; Helwig et al., 2001.
[225] Laupa & Turiel, 1995; Smetana, 1981; Tisak, 1993.

Figure 7.14 In this poem about the Holocaust, Matthew, a middle school student, expresses empathy for its victims

hopes
goals
dreams
happiness
broken
destroyed
eliminated
exterminated
no steps forward
no evolution
no prosperity
no hope
But
maybe
perhaps
except
if we
help
together
we stand
a chance.

think about it
How do you feel when you inadvertently inconvenience someone else? When you hurt someone else's feelings? When a friend unexpectedly loses a close family member? Do such feelings as guilt, shame, and sympathy come to mind?

Whereas many moral transgressions are universal across cultures, conventional transgressions are usually specific to a particular culture.[226] For example, although burping is often considered a conventional transgression in mainstream Western culture, people in some cultures burp as a compliment to the cook. As another example, telling lies to avoid punishment for inappropriate behavior is considered morally wrong in some cultures, but in certain other cultures, it's a legitimate way of saving face.[227] In addition, some cultural groups see such things as *group loyalty*, *respect for authority figures*, and *reverence and devotion to certain individuals or objects* as being essential elements of personal morality.[228] For instance, in much of North America, helping others (or not) is considered to be a voluntary choice, but in some societies (e.g., in many Asian and Arab countries) it is one's *duty* to help others. Such a sense of duty, which is often coupled with strong ties to family and the community, can lead to considerable prosocial behavior.[229]

Children's awareness of social conventions emerges in infancy and increases throughout the preschool, elementary, and secondary school years.[230] But especially as children reach adolescence, they don't always agree with adults about which behaviors constitute moral transgressions, which ones fall into the conventional domain, and which ones are simply a matter of personal choice. For example, many adolescents resist rules they think are infringements on their personal freedoms, such as rules about clothing, hairstyle, and talking in class.[231]

Children's capacity to respond emotionally to other people's misfortunes and distress increases throughout the school years.

Within the first 2 or 3 years of life, two emotions important for moral development emerge.[232] First, children occasionally show **guilt**—a feeling of discomfort when they know they've inflicted damage or caused someone else pain or distress. They also feel **shame**—a feeling of embarrassment or humiliation when they fail to meet their own or other people's standards for moral behavior. Both guilt and shame, although unpleasant emotions, are good signs that children are developing a sense of right and wrong and will work hard to correct their misdeeds.[233]

Guilt and shame are the result of doing something perceived to be wrong. In contrast, **empathy**—experiencing the same feelings as someone in unfortunate circumstances—appears in the absence of personal wrongdoing. The ability to empathize emerges in the preschool years and continues to develop throughout childhood and adolescence (e.g., see Figure 7.14).[234] Truly prosocial children—those who help others even in the absence of their own wrongdoing—typically have a considerable capacity for perspective taking and empathy.[235] Empathy is especially likely to spur prosocial behavior when it leads to **sympathy**, whereby children not only assume another person's feelings but also have concerns for the individual's well-being.[236]

[226] Nucci, 2009; Smetana, 2006; Turiel, 2002.
[227] Triandis, 1995.
[228] Haidt, 2012; J. G. Miller, 2007; Snarey, 1995; Turiel, 2002.
[229] X. Chen et al., 2009; J. G. Miller, 2007; Greenfield, 1994; Rubin et al., 2010; Triandis, 1995.
[230] Helwig & Jasiobedzka, 2001; Laupa & Turiel, 1995; Nucci, 2001; Nucci & Nucci, 1982; E. Robbins & Rochat, 2011; M. F. H. Schmidt & Tomasello, 2012.
[231] Nucci, 2009; Smetana, 2005.
[232] Kochanska et al., 2002; M. Lewis & Sullivan, 2005.
[233] N. Eisenberg, 1995; Harter, 1999; Narváez & Rest, 1995.
[234] N. Eisenberg et al., 1995; Spinrad & Eisenberg, 2009.
[235] Damon, 1988; Decety & Cowell, 2014; N. Eisenberg et al., 2001; Hoffman, 1991.
[236] Batson, 1991; Decety & Cowell, 2014 (who use the term *empathic concern*); N. Eisenberg & Fabes, 1998; Malti et al., 2009; Turiel, 1998.

With age, reasoning about moral issues becomes increasingly abstract and flexible.

To probe people's reasoning about moral issues, researchers sometimes present **moral dilemmas**, situations in which two or more people's rights or needs may be at odds and for which there are no clear-cut right or wrong solutions. The following exercise is an example.

See For Yourself

Martin's Plight

Imagine you're a ninth-grader walking quickly down the school hall on your way to your math class. You see three boys from the so-called "popular" crowd cornering a small, socially awkward boy named Martin. The boys first make fun of Martin's thick glasses and unfashionable clothing, then they start taunting him with offensive names. What do you do?

a. You look the other way, pretending you haven't heard anything, and hurry on to class. If you were to stop to help, the boys might taunt you as well, and that will only make the situation worse.
b. You shoot Martin a sympathetic look and then head to class so that you won't be late. Afterward, you anonymously report the incident to the principal's office because you know that the boys' behaviors have violated your school's antibullying policy.
c. You stop and say, "Hey, cut it out! Stop bullying Martin, he doesn't deserve to be picked on. Come on Martin, let's go, we don't want to be late for math class."

Looking for the moral high ground in this situation, you might very well have chosen Alternative *c*. But if you were a ninth-grader—someone who might still be working hard to fit in with your peer group—is that *really* what you would do?

In his groundbreaking early research on moral development, Lawrence Kohlberg gave children and adults a variety of moral dilemmas and asked them what they would do and why they would do it. Based on the hundreds of responses he obtained, Kohlberg proposed that as children grow older, they construct increasingly complex views of morality. In Kohlberg's view, the development of moral reasoning is characterized by a sequence of six stages grouped into three general *levels* of morality: preconventional, conventional, and postconventional (see Table 7.3). Children with **preconventional morality** haven't yet adopted or internalized society's conventions regarding what things are right and wrong but instead focus largely on external consequences that certain actions might bring to themselves, as illustrated in Alternative *a* in the previous exercise. Kohlberg's second level, **conventional morality**, is characterized by general, often unquestioning obedience either to an authority figure's dictates or to established rules and norms, even when there are no consequences for disobedience. Alternative *b* in the previous exercise is an example: You report a violation of school rules to school authorities, but you don't want to be late to class (that would violate another school rule) and through your actions, you don't jeopardize any good relationships you might have with the supposedly "popular" boys.

In contrast to the somewhat rigid nature of conventional morality, people at Kohlberg's third level, **postconventional morality**, view rules as useful but changeable mechanisms that ideally can maintain the general social order and protect human rights; rules aren't absolute decrees that must be obeyed without question. These people live by their own abstract principles about right and wrong and may disobey rules inconsistent with these principles. Alternative *c* has an element of postconventional reasoning: You're more concerned about protecting Martin's physical and psychological safety than you are about getting to class on time.

Recent research supports Kohlberg's proposed sequence: Generally speaking, people seem to make advancements in the order Kohlberg described.[237] And as Kohlberg

[237] Boom et al., 2001; Colby & Kohlberg, 1984; Snarey, 1995; Stewart & Pascual-Leone, 1992.

Table 7.3 The Three Levels and Six Stages of Moral Reasoning in Kohlberg's Theory of Moral Development

LEVEL	PROPOSED AGE RANGE	STAGE	NATURE OF MORAL REASONING
Level I: Preconventional morality	Seen in preschool children, most elementary school students, some junior high school students, and a few high school students	Stage 1: Punishment-avoidance and obedience	People make decisions based on what is best for themselves, without regard for others' needs or feelings. They obey rules only if established by more powerful individuals; they may disobey if they aren't likely to get caught. "Wrong" behaviors are those that will be punished.
		Stage 2: Exchange of favors	People recognize that others also have needs. They may try to satisfy others' needs if their own needs are also met ("You scratch my back, and I'll scratch yours"). They continue to define right and wrong primarily in terms of consequences to themselves.
Level II: Conventional morality	Seen in a few older elementary school students, some junior high school students, and many high school students (Stage 4 usually doesn't appear before high school)	Stage 3: Good boy/good girl	People make decisions based on what actions will please others, especially authority figures (e.g., teachers, popular peers). They're concerned about maintaining relationships through sharing, trust, and loyalty, and they consider other people's perspectives and intentions when making decisions.
		Stage 4: Law and order	People look to society as a whole for guidelines about right and wrong. They know that rules are necessary for keeping society running smoothly and believe that it's their duty to obey them. However, they perceive rules to be inflexible; they don't necessarily recognize that as society's needs change, rules should change as well.
Level III: Postconventional morality	Rarely seen before college (Stage 6 is extremely rare even in adults)	Stage 5: Social contract	People recognize that rules represent agreements among many individuals about appropriate behavior. Rules are seen as useful mechanisms that maintain the general social order and protect individual rights, rather than as absolute dictates that must be obeyed simply because they are the law. People also recognize the flexibility of rules; rules that no longer serve society's best interests can and should be changed.
		Stage 6: Universal ethical principle	Stage 6 is a hypothetical, ideal stage that few people ever reach. People in this stage adhere to a few abstract, universal principles (e.g., equality of all people, respect for human dignity, commitment to justice) that transcend specific norms and rules. They answer to a strong inner conscience and willingly disobey laws that violate their own ethical principles.

Sources: Colby & Kohlberg, 1984; Colby et al., 1983; Kohlberg, 1976, 1984, 1986; Reimer et al., 1983; Snarey, 1995.

suggested, moral development emerges out of children's own, self-constructed beliefs, which they often revisit and revise. Nevertheless, his theory has weaknesses. For one thing, Kohlberg underestimated young children, who, as we discovered earlier, acquire some internal standards of right and wrong long before they reach school age. Also, his stages encompassed a mixture of moral issues (e.g., causing harm) and social conventions (e.g., having rules to help society run smoothly), but as we've seen, children distinguish between these two domains, and their views about each domain may change differently over time.[238] A third weakness is that Kohlberg's theory pays little attention to one very important aspect of morality: *showing compassion and helping* other people.[239] Finally, Kohlberg overlooked motives, social benefits, and other situational factors that children and adolescents consider when deciding what actions are morally right and wrong.[240] For example, they're more apt to think of lying as immoral if it causes someone else harm than if it apparently has no adverse effect; that is, if it's just a "white lie" or enables them to escape from what they believe to be unreasonable restrictions on their behavior.[241]

[238] Nucci, 2001, 2009.
[239] Gilligan, 1982, 1987; P. L. Hill & Roberts, 2010; J. G. Miller, 2007.
[240] Aikins & Litwack, 2011; Helwig et al., 2001; Killen & Smetana, 2008; Nucci, 2009; Piaget, 1960; Thorkildsen, 1995; Turiel, 1998.
[241] S. A. Perkins & Turiel, 2007; Turiel et al., 1991.

Many contemporary developmental psychologists believe that moral reasoning involves general *trends* rather than distinct stages. It appears that children and adolescents gradually construct several different standards that guide their moral reasoning and decision making in various situations. Such standards include the need to address one's own personal interests, consideration of other people's needs and motives, a desire to abide by society's rules and conventions, and, perhaps eventually, an appreciation for abstract ideals regarding human rights and society's overall needs.[242] With age, young people increasingly apply more advanced standards, but even a fairly primitive one—satisfying one's own needs without regard for others—may occasionally take priority.[243]

Table 7.4 describes the forms that moral reasoning and other aspects of morality are apt to take at various grade levels. As you look at the suggested strategies in the right-hand column of the table, notice how several of them are consistent with the *authoritative parenting* style described earlier in the chapter.

Challenges to current moral perspectives can promote advancement toward more sophisticated reasoning.

Kohlberg drew on Piaget's concept of *disequilibrium* (also known as *cognitive dissonance*) to explain how learners progress to more advanced moral reasoning. In particular, children and adolescents occasionally encounter dilemmas and persuasive arguments that they can't adequately respond to using their current moral perspectives. Over time they become increasingly aware of weaknesses in their thinking, especially if their judgments are challenged by people who reason at one stage above their own. For example, a Stage 3 student who agrees to let a popular soccer player copy his homework may begin to question his decision if a Stage 4 student argues that the soccer player would learn more by doing her own homework. By struggling with such challenges, Kohlberg suggested, children and adolescents may begin to revise their own thoughts about morality and gradually move from one stage to the next.

Although most contemporary psychologists reject Kohlberg's idea of discrete stages, researchers have confirmed his view that disequilibrium spurs moral development. For instance, classroom discussions of controversial topics and moral issues appear to promote increased perspective taking and the transition to more advanced reasoning.[244] Implicit in this finding is a very important point: Children's moral reasoning does *not* result simply from adults dogmatically passing along particular moral values and preachings.[245] Instead, it emerges out of children's own, personally constructed beliefs, which they often revisit and revise over time.

Cognition, affect, and motivation all influence moral and prosocial behavior.

Most children behave more morally and prosocially as they grow older, and their increasingly moral behavior is due, in part, to more advanced moral reasoning.[246] However, the correlation between moral reasoning and moral behavior isn't an especially strong one. As mentioned earlier, affective factors—guilt, shame, empathy, and sympathy—also enter into the picture. For instance, when children feel guilty about damage or distress they've caused, they may work hard to repair the damage, soothe hurt feelings, and in other respects "make things right."[247] And when they can empathize and sympathize with

[242] Killen & Smetana, 2008; Krebs, 2008; Nucci, 2009; Rest et al., 1999.
[243] Rest et al., 1999; Turiel, 1998.
[244] de Vries & Zan, 1996; Power et al., 1989; Schlaefli et al., 1985.
[245] Damon, 1988; Higgins, 1995; N. Park & Peterson, 2009; Turiel, 1998.
[246] Blasi, 1980; N. Eisenberg, Zhou, et al., 2001; Paciello et al., 2008.
[247] N. Eisenberg, 1995; Harter, 1999; Malti et al., 2009.

Developmental Trends

Table 7.4 Moral Reasoning and Prosocial Behavior at Different Grade Levels

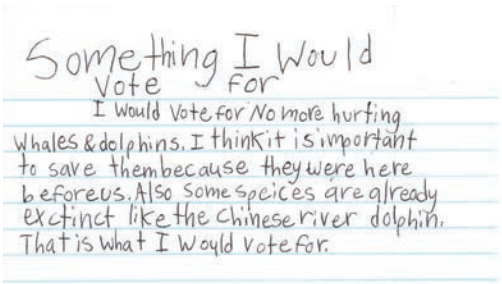
GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **Grades K–2**	• Some awareness that behaviors causing physical or psychological harm are morally wrong • Ability to distinguish between behaviors that violate human rights and dignity versus those that violate social conventions • Guilt and shame about misbehaviors that cause obvious harm or damage • Some empathy for, as well as attempts to comfort, people in distress • Appreciation for the need to be fair; fairness seen as strict equality in how a desired commodity is divided	When Jake pushes Otis off the ladder of a playground slide, several of the boys' kindergarten classmates are horrified. One child shouts, "That's wrong!" and several others rush to Otis's side to make sure he's not hurt.	• Make standards for behavior very clear. • When students misbehave, give reasons that such behaviors are unacceptable, focusing on the harm and distress they have caused for others (i.e., use *induction*). • Encourage students to comfort others in times of distress. • Model sympathetic responses; explain what you're doing and why you're doing it. • Keep in mind that some selfish behavior is typical for the age group; when it occurs, encourage perspective taking and prosocial behavior.
JohnnyGreig/E+/Getty images **Grades 3–5**	• Knowledge of social conventions for appropriate behavior • Growing realization that fairness doesn't necessarily mean equality—that some people (e.g., peers with disabilities) may need more of a desired commodity than others • Increasing empathy for unknown individuals who are suffering or needy • Recognition that one should strive to meet others' needs as well as one's own; growing appreciation for cooperation and compromise • Increased desire to help others as an objective in and of itself	At the suggestion of his third-grade teacher, 8-year-old Jeff acts as a "special friend" to Evan, a boy with severe physical and cognitive disabilities who joins the class 2 to 3 days a week. Evan can't speak, but Jeff gives him things to feel and manipulate and talks to him whenever class activities allow conversation. And the two boys regularly sit together at lunch. Jeff comments, "Doing things that make Evan happy makes me happy, too."	• Make prosocial behaviors (e.g., giving, sharing, caring for others) a high priority in the classroom. • Explain how students can often meet their own needs while helping others (e.g., when asking students to be "reading buddies" for younger children, explain that doing so will help them become better readers themselves). • Use prosocial adjectives (e.g., *kind, helpful*) when praising altruistic behaviors.
Photo by Unsplash **Grades 6–8**	• Growing awareness that some rules and conventions are arbitrary; in some cases accompanied by resistance to these rules and conventions • Interest in pleasing and helping others, but with a tendency to oversimplify what "helping" requires • Tendency to believe that people in dire circumstances (e.g., homeless people) are entirely responsible for their own fate	After the midwinter break, 13-year-old Brooke returns to school with several large nose rings and her hair styled into long, vertical spikes above her head. The school principal tells her that her appearance is inappropriate and insists that she go home to make herself more presentable. Brooke resists, claiming, "I have a right to express myself however I want!"	• Talk about how rules enable classrooms and other groups to run more smoothly. • Involve students in group projects that will benefit their school or community. • When imposing discipline for moral transgressions, accompany it with explanations about the harm that has been caused (i.e., use *induction*), especially when working with students who have deficits in empathy and moral reasoning.
Photo by Unsplash **Grades 9–12**	• Increasing concern about doing one's duty and abiding by the rules of society as a whole, rather than simply pleasing certain authority figures • Realization that most rules and conventions serve useful purposes • Genuine empathy for people in distress • Belief that society has an obligation to help people in need	Several high school students propose and establish a school chapter of Amnesty International, an organization dedicated to the preservation of human rights around the world. The group invites knowledgeable guest speakers from various countries and conducts several fundraisers to help combat abusive practices against women.	• Explore moral issues in social studies, science, and literature. • Encourage community service as a way of engendering feelings of commitment to helping others. Ask students to reflect on their experiences through group discussions or written essays. • Have students read autobiographies and other literature that depict heroic figures who have actively worked to help people in need.

Sources: N. Eisenberg, 1982; N. Eisenberg & Fabes, 1998; Farver & Branstetter, 1994; C. A. Flanagan & Faison, 2001; Gibbs, 1995; Gummerum et al., 2008; D. Hart & Fegley, 1995; Hastings et al., 2007; Helwig & Jasiobedzka, 2001; Helwig et al., 2001; Hoffman, 2000; Kohlberg, 1984; Krebs & Van Hesteren, 1994; Kurtines et al., 1995; Laupa & Turiel, 1995; M. Lewis & Sullivan, 2005; Nucci, 2009; Nucci & Weber, 1995; Rothbart, 2011; Rushton, 1980; Smetana & Braeges, 1990; Spinrad & Eisenberg, 2009; Turiel, 1983, 1998; Wainryb et al., 2005; Yates & Youniss, 1996; Yau & Smetana, 2003; Youniss & Yates, 1999; Zahn-Waxler et al., 1992.

people or other living beings in dire circumstances, they're apt to show considerable caring and compassion even in the absence of their own wrongdoing (see Figure 7.15).

Nevertheless, children's own needs and goals often come into play as well. For instance, although children may want to do the right thing, they may also be concerned about whether others will approve of their actions and about what positive or negative consequences might result. Children are more apt to behave in accordance with their moral standards if the benefits are high (e.g., they gain others' approval or respect) and the personal costs are low (e.g., an act of altruism involves little sacrifice).[248] They're also more likely to behave prosocially if the recipients have helped them in the past or might be able to help them in the future.[249] As it turns out, young people often help themselves when they help others: Many children who engage in altruistic behaviors enhance not only other people's well-being but also their *own* sense of well-being.[250]

Figure 7.15 A strong moral code often encompasses a concern for the welfare of animals, as shown in this 9-year-old's response to the topic "Something I Would Vote For"


Something I Would Vote For

I would vote for No more hurting whales & dolphins. I think it is important to save them because they were here before us. Also some spcies are already exctinct like the chinese river dolphin. That is what I wayld vote for.

Moral values become an important part of some young people's identity.

Some adolescents incorporate a commitment to moral values into their overall sense of identity: They think of themselves as generally caring individuals who are concerned about the rights and well-being of others.[251] Their acts of altruism and compassion aren't limited to their friends and acquaintances but also extend to the community at large. For example, in one study, researchers conducted in-depth interviews with inner-city Hispanic and African American teenagers who showed an exceptional commitment to helping others (by volunteering many hours at Special Olympics, a neighborhood political organization, a nursing home, etc.). These teens didn't necessarily display more advanced moral reasoning than their peers (as defined by Kohlberg's stages), but they were more likely to describe themselves in terms of moral traits and goals (e.g., helping others) and to mention certain ideals toward which they were striving.[252]

As you can see, then, morality and identity are interrelated. In fact, the various topics we've discussed in this chapter—personality, sense of self, identity, peer relationships, social cognition, and moral and prosocial development—are all interconnected. For example, moral beliefs influence the interpersonal behaviors that learners believe to be appropriate (social cognition). Those interpersonal behaviors influence the quality of peer relationships, which, in turn, influences learners' self-concepts and self-esteem. This ripple effect works in other directions as well. For instance, learners' sense of self is apt to influence their interpretations of other people's behaviors toward them (social cognition again) and so will also influence their responses and overall social effectiveness (e.g., recall the discussion of hostile attributional bias).

Teaching Strategies: Promoting Moral Reasoning and Prosocial Behavior

Some of the recommendations in the preceding sections related to personal and social development should promote moral and prosocial development as well. For example, the use of induction—explaining *why* certain behaviors won't be tolerated—can help

[248] Batson & Thompson, 2001; Cillessen et al., 2011; Hawley, 2014; Narváez & Rest, 1995; Wentzel et al., 2007.
[249] A. Martin & Olson, 2015.
[250] J. G. Miller et al., 2015.
[251] Arnold, 2000; Blasi, 1995; Hastings et al., 2007; McFarland et al., 2013; Thorkildsen et al., 2008; Youniss & Yates, 1999.
[252] D. Hart & Fegley, 1995.

students acquire more prosocial attitudes toward their classmates. And by encouraging perspective taking and empathy, teachers foster advancements in moral reasoning and altruistic behavior as well as in social skills. Following are four additional recommendations.

Expose students to numerous models of moral and prosocial behavior.

Children and adolescents are more likely to exhibit moral and prosocial behavior when they see other people (including their teachers) behaving in moral rather than immoral ways. For instance, when they see adults or peers being generous and showing concern for others, they tend to do likewise.[253] Good models can be found in various media as well—for example, in carefully selected and age-appropriate literature, in prosocial song lyrics, and, yes, even in some video games.[254]

Engage students in discussions of social and moral issues.

As noted earlier, the disequilibrium (cognitive dissonance) that students experience when they wrestle with moral dilemmas can often promote more advanced moral reasoning. Social and moral dilemmas often arise within the school curriculum. Following are examples:

- Is military retaliation for acts of terrorism acceptable if it involves killing innocent people?
- Should laboratory rats be used to study the effects of cancer-producing agents?
- Was Hamlet justified in killing Claudius to avenge the murder of his father?

Students typically have a variety of opinions about social and moral issues, and they often get emotionally as well as cognitively involved in the subject matter (recall the discussion of hot cognition in Chapter 5). To facilitate productive discussions about such issues, teachers must create a trusting and nonthreatening classroom atmosphere in which students can express ideas without fear of censure or embarrassment. Teachers should also help students identify all aspects of a dilemma, including the needs and perspectives of the various individuals involved. The most fruitful discussions occur when teachers encourage students to explore their reasons for thinking as they do; that is, to clarify and reflect on the moral principles on which they're basing their judgments.[255]

Discourage all forms of cheating.

Teachers must explicitly and consistently discourage *cheating* in its various forms, whether it be submitting a research paper downloaded from the Internet (i.e., plagiarism), copying other students' responses to quizzes or homework, or giving friends unfair advance notice of test questions. The prevalence of cheating increases as students get older, and by high school, the great majority of students are apt to cheat at one time or another.[256]

Unfortunately, students don't always see cheating as being a violation of moral standards.[257] Perhaps they're trying to help a friend, or they see an assignment as being a waste of time or hopelessly beyond their ability levels. Not only does cheating hinder students' classroom learning (students gain very little from copying other people's work)

[253] Hoffman, 2000; Rushton, 1980; Spinrad & Eisenberg, 2009.
[254] Dubow et al., 2007; Greitemeyer, 2011; Halbrook et al., 2019; K. Lee et al., 2014; Nucci, 2001; Tobias et al., 2011.
[255] Nucci, 2001, 2006; Reimer et al., 1983.
[256] Cizek, 2003.
[257] L. H. Anderman et al., 2007; Honz et al., 2010.

but it's also dishonest and therefore immoral. Several strategies can potentially discourage cheating:[258]

- Explain in clear, concrete terms what cheating is—for example, that it includes not only representing another person's work as one's own but also giving certain classmates an unfair advantage over others.
- Contrast cheating with legitimate collaboration, in which everyone learns something and the submitted work is honestly represented as a joint effort.
- Independently verify suspected instances of cheating (e.g., by searching online for a document that you think a student might have copied word for word).
- Provide enough guidance and support that students can reasonably accomplish assigned tasks without cheating.

Get students actively involved in community service or service-learning experiences.

Adolescents are more likely to act in moral and prosocial ways if they have integrated a commitment to moral ideals into their overall sense of identity. Regular community service or service-learning—ideally beginning well before adolescence—can facilitate this aspect of identity development. Through ongoing community service activities (e.g., food and clothing drives, visits to homes for the elderly, community cleanup efforts), elementary and secondary students alike learn that they have the skills and the responsibility for helping those less fortunate than themselves and in other ways making the world a better place in which to live. In the process, they also begin to think of themselves as concerned, compassionate, and moral citizens.[259] *Critical service-learning* experiences that encourage students to consider the root causes of social inequities could be especially useful in helping students to believe that they could be agents of social change and address injustice in communities (see Chapter 3).[260] Considering root causes of questions such as "Why are some people less fortunate than me?" could lead students to confront a variety of moral dilemmas. And when high school students participate in community service and service-learning projects, they gain a sense that their school activities can actually *make a difference* in other people's lives, increasing their desire to stay in school rather than drop out.[261]

7.4 Students Who Face Exceptional Personal or Social Challenges

Big Idea 7.4 **Students who most need teachers' guidance and support are those who face exceptional personal or social challenges.**

Students At Risk for Academic Failure

All students need a certain amount of teacher support in order to reach their full potential, but some students need considerably more support than others. In this section, we focus on **students at risk**—those who are on a path toward poor long-term developmental

[258] L. H. Anderman et al., 2007; Bellanca & Stirling, 2011; Honz et al., 2010; Lenski et al., 2010.
[259] J. P. Allen & Antonishak, 2008; Celio et al., 2011; Kahne & Sporte, 2008; W.-M. Roth, 2011; Thorkildsen et al., 2008; Youniss & Yates, 1999.
[260] Estes et al., 2018; Mitchell, 2008; Rosenberger, 2000.
[261] Eccles, 2007.

outcomes. Traditionally educators have used the term *at risk* primarily in reference to students who have a high probability of dropping out of school before they earn their high school diplomas. Here, however, we use the term more broadly to include students with significant social or emotional problems as well.

Some students face, or have faced, exceptional challenges outside of school.

Ideally, families provide the guidance, encouragement, emotional support, and resources that students need to succeed at school and in the outside world. Unfortunately, not all families provide nurturing environments for their children. Some parents can't afford adequate food, housing, or medical care. Other parents are so overwhelmed by personal crises (e.g., marital conflict, loss of employment, a life-threatening illness) that they have little time or energy to devote to anyone else. Still others suffer from mental illness or have serious substance abuse problems. And in some cases, parents have learned ineffective parenting strategies from their *own* parents.[262] Such challenges increase the likelihood that children will have emotional problems (e.g., anxiety or depression), ineffective social skills (e.g., aggression), and poor classroom behavior (e.g., chronic disruptiveness). The more challenges children have previously faced or currently face at home, the more vulnerable they are.[263]

Parental neglect and abuse can have significant adverse effects on children's personal and social development.[264] On average, children who have been routinely neglected or abused have low self-esteem, poorly developed social skills, and low school achievement. Many are angry, aggressive, and defiant. Others can be depressed, anxious, socially withdrawn, and occasionally suicidal.

Often among those young people who have previously faced and continue to face exceptional life challenges are recent refugees from war-torn countries. Such students may have experienced or witnessed exceptional violence in their home countries, lost parents or other close family members, and been homeless and hungry for many months on end. Understandably, then, they may suffer from bouts of depression, debilitating anxiety, anger, and (in some cases) posttraumatic stress disorder. Compounding these very significant personal problems may be uncertainty both about their future livelihoods and living accommodations and about the norms and expectations of a new culture very different from the one in which they've grown up.[265]

Some students do well in school despite hardships.

Fortunately, many children and adolescents do well in school despite exceptional hardships on the home front. Some are **resilient students** who acquire characteristics and coping skills that help them rise above their adverse circumstances. As a group, resilient students have easygoing temperaments, likable personalities, positive self-concepts, and high yet realistic goals. They believe that success comes with hard work—for example, they have a *growth mindset* about their abilities—and their bad experiences serve as constant reminders of the importance of getting a good education.[266]

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[262] R. H. Bradley, 2010; Cummings et al., 2006; Hemmings, 2004; Serbin & Karp, 2003; R. A. Thompson & Wyatt, 1999.

[263] Brooks-Gunn et al., 2005; P. T. Davies & Woitach, 2008; El-Sheikh et al., 2009; G. W. Evans & Kim, 2007; Jaffee et al., 2012; Maikovich et al., 2008.

[264] Bates & Pettit, 2007; Crosson-Tower, 2010; J. Kim & Cicchetti, 2006; R. A. Thompson & Wyatt, 1999.

[265] A. L. Sullivan & Simonson, 2016.

[266] S. Goldstein & Brooks, 2006; Kim-Cohen & Gold, 2009; Martinez-Torteya et al., 2009; Rothbart, 2011; Schoon, 2006; Werner & Smith, 2001; Yeager & Dweck, 2012.

Teaching Strategies: Supporting Students Who Face Challenges

With research about students who face exceptional personal or social challenges in mind, we offer the following recommendations.

Intervene early and often with students who are at risk for dropping out of school.

Some students have personal circumstances or negative school experiences that lead them to drop out of school before high school graduation, and a subset of these students leave without basic skills in reading or math.[267] Many school dropouts, then, are ill-equipped to make productive contributions to their families, communities, or society at large. Students at risk for dropping out of school typically have some or all of the following characteristics:

- **A history of academic failure:** On average, students who drop out have less effective study skills, achieve at lower levels, and are more likely to have repeated a grade than their classmates who graduate.[268]
- **Emotional and behavioral problems:** Potential dropouts tend to have lower self-esteem than their more successful classmates, and they're more likely to exhibit serious behavioral problems (e.g., fighting, substance abuse) both in and out of school. Often their close friends are low-achieving and, in some cases, antisocial peers.[269]
- **Lack of psychological attachment to school:** Students at risk for academic failure are less likely to identify with their school or to believe that they are valued members of the school community. For example, they engage in fewer extracurricular activities than their classmates do, and they're apt to express dissatisfaction with school in general.[270]
- **Increasing disinvolvement with school:** Dropping out isn't necessarily an all-or-none event. Many high school dropouts show lesser forms of "dropping out" many years before they officially leave school. Future dropouts are absent from school more frequently than their peers. They're also more likely to be occasionally suspended from school or to show a long-term pattern of dropping out, returning to school, and dropping out again.[271]

Students drop out for a variety of reasons. Some have little family and peer encouragement and support for school success. Others have extenuating life circumstances; perhaps they have medical problems, take a job to help support the family, or get pregnant. Many simply become dissatisfied with school: They may find the school environment unwelcoming or dangerous, be consistently victimized by bullies, perceive the curriculum to be boring and personally irrelevant, or doubt that they can pass high-stakes achievement tests on which graduation depends.[272] Sadly, teacher behaviors can enter into the picture as well. For example, a teacher might communicate low expectations for students' achievement either explicitly (e.g., by telling students that their chances of earning passing grades are slim) or implicitly (e.g., by brushing off their requests for assistance on assigned tasks).

[267] Boling & Evans, 2008; Rumberger, 2011; Slavin, 1989.
[268] Battin-Pearson et al., 2000; Brophy, 2002; Garnier et al., 1997; Hattie, 2008; Rumberger, 2011.
[269] Battin-Pearson et al., 2000; Garnier et al., 1997; Suh et al., 2007.
[270] Christenson & Thurlow, 2004; Hymel et al., 1996; Rumberger, 2011.
[271] Christenson & Thurlow, 2004; Rumberger, 2011; Suh et al., 2007.
[272] Brayboy & Searle, 2007; Cornell et al., 2013; Hardré & Reeve, 2003; Hursh, 2007; Portes, 1996; Rumberger, 2011.

Students are more likely to drop out when they perceive their teachers to be uninterested in helping them succeed.[273]

Teachers may begin to see indicators of "dropping out," such as low school achievement and high absenteeism, as early as elementary school, and other common signs—low self-esteem, disruptive behavior, lack of involvement in school activities—may appear soon thereafter. So it's quite possible to identify potential dropouts early in their school careers and take steps to prevent or remediate academic difficulties before they become insurmountable. Research clearly indicates that for students at risk, prevention, early intervention, and long-term support are more effective than later, short-term efforts.[274] The Classroom Strategies box "Encouraging and Supporting Students Who Are At Risk for Dropping Out" presents several strategies that researchers and experienced educators have found to be effective in helping students to stay in school.

Connect students and families to resources.

In addition to providing whatever support systems are possible at school, educators can certainly help to connect students and their families to government programs and local agencies that provide meals, warm clothing, physical and mental health care, and other basic necessities. Also, if poor parenting practices have been a significant factor affecting students' current functioning, teachers can serve as valuable resources to parents about possible strategies for promoting children's personal and social development, perhaps through newsletters, parent–teacher conferences, and parent discussion groups (we identify specific mechanisms for communicating with parents in Chapter 9). The important thing is to communicate information *without* blaming parents or being judgmental about parenting practices. As noted previously, how parents treat their children is sometimes the *result*, rather than the cause, of how their children behave. For example, if children are temperamentally hyperactive or impulsive, parents may have to impose restrictions on behavior and administer severe consequences for misbehaviors. Teachers must be careful not to always place total blame (or credit) on parents for their parenting styles.

think about it
Were you an easy or difficult child to raise? How much might the parenting style in your childhood home have been the result of your particular temperament?

Identify additional supportive strategies and services for students who are homeless.

Children of homeless families typically face major challenges in their daily lives. Many have chronic physical problems, limited social support networks, significant mental health issues, and inappropriate behaviors. Some may be reluctant to come to school because they lack bathing facilities and suitable clothing. And some may have moved so frequently from one school to another that they have large gaps in their academic skills.[275]

When students either live in a homeless shelter or else regularly move from one temporary location to another, strategies such as the following can support their efforts to achieve academic and social success at school:[276]

- Pair new students with classmates who can provide guidance and assistance—for example, by explaining school procedures and making introductions to other students.
- Provide a notebook, clipboard, or other portable "desk" on which students can do their homework outside of school.

[273] Becker & Luthar, 2002; Rumberger, 2011; Suh et al., 2007.
[274] K. L. Alexander et al., 1995; Brooks-Gunn, 2003; Christenson & Thurlow, 2004; McCall & Plemons, 2001; Paris et al., 2006; Ramey & Ramey, 1998; Rumberger, 2011.
[275] Fantuzzo et al., 2012; Herbers et al., 2012; McLoyd, 1998; P. M. Miller, 2011; Polakow, 2007.
[276] Pawlas, 1994.

Classroom Strategies

Encouraging and Supporting Students Who Are At Risk for Dropping Out

- **Make the curriculum relevant to students' lives and needs.**
  A math class in an inner-city middle school expresses concern about the 13 liquor stores located near the school and about the shady customers and drug dealers the stores attract. The students use yardsticks and maps to calculate the distance of each store from the school, gather information about zoning restrictions and other city government regulations, identify potential violations, meet with a local newspaper editor (who publishes an editorial describing the situation), and eventually meet with state legislators and the city council. As a result of students' efforts, city police monitor the liquor stores more closely, major violations are identified (leading to the closing of two stores), and the city council makes it illegal to consume alcohol within 600 feet of the school.
- **Pique students' interest with stimulating activities.**
  In a unit on the physics of sound, a junior high school science teacher shows students how basic principles of sound reveal themselves in popular music. On one occasion the teacher brings in a guitar and explains why holding down a string at different points along the neck of the guitar creates different frequencies and thus different notes.
- **Use students' strengths to promote a positive sense of self.**
  An elementary school in a low-income neighborhood forms a singing group (the Jazz Cats) for which students must try out. The group performs at a variety of community events, and the students enjoy considerable visibility for their talent. Group members exhibit increased self-esteem, improvement in other school subjects, and greater teamwork and leadership skills.
- **Through both words and actions, communicate optimism about students' chances for short-term and long-term personal and professional success.**
  A math teacher at a low-performing high school recruits students to participate in an intensive math program. The teacher and students work on evenings, Saturdays, and vacations, and many of them eventually pass the Advanced Placement calculus exam. (This real-life example is depicted in the 1988 movie *Stand and Deliver*.)
- **Provide extra support for academic success.**
  A middle school homework program meets every day after school in Room 103, where students find their homework assignments on a shelf. Students follow a particular sequence of steps to complete each assignment (assembling materials, having someone check their work, etc.) and use a checklist to make sure they don't skip any steps. Initially, a supervising teacher closely monitors what they do, but with time and practice, the students can do their homework with only minimal help and guidance.
- **Show students that they are personally responsible for their successes.**
  A teacher says to a student, "Your essay about recent hate crimes in the community is very powerful. You've given the topic considerable thought, and you've clearly mastered some of the techniques of persuasive writing that we've talked about this semester. I'd like you to think seriously about submitting your essay to the local paper for its editorial page. Can we spend some time during lunch tomorrow to fine-tune the grammar and spelling?"
- **Create peer support groups that enable students to provide mutual encouragement.**
  At a school that serves a large number of minority-group students who are at risk for academic failure, faculty and students create a Minority Achievement Committee program designed to make academic achievement a high priority. Participation in the program is selective (i.e., students must show a commitment to academic improvement) and prestigious. In regular meetings, high-achieving 11th- and 12th-graders describe, model, and encourage many effective strategies, and they help younger students who are struggling with schoolwork.
- **Get students involved in extracurricular activities, especially those that involve making a long-term commitment to a group effort.**
  A teacher encourages a student with a strong throwing arm to try out for the school baseball team and introduces the student to the baseball coach. The coach, in turn, expresses his enthusiasm for having the student join the team and asks several current team members to help make him feel at home during team practices.
- **Involve students in school policy and management decisions.**
  At a high school that has historically had high dropout rates, students and teachers hold regular "town meetings" to discuss issues of fairness and justice and establish rules for appropriate behavior. Meetings are democratic, with students and teachers alike having one vote apiece, and the will of the majority is binding.

Sources: J. P. Allen & Antonishak, 2008; L. W. Anderson & Pellicer, 1998; Belfiore & Hornyak, 1998 (homework program example); Christenson & Thurlow, 2004; Cosden et al., 2001; Eccles, 2007; Feldman & Matjasko, 2005; Fuchs, Fuchs, et al., 2008; Higgins, 1995 (town meeting example); Jenlink, 1994 (Jazz Cats example); Knapp et al., 1990; Ladson-Billings, 1994; Lee-Pearce et al., 1998; Mathews, 1988 (inner-city math program example); McGovern et al., 2008 (Minority Achievement Club example); Ramey & Ramey, 1998; Rumberger, 2011; Suh et al., 2007; Tate, 1995 (liquor store example); E. N. Walker, 2006; D. Wood et al., 2009; Yeager & Dweck, 2012.

- Find adult or teenage volunteers to serve as tutors outside of school.
- Meet with students' parents at their homeless shelter or other temporary residence rather than at school.
- Share copies of homework assignments, school calendars, and newsletters with shelter officials.

When teachers use such strategies, however, they must keep in mind that students and their families are apt to feel embarrassed about their homeless status.[277] Accordingly, showing respect for their privacy and self-esteem must be a high priority.

Watch for signs of abuse.

Teachers must be alert for signs of possible child maltreatment. In some cases, parents and other primary caregivers neglect children: They fail to provide nutritious meals, adequate clothing, and other essential items. In other cases, they abuse their children physically, sexually, or emotionally. Possible indicators of neglect or abuse are chronic hunger, lack of warm clothing in cold weather, untreated medical needs, frequent or serious physical injuries (e.g., bruises, burns, broken bones), and exceptional knowledge about sexual matters.[278] Teachers are both morally and legally obligated to report any cases of suspected child abuse or neglect to the proper authorities (e.g., the school principal or child protective services). Two helpful resources are the National Child Abuse Hotline (1-800-4-A-CHILD, or 1-800-422-4453) and the website for Childhelp (www.childhelp.org).

Be on the lookout for students who appear to be social outcasts.

Recall the earlier discussions of rejected students and neglected students. Both groups tend to hover at the very fringes of a school's social life. Like William in the opening case study, they have few, if any, friends, and hence get little or no social and emotional support from their peers. Social exclusion by agemates over a lengthy period—psychologists call it *social marginalization*—can cause students considerable psychological distress and shame. To cope with such feelings and try to preserve their sense of self-worth, students may psychologically disengage from school life, jeopardizing their academic achievement as well as their social development and emotional well-being. Some marginalized teenagers begin to associate with a few equally marginalized peers, who may or may not encourage attitudes and behaviors that are in teens' long-term best interests.[279]

Certainly, some of the strategies presented earlier in the chapter can help integrate marginalized students into their school's social activities (e.g., look once again at the sections on bullying and the Classroom Strategies box "Encouraging Productive Interactions among Diverse Individuals and Groups"). But in addition, teachers should explicitly reach out to these students, providing emotional support and ideally helping them find one or two prosocial agemates who share similar interests.[280] Another potentially effective strategy is to help them reinterpret some of their unpleasant social experiences in ways that aren't so demoralizing and debilitating (e.g., "Some kids make fun of other kids to make themselves look 'tough,' when underneath they don't feel tough at all").[281]

Provide extra support and guidance for students who have disabilities that affect their personal or social functioning.

Some students show enduring patterns of social, emotional, or behavioral difficulties that significantly interfere with their classroom performance and interpersonal relationships. Symptoms of such **emotional and behavioral disorders** typically fall into one of two broad categories. **Externalizing behaviors** have direct or indirect effects on other people; examples are aggression, defiance, lying, stealing, and general lack of self-control. **Internalizing behaviors** primarily affect the student with the disorder; examples are extreme adverse emotions (e.g., severe anxiety or depression, exaggerated mood swings), withdrawal from

[277] Polakow, 2007.
[278] Crosson-Tower, 2010; Turnbull et al., 2010.
[279] Crosnoe, 2011; Loose et al., 2012.
[280] Crosnoe, 2011.
[281] For a related intervention that shows considerable promise, see Yeager et al., 2014.

social interaction, and eating disorders. Some emotional and behavioral disorders result from environmental factors, such as stressful living conditions, inconsistent parenting practices, child maltreatment, or family alcohol or drug abuse. But biological causes, such as inherited predispositions, chemical imbalances, and brain injuries, may also be involved.[282]

Other disabilities that adversely affect students' social functioning—and sometimes their academic learning as well—are collectively known as **autism spectrum disorders**, which are probably caused by abnormalities in the brain. Common to all of these disorders are marked impairments in social cognition (e.g., perspective taking), social skills (e.g., misreading nonverbal interactions), and social interaction (e.g., responding inappropriately in conversations). Students with autism spectrum disorders differ considerably in the severity of their condition. Some have exceptional talents in one or more specific areas, such as math, engineering, computer science, art, or poetry, as illustrated by the poignant poem presented in Figure 7.16. But in severe cases, children have major delays in cognitive development and language and exhibit certain unusual behaviors such as constantly rocking or waving fingers, continually repeating what someone else has said, or showing unusual fascination with a very narrow category of objects or topics.[283]

Professional intervention is called for whenever students are identified as having an emotional, behavior, or autism spectrum disorder. Nevertheless, many students with these

Figure 7.16 In this masterful poem, 15-year-old Aleph describes what it feels like to have autism. Copyright © by Aleph Altman-Mills. Reprinted with permission of the author

On Not Looking Disabled

It's great to be one of the *good* special ed kids
and get restrained less than your friends do!
"You don't look disabled," you tell me,
but this is what disabled looks like.
"You don't look disabled."
You tell me it's a compliment.
You tell me my brain and my body are insults.
We know that our brains and our bodies are insults.
We know that we're supposed to be Indistinguishable From Typically Developing Peers.
We know our parents want to lose us in a crowd.
I've spent too long
trying to have quiet hands,
trying to sit so still my heart stops beating,
trying to look at your eyes,
when I know you will never see me;
you'll either see a girl without a disability,
or a disability without a girl.
"You don't look disabled!"
and I feel like a spy among the real people
in a costume so tight it shrinks my lungs to capsules,
mask glazed on so you can almost pretend it is my face.
I have learned not to look disabled
through years of pills and hands and cruel guttered laughs
and I wish to god that looking disabled was safe.

[282] Angold et al., 2003; P. T. Davies & Woitach, 2008; El-Sheikh et al., 2009; D. Glaser, 2000; H. C. Johnson & Friesen, 1993; Martinez-Torteya et al., 2009.
[283] Gallese et al., 2011; Hobson, 2004; Lord, 2010; Pelphrey & Carter, 2007; Tager-Flusberg, 2007.

disabilities are in general education classrooms for much or all of the school day. Strategies for working effectively with them include the following:[284]

- Communicate a genuine interest in students' well-being.
- Explicitly teach and scaffold productive social cognition and effective interpersonal skills.
- Stick to a consistent and predictable weekly schedule (especially for students with autism spectrum disorders).
- Make classroom activities relevant to students' interests.
- Consistently communicate the need for appropriate classroom behavior.
- Expect gradual improvement rather than overnight success.

Know the warning signs of severe depression and possible suicide.

Serious depression can be the result of biology (e.g., hormonal imbalances), life circumstances (e.g., a romantic breakup, chronic peer rejection or bullying, poor academic performance in school, exceptional stress at home), or a combination of the two.[285] Some seriously depressed students think about taking their own lives. Warning signs include:[286]

- Sudden withdrawal from social relationships
- Increasing disregard for personal appearance
- Dramatic personality change (e.g., sudden elevation in mood)
- Preoccupation with death and morbid themes
- Overt or veiled threats (e.g., "I won't be around much longer")
- Actions that indicate "putting one's affairs in order" (e.g., giving away prized possessions)

Teachers must take any of these warning signs seriously and seek help from trained professionals, such as a school psychologist or counselor, *immediately*.

Foster resilience in students.

Resilient students usually have one or more individuals in their lives whom they trust and can turn to in difficult times. Such individuals might be family members, neighbors, close friends, adult volunteer mentors in the local community, or school staff members. For example, resilient students often mention teachers who have taken a personal interest in them and been instrumental in their school success. Teachers are most likely to foster resilience in students by demonstrating true affection and respect for them, being available and willing to listen when students have concerns, holding high expectations for their performance, and providing the encouragement and support students need to succeed both inside and outside the classroom (these are consistent with the caring strategies provided in Chapter 5).[287]

Above all, teachers who have high success rates with students at risk tend to be those who, through both words and deeds, communicate a genuine sense of caring, concern, and high regard for students as human beings. And in general, the most effective teaching strategies for students at risk are those that would be ideal for *any* student.

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[284] J. M. Chan & O'Reilly, 2008; Clarke et al., 1995; Dalrymple, 1995; Evertson & Weinstein, 2006; Hertel & Mathews, 2011; Leaf et al., 2012; Myles & Simpson, 2001; Wentzel et al., 2009.

[285] Champagne & Mashoodh, 2009; Dodge, 2009; Furman & Collins, 2009; Goldston et al., 2008; Herman et al., 2020; Hyman et al., 2006; Leadbeater & Hoglund, 2009.

[286] Kerns & Lieberman, 1993; Wiles & Bondi, 2001.

[287] Bukowski et al., 2009; E. Chen, 2012; DuBois et al., 2011; Masten & Coatsworth, 1998; D. A. O'Donnell et al., 2002.

Summary

To summarize our discussions of personal, social, and moral development, we now return to the Big Ideas presented at the beginning of the chapter.

7.1 Personal Development

Big Idea 7.1 Students' personalities, sense of self, and identities are gradually shaped by traits, environmental contexts, and maturational changes in the brain.

Children's and adolescents' personalities are the result of complex interactions between heredity (e.g., temperament traits, genetically controlled brain maturation) and environment (e.g., parenting styles, cultural standards for behavior). Their personality traits lead them to behave somewhat consistently across situations, although distinctly different contexts can elicit distinctly different behaviors. For example, a child might be talkative with one or two close friends but shy and quiet in a large group setting.

As children grow older, they construct increasingly complex and abstract understandings of who they are as people, and these understandings affect their actions and activity choices. They derive their self-perceptions, collectively known as *sense of self*, not only from their own prior successes and failures but also from the behaviors of others, from the achievements of groups to which they belong, and from their racial-ethnic, gender, and sexual orientation identities. Ultimately, children and adolescents socialize *themselves* to a considerable degree, conforming to their own, self-constructed ideas about appropriate behavior.

Students are more likely to be academically successful and to acquire a positive sense of self when teachers accommodate their diverse temperaments and help them identify areas of particular talent. At the same time, teachers must communicate clear standards for behavior, explain why some behaviors are unacceptable, and, when possible, channel students' risk-taking tendencies into productive activities.

7.2 Social Development

Big Idea 7.2 Students must have good social skills and be able to interpret and respond to various social situations and problems in productive ways if they are to benefit fully from their interactions with peers.

Healthy peer relationships are critical for optimal personal and social development. Peers provide a testing ground for emerging social skills, help one another with challenging tasks, offer support and comfort in times of trouble or uncertainty, and are influential socialization agents. Furthermore, peers provide opportunities for young people to take others' perspectives, draw conclusions about others' motives and intentions, and develop workable solutions to interpersonal problems.

Children often form friendships even before they reach kindergarten or first grade. As they move through the school years, many of them form larger social groups (perhaps cliques, crowds, or gangs), and some also form romantic relationships. Yet certain students are consistently rejected or neglected by their peers, and these students may need a good deal of teacher support.

Most children and adolescents actively try to make sense of their social world. With age, this *social cognition*—thinking about what other people might be thinking and feeling and hypothesizing about how others might act and react in various situations—becomes increasingly complex and insightful, enabling effective interaction with adults and peers. But some young people have difficulty interpreting social cues in productive ways and may have few effective social skills. Such difficulties can occasionally lead to aggressive and potentially dangerous actions toward others.

Some types of aggression involve behaviors that might cause another person physical harm. But other forms—collectively known as *psychological aggression*—involve behaviors intended to inflict mental anguish or reduce self-esteem. An especially devastating form of psychological aggression is *cyberbullying*, in which someone uses a phone or the Internet to make embarrassing information or photographs available to a large number of peers.

Teachers can help students acquire effective social skills by fostering perspective taking and empathy, as well as by providing opportunities for social interaction and cooperation. Some students need to be explicitly taught social skills (e.g., social information processing skills) and what bullying is and why it's not tolerated. Teachers can also take steps to encourage communication and interaction among students with diverse backgrounds and characteristics.

7.3 Moral and Prosocial Development

Big Idea 7.3 Some signs of moral reasoning and prosocial behavior emerge early in life, but key components of morality continue to evolve over the course of childhood and adolescence.

As children move through the grade levels, most acquire a clear sense of right and wrong, such that they behave in accordance with prosocial standards for behavior rather than acting solely out of self-interest. This developmental progression is the result of many things, including increasing capacities for empathy and abstract thought, an evolving appreciation for human rights and other people's welfare,

and ongoing encounters with moral dilemmas and problems. Even at the high school level, however, students don't always take the moral high road because personal needs and self-interests often enter into their moral decision making.

Teachers can promote moral reasoning and altruistic behavior by modeling appropriate behavior, discouraging cheating, and engaging students in regular discussions about social and moral issues. Getting students actively involved in community service or critical service-learning experiences can also foster empathy and more advanced moral reasoning.

7.4 Students Who Face Exceptional Personal or Social Challenges

Big Idea 7.4 Students who most need teachers' guidance and support are those who face exceptional personal or social challenges.

All students need ongoing teacher support and guidance, but supportive teachers are especially important for (1) students who face more than their fair share of challenges at home, (2) students who are homeless, (3) students who have little or no involvement in their peer group's social life, and (4) students with disabilities or emotional problems that adversely affect their social and psychological well-being. Some of these students—and certain other students as well—are at high risk for dropping out of school, perhaps because of chronically low academic achievement or perhaps because of a lack of emotional attachment to the school community.

Teachers should remain optimistic that they *can* make a difference in getting many of these at-risk students on the road to greater academic and social success. Teachers can do so by helping students believe that they can succeed in the classroom and by creating interesting classroom activities that are relevant to students' lives. Teachers can also connect students and families to resources, watch for signs of abuse, know the signs of severe depression and possible suicide, and support students who may be social outcasts or who have disabilities that affect their personal or social functioning. Ultimately, building caring relationships with students at risk can go a long way in fostering resilience in these students.

Case Study Practice Exercises

The Scarlet Letter

Ms. Southam's 11th-grade English class has been reading Nathaniel Hawthorne's *The Scarlet Letter*. Set in 17th-century Boston, the novel focuses largely on two characters who have been carrying on an illicit love affair: Hester Prynne, a young woman who has not seen or heard from her husband for the past 2 years, and the Reverend Arthur Dimmesdale, a pious and well-respected local preacher. When Hester becomes pregnant, she is imprisoned for adultery and eventually bears a child. The class is currently discussing Chapter 3, in which the governor and town leaders, including Dimmesdale, are urging Hester to name the baby's father.

Ms. Southam: The father of the baby . . . how do you know it's Dimmesdale . . . the Reverend Arthur Dimmesdale? . . . What are the clues in the text in Chapter 3? . . . Nicole?

Nicole: He acts very withdrawn. He doesn't even want to be involved with the situation. He wants the other guy to question her, because he doesn't want to look her in the face and ask her to name *him.*

Ms. Southam: OK. Anything else? . . .

Student: The baby.

Ms. Southam: What about the baby?

Student: She starts to cry, and her eyes follow him.

Ms. Southam: That is one of my absolutely favorite little Hawthornisms.

Ms. Southam reads a paragraph about Dimmesdale and asks students to jot down their thoughts about him. She then walks around the room, monitoring what students are doing until they appear to have finished writing.

Ms. Southam: What pictures do you have in your minds of this man . . . if you were directing a film of *The Scarlet Letter*?

Mike: I don't have a person in mind, just characteristics. About five-foot-ten, short, well-groomed hair, well dressed. He looks really nervous and inexperienced. Guilty look on his face. Always nervous, shaking a lot.

Ms. Southam: He's got a guilty look on his face. His lips always trembling, always shaking.

Mike: He's very unsure about himself.

Matt: Sweating really bad. Always going like this. (Matt shows how Dimmesdale might be wiping his forehead.) He does . . . he has his hanky. . . .

Ms. Southam: Actually, we don't see him mopping his brow, but we do see him doing what? What's the action? Do you remember? If you go to the text, he's holding his hand over his heart, as though he's somehow suffering some pain.

Student: Wire-framed glasses. . . . I don't know why. He's like. . . .

Mike: He's kind of like a nerd-type guy. . . . Short pants. . . .

Ms. Southam: But at the same time . . . I don't know if it was somebody in this class or somebody in another class. . . . he said, "Well, she was sure *worth* it." Worth risking your immortal soul for, you know? . . . Obviously she's sinned, but so has he, right? And if she was worth it, don't we also have to see him as somehow having been worthy of her risking *her* soul for this?

Student: Maybe he's got a good personality. . . .

Ms. Southam: He apparently is, you know, a spellbinding preacher. He really can grab the crowd.

Student: It's his eyes. Yeah, the eyes.

Ms. Southam: Those brown, melancholy eyes. Yeah, those brown, melancholy eyes. Absolutely.

1. Constructed-response question

In this classroom dialogue Ms. Southam and her students speculate about what the characters in the novel, especially Arthur Dimmesdale, might be thinking and feeling. In other words, they are engaging in social cognition.

A. Identify two examples of student statements that show social cognition.

B. For each example you identify, explain what it reveals about the speaker's social cognition.

2. Multiple-choice question

Ms. Southam does several things that are apt to enhance students' perspective-taking ability. Which one of the following is the best example?

a. She models enthusiasm for the novel ("That is one of my absolutely favorite little Hawthornisms").

b. She walks around the room as the students write down their thoughts about Dimmesdale.

c. She points out that Dimmesdale is "holding his hand over his heart, as though he's somehow suffering some pain."

d. She agrees with Mike's description of Dimmesdale as having a guilty look on his face.

Chapter 8
Instructional Strategies

Photo by Unsplash

Big Ideas to Master in this Chapter

8.1 Effective teachers identify the knowledge and abilities they want students to acquire, and they plan instruction accordingly.

8.2 Sometimes instruction is most effective when it is teacher-directed—that is, when the teacher chooses the specific topics to be studied and the general course of a lesson.

8.3 Sometimes instruction is most effective when it is student-directed—that is, when students have some control over the issues to be addressed and the ways in which to address them.

8.4 Different instructional strategies are appropriate for different instructional goals and for different students.

Case Study: Westward Expansion

Martin Quinn's sixth-grade class is studying the westward expansion in North America during the middle 1800s. The overall unit lesson includes the reasons for the westward expansion, as well as its effects on the Native Americans and their lands, culture, religion, and politics. Today's lesson is about a typical journey west in a covered wagon. Mr. Quinn begins by showing a 19th-century U.S. map on a screen at the front of the room. "Many people traveled by steamship up the Missouri River to the town of Independence," he says, and he uses a pointer to trace the route on the map. "Then they continued west in a covered wagon until they reached their final destination—maybe Colorado, Oregon, or California." He now shows several old photographs of people traveling in covered wagons and says, "A typical covered wagon was about 4 feet wide and maybe 10 or 12 feet long." He has two students use masking tape to mark a 4-by-10-foot rectangle on the classroom floor. "How much room would a wagon with these dimensions give you for your family and supplies?" The students agree that people would have to be quite selective about what they brought with them on the trip west.

"All right," Mr. Quinn continues, "let's think about the kinds of things you would need to pack in your wagon. Let's start with the kinds of food you'd want to bring and how much of each kind you should pack." He divides the students into groups of three or four members each and has them brainstorm what might seem to be a reasonable grocery list. After a few minutes, he writes each group's suggestions on the board.

At this point, Mr. Quinn clicks on an Internet link and projects an electronic copy of John Lyle Campbell's pamphlet *Idaho: Six Months in the New Gold Regions: The Emigrant's Guide*, published in 1864. "This pamphlet provided advice for a party of four men who might be traveling west to seek their fortunes in the quartz mining boom in Idaho." The pamphlet lists many things that the students haven't thought of and suggests much larger amounts than the students have estimated. For example, it recommends 12 sacks of flour, 400 pounds of bacon, 100 pounds of coffee, 15 gallons of vinegar, 50 pounds of lard, and "one good cow for milking purposes."

"What do you think about the list?" Mr. Quinn asks. "Does it make sense?" The students have varying opinions: "Fifty pounds of lard—eeuuww, gross! Isn't that stuff really bad for your arteries or something?" "We *way* underestimated our flour." "I don't understand why they needed to bring so much coffee." "The cow's a good idea, though."

Mr. Quinn's next question is, "*Why* did people need all of these things? Let's talk about that for a bit."

Answer the following two questions before you read further:

1. What specific instructional strategies does Mr. Quinn use to engage and motivate his students?
2. What strategies does he use to help them learn and remember the content of the lesson?

To engage and motivate his students, Mr. Quinn arouses their interest through a physical activity (students mark a "wagon" on the floor), creates cognitive dissonance (the list in the pamphlet is quite different from the ones the students have generated), and makes the lesson a very social, interactive one. And he promotes learning and understanding, in part, by encouraging visual imagery and elaboration; for example, by making the subject matter concrete and vivid (through the old photographs and masking-tape wagon) and by asking students to speculate about why such things as lard and coffee might have been important to have.

Much of Mr. Quinn's lesson reflects **teacher-directed instruction** because the teacher chooses which topics will be addressed and carefully structures students' activities. However, one of Mr. Quinn's strategies (having students develop grocery lists in small cooperative groups) reflects **student-directed instruction**, in which students have some control

Chapter Outline

Case Study: Westward Expansion

8.1 Planning Instruction

8.2 Conducting Teacher-Directed Instruction

8.3 Conducting Student-Directed Instruction

8.4 General Instructional Strategies

Summary

Case Study Practice Exercises: Cooperative Learning Project

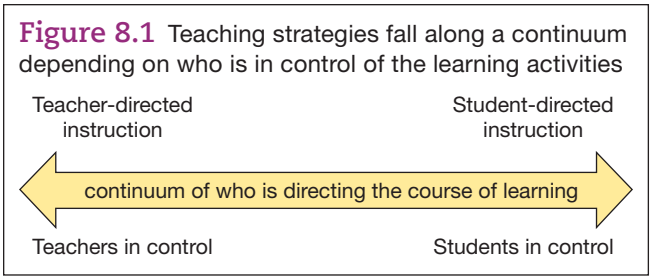


Figure 8.1 Teaching strategies fall along a continuum depending on who is in control of the learning activities

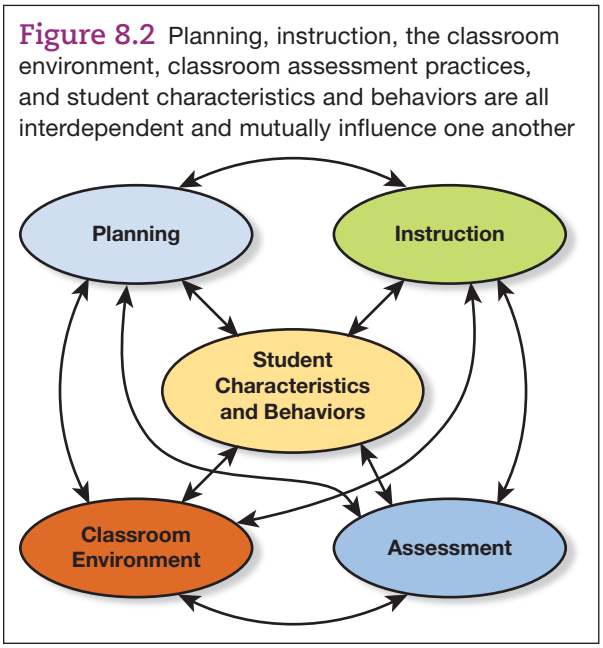


Figure 8.2 Planning, instruction, the classroom environment, classroom assessment practices, and student characteristics and behaviors are all interdependent and mutually influence one another

regarding what they do and learn. Decisions about whether to use teacher-directed or student-directed strategies—or to combine both kinds of strategies into a single lesson, as Mr. Quinn does—should be based on the goals for instruction, on students' current abilities, and on students' motivation and engagement. The distinction we're making here is that teaching strategies fall along a *continuum* from teacher-directed instruction to student-directed instruction because instructional strategies can vary considerably in the degree to which teachers and students direct—that is, *control*—the learning activities (see Figure 8.1).[1]

In this chapter, we build on what we've learned about human learning, cognition, motivation, and development to identify effective strategies for both planning and carrying out instruction. As we examine in Chapter 9 and Chapter 10, planning and carrying out instruction are closely intertwined with two other essential elements of teaching: creating an effective classroom environment (Chapter 9) and assessing students' ongoing achievement levels (Chapter 10). But at the heart of it all, *student characteristics and behaviors* must drive what teachers do in the classroom. To repeat a point made in Chapter 1, teachers' classroom strategies should be centered around the learner (see Figure 8.2). However, these strategies don't always have to be student-directed if it is more appropriate to use teacher-directed approaches to meet the instructional goals and the needs of students. Teaching strategies should also encompass **evidence-based practices**—that is, they should be ones that research has consistently shown to be effective in helping students learn and achieve.

8.1 Planning Instruction

Big Idea 8.1 **Effective teachers identify the knowledge and abilities they want students to acquire, and they plan instruction accordingly.**

Good teachers engage in considerable advance planning: They identify the information and skills they want students to acquire, determine an appropriate sequence in which to teach the knowledge and skills, and develop classroom lessons and activities that will maximize learning and keep students motivated and on task. Ideally, teachers also coordinate their plans with one another—for example, by identifying common goals toward which everyone will strive or by developing interdisciplinary units that involve two or more classes and subject areas.

The following strategies are key elements of effective instructional planning.

Begin by identifying what students should ultimately know and be able to do.

An essential step in planning instruction is to identify the specific things students should accomplish during a lesson or unit, as well as the things they should accomplish over the course of the semester or school year. Educators use a variety of terms for such end results,

[1] Some educators instead use the terms *teacher-centered* and *learner-centered*; however, because all instructional strategies should be centered (focused) on what and how students are learning, we prefer to use the terms *teacher-directed* and *student-directed*. The essential difference here lies in who *controls* the instructional activity.

including *goals*, *objectives*, *outcomes*, *targets*, *competencies*, *benchmarks*, and *standards*. In this text, we typically use the term **instructional goals** when referring to general, long-term outcomes of instruction. We use the term **instructional objectives** when referring to more specific outcomes of a particular lesson or unit.

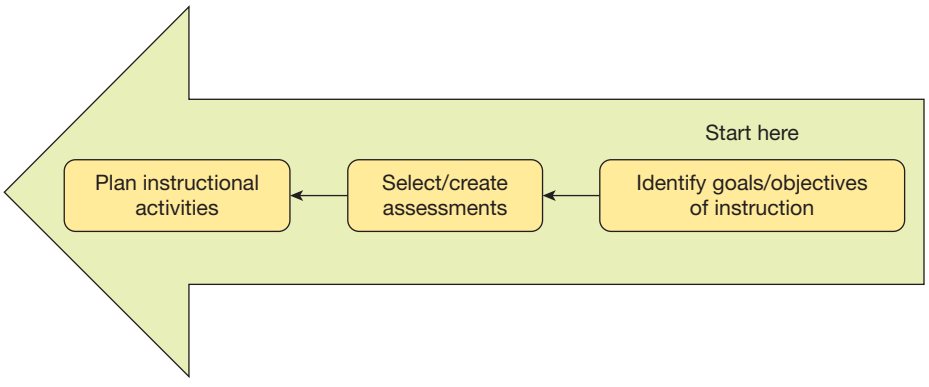
Regardless of the terminologies they use, experts agree that the desired end results of instruction should influence what teachers teach, how they teach it, and how they assess students' learning and achievement. In fact, as a general rule, teachers should *begin* the planning process by determining what they ultimately want students to know and be able to do. One widely recommended approach is a **backward design**, in which teachers proceed "backward" by thinking about the end results first and then working backward to figure out how they want to start the learning experience. Thus, in backward design, teachers proceed through this sequence:[2]

1. Identify the desired end results in terms of knowledge and skills that students should attain—ideally including meaningful learning, conceptual understanding, and complex cognitive processes.
2. Determine acceptable evidence—in the form of performance on various classroom assessment tasks—to verify that students have achieved those results.
3. Plan learning experiences and instructional activities that enable students to master the knowledge and skills identified in Steps 1 and 2.

With such an approach, teachers essentially *begin at the end* by identifying the instructional goals/objectives of the instruction and then choosing assessments and instructional activities specifically related to that end (see Figure 8.3). For example, if the objective for a unit on addition is *rapid retrieval* of number facts, a teacher might create a timed quiz to assess students' ability to recall the facts quickly, and the instructional activities might include the use of a math app on a tablet to allow students to practice and gain automaticity for the facts. But if the objective is *application* of number facts, a teacher may instead want to focus assessment methods and instructional strategies on word problems or, better still, on activities involving real objects and hands-on measurements.

Knowing the desired final outcomes of instruction benefits not only teachers—who can then choose appropriate assessments and instructional methods—but students as well. When students know what they need to accomplish, they can make more informed decisions about how to focus their efforts and allocate their study time,

Figure 8.3 The backward design approach involves teachers beginning with the goals and objectives of instruction and working "backward" by then selecting or creating assessments and planning their instructional activities



[2] Tomlinson & McTighe, 2006; Wiggins & McTighe, 2011.

and they can more effectively monitor their comprehension as they read and study.[3] For example, if their teacher tells them that they should be able to apply science and math to everyday situations, they'll probably think about and study these subject areas very differently than if they somehow get the message that they should memorize definitions and formulas.

Align long-term instructional goals with appropriate standards for various content domains.

Teachers don't pull their goals and objectives out of the blue, of course. One source of guidance comes from **content-area standards** identified by national and international discipline-specific professional groups (e.g., National Council for Geographic Education, National Association for Music Education). Such standards are typically in the form of general statements regarding the knowledge and skills that students should acquire at various grade levels in a particular content domain, as well as the characteristics that their students' accomplishments should reflect.

Also, in the United States, state departments of education have established comprehensive lists of standards in reading, writing, math, science, and social studies and sometimes in such domains as art, music, foreign languages, and physical education. Many U.S. states have jointly adopted a set of **Common Core State Standards** in mathematics and English language arts (available at corestandards.org), and some have signed on to the **Next Generation Science Standards** (available at nextgenscience.org). Table 8.1 presents examples of reading skills identified in the Common Core State Standards for English Language Arts, along with instructional strategies potentially useful in helping students acquire those skills. Notice that the two columns are in two different colors to help you remember that statements in the "Standards" column refer to things that *students* should be able to do, whereas statements in the "Strategies" column offer suggestions about what *teachers* might do.

Also notice that two of the examples presented in the rightmost column of Table 8.1 are suggestions for either science or history instruction. Teachers in *all* content domains must strive to enhance students' literacy skills. For example, we refer you to the supplementary standards "Grades 6–12 Literacy in History/Social Studies, Science, & Technical Subjects" described on the Common Core website (go to www.corestandards.org/ELA-Literacy).

In recent years, many teachers, parents, and policymakers have voiced major concerns about the use of the Common Core standards in their states and local school districts. By and large, the concerns they've raised reflect a great deal of misinformation about the intent and implementation of these standards. In an effort to counter such misconceptions, here are a few basic facts about Common Core:

- Development of the standards was the joint initiative of many state governors and state commissioners of education in an effort to ensure that high school graduates in their states would be prepared for college and meaningful careers. The U.S. federal government was *not* involved in developing the standards, nor has it mandated their use in public schools.
- The standards do *not* prescribe particular instructional methods; in fact, the developers have emphatically stated that local schools and teachers should make their own decisions about how best to help students achieve the standards.
- The standards do *not* prescribe particular assessment tools for measuring students' achievement of the standards; for example, they do *not* require that students' achievement be assessed by one or more multiple-choice achievement tests. (Any tests that currently exist for this purpose have been developed by private companies and have *not* been endorsed by the developers of Common Core.)

[3] Gronlund & Brookhart, 2009; McAshan, 1979.

Developmental Trends

Table 8.1 Examples of How You Might Align Instructional Strategies with Common Core State Standards at Different Grade Levels

GRADE LEVEL	EXAMPLES OF COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS	EXAMPLES OF INSTRUCTIONAL STRATEGIES THAT ADDRESS THESE STANDARDS
Photo by Unsplash **GRADE 2**	Ask and answer such questions as *who, what, where, when, why,* and *how* to demonstrate understanding of key details in a text. (Reading literature, Grade 2, Standard 1)	During "settling-down" time immediately after lunch each day, read a chapter of a high-interest children's novel, stopping frequently to ask questions that require students to go beyond the text itself (e.g., ask students to speculate about what a character might be feeling).
	Recount stories, including fables and folktales from diverse cultures, and determine their central message, lesson, or moral. (Reading literature, Grade 2, Standard 2)	Have several students create props for and act out a story they have recently read, with other class members serving as the audience. Follow up with a class discussion of important lessons that one or more story characters might have learned from events or challenges they faced.
JohnnyGreig/E+/ Getty images **GRADE 4**	Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (Reading literature, Grade 4, Standard 1).	As a reading group discusses Carl Hiaasen's *Hoot*, ask students to speculate about how the plot might progress and to identify clues in the text that support their predictions.
	Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (Reading information text, Grade 4, Standard 3)	When students are reading a chapter in their history textbook, ask *why* questions that encourage cause-and-effect connections (e.g., "Why did Columbus's crew want to sail back to Europe after several weeks on the open sea?").
Photo by Unsplash **GRADE 7**	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to the development of the ideas. (Reading information text, Grade 7, Standard 5)	Before students read a chapter in their science textbook, have them use its headings and subheadings to (1) create a general outline of the chapter and (2) generate questions they hope to answer as they read the chapter. Then, for homework, ask them to read and take notes on the chapter, using the outline and self-questions as guides for note taking.
	Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (Reading information text, Grade 7, Standard 8)	Give students an advertisement for a self-improvement product (e.g., a health supplement or exercise equipment); have them work in small cooperative learning groups to (1) identify the advertiser's motives and (2) evaluate the quality of evidence for the product's effectiveness.
Photo by Unsplash **GRADES 11–12**	Analyze and evaluate the effectiveness of the structure an author uses in his or her position or argument, including whether the structure makes points clear, convincing, and engaging. (Reading information text, Grades 11 and 12, Standard 5)	Describe common techniques in persuasive writing, and have students identify the various persuasive techniques used in newspaper editorials.
	Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text. (Reading information text, Grades 11 and 12, Standard 6)	Ask students to identify the unstated assumptions underlying two news magazines' depictions of the same event (e.g., an assumption that one group is good or right, and another is bad or wrong).

Source: Excerpts from Common Core State Standards. National Governors Association for Best Practices and Council of Chief State School Officers.

The website corestandards.org addresses these and many other myths about Common Core; we strongly urge you to take a look at this website.

Keep in mind that existing content-area standards focus almost exclusively on what students should achieve in reading, writing, and various academic content domains. They largely overlook goals that lie *outside* particular content areas—for instance, goals related to technological literacy, effective study strategies, self-regulation techniques, and good social skills. The International Society for Technology in Education has developed standards that

can help teachers enhance students' knowledge and skills related to using digital technologies and the Internet—for instance, how to create authentic technology-based products and how to evaluate and synthesize information available on websites (available at iste.org/standards). But with an eye toward enhancing students' long-term academic and social success both at school and in the outside world, teachers should also formulate some of their *own* goals and objectives for instructional activities.

Include goals and objectives at varying levels of complexity and sophistication.

Notice that the standards presented in Table 8.1 focus largely on meaningful learning and complex cognitive processes, such as drawing inferences, analyzing and critically evaluating ideas, and so on. Such processes must be important components of teacher-developed goals and objectives as well. One simple tool that can help teachers broaden their view of what students should learn and be able to do is a 2001 revision of **Bloom's taxonomy**, a list of six general categories of cognitive processes that includes remembering (retrieving knowledge from long-term memory), understanding (constructing meaning), applying (using knowledge), analyzing (dividing information into parts and relating the parts to one another), evaluating (making judgments about information based on criteria), and creating (putting together knowledge or procedures to form a coherent whole) (see Chapter 3 for more explanation of Bloom's revised taxonomy).[4]

Another helpful taxonomy can be found in *Understanding by Design*, a popular resource for guiding teachers through the backward-design process.[5] This taxonomy identifies six forms ("facets") that students' understanding of a topic might take:

1. *Explanation:* Integrating various bits of information into meaningful wholes (e.g., knowing the *hows* and *whys* of various facts and principles), drawing appropriate inferences, and possibly helping others understand the subject matter
2. *Interpretation:* Making sense of and identifying the underlying meanings of events, data, documents, and works of art and literature
3. *Application and adjustment:* Using acquired knowledge in new situations and diverse contexts
4. *Perspective:* Considering various points of view regarding an issue; trying to minimize bias in one's own analysis of the issue
5. *Empathy:* Looking at a situation or issue from a particular individual's or group's vantage point, perhaps based on the individual's or group's feelings or general worldviews
6. *Self-knowledge:* Identifying gaps in one's own understandings, as well as personal prejudices that might distort one's views and interpretations

Neither of the preceding taxonomies provides an exhaustive list of what students should be able to do while learning classroom subject matter; for example, neither taxonomy includes psychomotor skills. Nor do the particular sequences of items necessarily reflect progressions from simpler to more complex processes.[6] Even so, the taxonomies provide helpful reminders that there's much more to school learning and academic achievement than learning and recalling discrete facts.

The Classroom Strategies box "Identifying Goals and Objectives of Instruction" offers several suggestions that experienced educators have found to be helpful in guiding instruction and classroom assessment practices.

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[4] L. W. Anderson & Krathwohl, 2001.
[5] Wiggins & McTighe, 2005, 2011.
[6] L. W. Anderson & Krathwohl, 2001; Iran-Nejad & Stewart, 2010; Marzano & Kendall, 2007.

Classroom Strategies

Identifying Goals and Objectives of Instruction

- **Consult local, state, national, and international standards, but don't rely on them exclusively.**
  When identifying instructional goals for the year, a middle school science teacher takes into account the Next Generation Science Standards (nextgenscience.org), which her state has adopted as a framework for guiding public schools' science curricula. In addition, she identifies specific objectives related to two issues directly affecting many students in her inner-city school district: poor nutrition and air pollution.
- **Be realistic about what can be accomplished in a given time frame; allow time to pursue important topics in depth.**
  Rather than expect students to remember a lot of discrete facts in social studies, a second-grade teacher identifies several "Big Ideas" that students should master during the school year; for instance, the ideas that (1) all people have certain needs and desires that affect their behaviors and (2) different cultural groups may strive to satisfy those needs and desires in different ways.
- **Identify both short-term objectives and long-term goals.**
  A fourth-grade teacher wants students to learn how to spell 10 new words each week. He also wants them to write a coherent and grammatically correct short story by the end of the school year.
- **In addition to goals related to specific topics and content areas, identify goals related to students' general long-term academic success.**
  A middle school teacher knows that early adolescence is an important time for developing the learning and study strategies that students will need in high school and college. Throughout the school year, he continually introduces new strategies for learning and remembering classroom subject matter—for example, effective ways to organize class notes, mnemonic techniques for remembering important facts, and self-questions to answer while reading a textbook chapter—and regularly assesses students' progress in using these strategies.
- **Consider physical, social, motivational, and affective outcomes as well as cognitive outcomes.**
  A physical education teacher wants students to know the basic rules of basketball and to dribble and pass the ball appropriately. She also wants them to acquire a love of basketball, effective ways of working cooperatively with teammates, and a general desire to stay physically fit.
- **Describe goals and objectives not in terms of what the teacher will do during a lesson but in terms of what *students* should be able to do at the *end* of instruction and, ideally, also in ways that point to appropriate assessment tasks.**
  A Spanish teacher knows that students often confuse the verbs *estar* and *ser* because both are translated into English as "to be." He identifies this objective for his students: "Students will correctly conjugate *estar* and *ser* in the present tense and use each one in appropriate contexts." He assesses students' ability to use the two verbs correctly through both paper-and-pencil quizzes and in-class conversations.
- **When formulating short-term objectives, identify specific behaviors that will reflect accomplishment of the objectives.**
  In a unit on building healthy eating habits, a health teacher identifies this objective for students: "Students will create menus for a breakfast, lunch, and dinner that are consistent with the recommended proportions for each food group" (available at choosemyplate.gov).
- **When formulating long-term goals that involve complex topics or skills, list a few abstract outcomes and give examples of specific behaviors that reflect each one.**
  Faculty members at a junior high school identify this instructional goal for all students at their school: "Students will demonstrate effective listening skills, for example, by taking thorough and accurate notes, showing respect for diverse points of view, and seeking clarification when they don't understand."

Sources: Brophy, 2008; Brophy et al., 2009; N. S. Cole, 1990; Gronlund & Brookhart, 2009 ; M. D. Miller et al., 2009; Pellegrino et al., 2001; Popham, 2014; Wiggins & McTighe, 2011.

Ask students to identify some of their own goals for instruction.

With this suggestion, we're simply revisiting a recommendation made in Chapter 5: *Ask students to set some personal goals for learning and performance.* Naturally, student-chosen goals and objectives must be compatible with any mandated standards and with their teachers' goals and objectives. However, most school curricula do allow for some flexibility in what students focus on. For example, different students might choose different gymnastic skills to master, different art media to use, or different historical events to study in depth. By allowing students to identify some of their own goals and objectives, teachers encourage the *goal setting* that's an integral aspect of self-regulation (Chapter 3) and foster the sense of *autonomy* that's so important for motivation (Chapter 5).

Break complex tasks and topics into smaller pieces, identify a logical sequence for the pieces, and decide how best to teach each one.

Instructional planning also involves determining how best to break down complex topics and skills into manageable chunks. As examples, consider these four teachers:

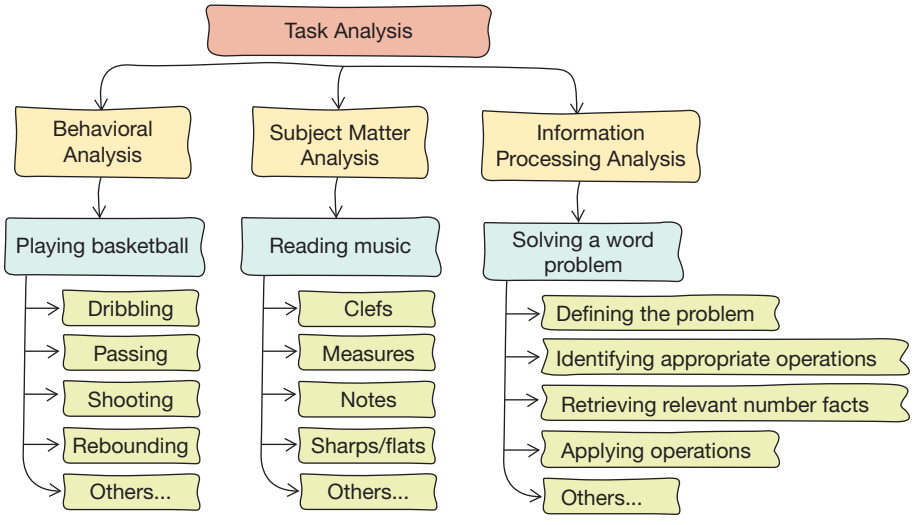
- Ms. Begay, a third-grade teacher, plans to teach her students how to solve arithmetic word problems. She also wants to help them learn more effectively from reading materials.
- Mr. Marino, a middle school physical education teacher, wants his students to develop enough proficiency in basketball to feel comfortable playing either on organized basketball teams or in pick-up games in their neighborhoods.
- Mr. Wu, a junior high school music teacher, hopes to teach his new trumpet students how to play "Jingle Bell Rock" in time for the New Year's Day parade.
- Ms. Flores, a high school social studies teacher, is going to introduce her students to the intricacies of the federal judicial system.

All four teachers want to teach complex topics or skills. Accordingly, each of them should conduct a **task analysis**, identifying the essential behavioral or cognitive aspects of mastering a particular topic or skill. The task analyses can then guide the teachers in their selections of appropriate methods and sequences in which to teach the subject matter.

Figure 8.4 illustrates three general approaches to task analysis:[7]

- **Behavioral analysis.** One way of analyzing a complex task is to identify the specific behaviors required to perform it. For example, Mr. Marino can identify the specific physical movements involved in dribbling, passing, and shooting a basketball. Similarly, Mr. Wu can identify key behaviors his new students must master in order to play a trumpet, such as how to blow into the mouthpiece and the fingerings needed to play different notes.
- **Subject-matter analysis.** Another approach is to break down the subject matter into the specific topics, concepts, and principles it includes. For example, Ms. Flores can identify various aspects of the judicial system (concepts such as *innocent until proven*

Figure 8.4 Three approaches to task analysis



[7] R. E. Clark et al., 2008; Jonassen et al., 1989.

guilty and *reasonable doubt*, the roles that judges and juries play, etc.) and their interrelationships. And Mr. Wu can identify the basic elements of written music that his trumpet students must be able to interpret, such as the treble and bass clefs and quarter, half, and whole notes. Subject-matter analysis is especially important when the subject matter being taught includes many interrelated concepts and ideas that students should learn meaningfully and with conceptual understanding.

- **Information processing analysis.** A third approach is to specify the cognitive processes involved in a task. As an illustration, Ms. Begay can identify the mental processes involved in successfully solving an arithmetic word problem; for instance, correct encoding of the problem (e.g., determining whether it requires addition, subtraction, etc.) and rapid retrieval of basic number facts. Similarly, she can identify specific cognitive strategies useful in reading comprehension, such as finding main ideas, elaborating, and summarizing.

To find out what a task analysis involves, try the following exercise.

See For Yourself

Driving a Car

Imagine that you are teaching students how to drive a car well enough to obtain a driver's license. These students have never driven before. Conduct a task analysis for the processes involved in learning how to drive by completing these two tasks:

1. Decide whether your approach should be a behavioral analysis, a subject-matter analysis, and/or an information processing analysis.
2. Based on the approach(es) you've selected, identify some of the behaviors (for a behavioral analysis); topics, concepts, or principles (for a subject-matter analysis); or cognitive processes (for an information processing analysis) involved.

Chances are good that you chose a behavioral analysis because driving requires many different behaviors. For example, you have to know how to start the car, how to put the car into gear to drive forward or backward, and how to accelerate and brake appropriately. However, you would also need to conduct a subject-matter analysis because driving requires knowledge of a lot of different topics, such as knowledge of traffic laws, roadway signs, and so forth.

Conducting task analyses for complex skills and topics serves at least three important functions in instructional planning.[8] First, by identifying a task's specific components—whether behaviors, concepts and ideas, or cognitive processes—a teacher gains a better sense of what things students need to learn and the sequence in which to most effectively learn them. Second, a task analysis helps a teacher choose appropriate instructional strategies. For example, if one necessary component of solving arithmetic word problems is rapid retrieval of math facts from memory, repeated practice of the facts may be critical for developing automaticity. If another aspect of solving such problems is identifying the relevant operation to apply (addition, subtraction, etc.), then promoting a true understanding of mathematical concepts and principles (perhaps by using concrete manipulatives or authentic activities) is essential.

A third important function of a task analysis is determining what kind of *cognitive load* a new task might impose on students; in particular, whether or not certain aspects of a task might initially put a strain on students' limited working memory capacity (see Chapter 2). Sometimes the analysis will reveal that certain components of a task should

[8] Jonassen et al., 1989; R. E. Mayer, 2011; Stokes et al., 2010; van Merriënboer & Kester, 2008.

be taught separately, one at a time. For instance, Mr. Wu may initially ask his beginning trumpet students to practice blowing into the mouthpiece correctly without worrying about the specific notes they produce. But on other occasions it might be both possible and desirable to teach the desired knowledge and behaviors entirely within the context of the overall task, in part because doing so makes the subject matter meaningful for students. For instance, Ms. Begay should almost certainly teach her students the processes involved in learning effectively from reading materials—elaborating, summarizing, and so on—primarily within the context of authentic reading activities.

Consider how you might motivate students to actively engage in instructional activities.

To truly benefit from classroom activities, students must be motivated to actively *engage* in them.[9] Chapter 5 includes many strategies for fostering students' motivation and engagement. Here we're simply reminding you that effective planning involves not only identifying the knowledge and skills that students need to acquire, but also designing instructional activities that are likely to motivate and engage students by both (1) capturing and keeping students' attention and interest and (2) enhancing their eagerness to persist in the face of academic challenges.

Develop step-by-step lesson plans.

After identifying goals for instruction and perhaps also conducting a task analysis, effective teachers develop one or more **lesson plans** to guide them during instruction. A lesson plan typically includes the following:

- The goal(s) or objective(s) of the lesson and, if applicable, relevant content-area standard(s)
- Instructional materials (e.g., textbooks, handouts, software programs) and equipment required
- Specific instructional strategies and the sequence in which they'll be used
- Assessment method(s) planned

Any lesson plan should also take into account students' developmental levels, prior knowledge, cultural backgrounds, and (if applicable) disabilities and other special educational needs.

Many beginning teachers develop fairly detailed lesson plans that describe how they're going to help students learn the subject matter in question.[10] For instance, when we authors first began teaching, we spent many hours each week writing down the information, examples, questions, and student activities we wanted to use in class during the following week. But as teachers gain experience teaching certain topics, they learn which strategies work effectively and which do not, and they use some of the effective ones frequently enough that they can retrieve them quickly and easily from long-term memory. Thus, as time goes on, planning lessons becomes far less time-consuming, and much of it becomes *mental* planning rather than planning on paper.

In planning lessons, teachers have many resources at their disposal, including experienced teachers' lesson plans in books and on the Internet. For example, the following websites offer lesson plans and related materials concerning a wide range of topics: Smithsonian Institution (https://learninglab.si.edu), Educator's Reference Desk (https://eduref.org), and Discovery Education (https://www.discoveryeducation.com). In taking advantage of such resources, however, teachers must always keep in mind that *lessons should be closely tied to instructional goals and objectives*.

[9] Chi & Wylie, 2014; Jones, 2020.
[10] Calderhead, 1996; Corno, 2008; Sternberg & Horvath, 1995.

You should think of a lesson plan more as a guide than as a recipe—in other words, as a general plan of attack that can and should be adjusted as events unfold. For example, during the course of a lesson, teachers may find it necessary to back up a bit and teach material that they had mistakenly assumed students had already mastered. Or, if students express considerable curiosity or have intriguing insights about a particular topic, teachers might want to capitalize on this unique opportunity—this **teachable moment**—and spend more time exploring the topic than originally planned.

As the school year progresses, teachers' long-range plans may also change somewhat. For instance, teachers might find that initial task analyses of certain topics were overly simplistic or that previous expectations for students' achievement were either unrealistically high or unnecessarily low. Teachers must continually revise their plans as instruction proceeds and as classroom assessments reveal how well students are learning and achieving.

Use class websites to share information and scaffold students' learning.

Teachers should share goals with students and parents throughout the school year. Class websites (e.g., Google Classroom, Moodle) can be an easy means to share information such as instructional goals, lesson topics, homework assignments, due dates, announcements, videos, and handouts. However, if students and/or parents don't have easy access to the Internet, teachers also need to figure out other ways to communicate this information (e.g., take-home paper handouts).

Class websites can also be used to scaffold students' learning. As an example, Jeff Ormrod used the website in Figure 8.5 to scaffold students' learning in his sixth-grade humanities classes. As part of a unit on early humans, his classes had been reading Marjorie Cowley's *Dar and the Spear-Thrower*, and Jeff had regularly posted study guides that encouraged students to elaborate on what they were reading; for example, by posing such questions as "Why does Dar decide to leave his clan to find the stranger?" and "Explain how the 'wind was his enemy.'" The sidebar on the right provided links to various online resources (e.g., Merriam-Webster's online dictionary) and schoolwide blogs.

Figure 8.5 Example of how a class website can provide ongoing scaffolding for students' learning

Source: Created by and used with permission from Jeffrey Scott Ormrod.

8.2 Conducting Teacher-Directed Instruction

Big Idea 8.2 **Sometimes instruction is most effective when it is teacher-directed—that is, when the teacher chooses the specific topics to be studied and the general course of a lesson.**

In the opening case study, Mr. Quinn directs the course of the lesson to a considerable degree. For example, he shows students a map, explains how pioneers traveled across the United States, shows photographs, and asks students questions related to covered wagons. Some forms of teacher-directed instruction are exclusively one-way in nature, in that information goes only from teacher to learners. Examples are lectures, textbook reading assignments, educational videos, and most educational websites. In each case, a "teacher" (e.g., a textbook author, video narrator) presents information without any possibility of getting information or questions from students in return.

Yet other forms of teacher-directed instruction can be quite interactive, with an ongoing exchange of information between students and the teacher (or maybe a virtual "teacher," such as a computer). For example, *lecture-discussions* include opportunities for student input, perhaps in the form of answers to teacher questions, inquiries about ambiguous points, or reactions to certain ideas. In approaches such as *direct instruction* and *computer-based instruction*—both of which we consider shortly—student input is a frequent and essential ingredient despite the considerable control that the teacher or computer programmer has over the content and sequence of the lesson.

In this section, you'll read about the teacher-directed instructional approaches presented in Table 8.2 and the associated strategies that teachers can use to enhance the effectiveness of these approaches. Student-directed approaches are presented next in the following section. However, because teaching approaches fall along a continuum ranging from teachers in control at one end to students in control at the other end (see prior Figure 8.1), labeling teaching approaches as teacher-directed or student-directed is not an exact science and some approaches that we have included in Table 8.2 could've also been placed in the student-directed approaches section, and vice versa. An example is *simulations* because some are very structured with the teacher in control and others give students a lot of freedom to make decisions and control their environment.

Encourage and support students' cognitive processes and motivation.

One of the most common teaching strategies is the **lecture**, which we define broadly as an approach to instruction in which the teacher presents information to students. The teacher could present information live in-person or online (e.g., via Zoom, Skype), pre-recorded online or in a video, or in another format (e.g., podcast). To allow students to become more actively involved in the instruction, teachers can add questioning and discussions to a lecture. For example, in the **lecture-discussion** approach, the teacher presents information and also asks students questions that lead to discussions. Lecture approaches work

Table 8.2 Teacher-Directed Approaches to Instruction

TEACHER-DIRECTED INSTRUCTIONAL APPROACHES	DEFINITION	BEST USED FOR. . .
Lecture	Approach to instruction in which a teacher presents information to students	• Teaching organized bodies of knowledge
Lecture-discussion	Approach to instruction in which a teacher presents information and also asks students questions that lead to discussions	• Teaching organized bodies of knowledge
Direct instruction	Approach to instruction in which a variety of techniques (e.g., explanations, questions, guided and independent practice) are used in a fairly structured manner to promote learning of fundamental knowledge and skills	• Teaching information and skills that are "clear-cut" and best taught in a step-by-step sequence
Mastery learning	Approach to instruction in which students learn one topic thoroughly before moving to a subsequent one	• Teaching subject matter that is hierarchical in nature (i.e., certain concepts and skills provide the foundation for future learning)
Computer-based instruction	Approach to instruction in which academic instruction is provided by means of specially designed computer software, apps, and/or websites (e.g., video games, intelligent tutoring systems)	• Teaching factual knowledge and procedures (e.g., drill-and-practice exercises) • Providing individualized feedback • Presenting tutorials and simulations • Recording student progress • Teaching a very large class • Teaching at a distance (*distance learning*)
Homework	Approach to instruction in which students work on assignments outside of regular class time	• Providing drill-and-practice exercises • Reviewing previously learned information • Applying class content to students' lives

best when students are learning organized bodies of knowledge, such as concepts and the relationships among them.

The effectiveness of a lecture (and any type of teacher-directed instruction) ultimately depends on the particular cognitive processes and motivational strategies that the instruction enables and encourages. Researchers have identified several factors that improve the effectiveness of teacher-directed instruction through the cognitive processes they promote. Table 8.3 describes and illustrates these factors as general principles that teachers should keep in mind when implementing teacher-directed approaches.

In addition to focusing on cognitive processes, lecturers also need to consider students' motivation. Because students are required to listen to the teacher during a lecture, it's easy for them to become passive and not engage in the *active listening* that is needed for them to learn from the lecture. Lecturers can help students remain active listeners using the strategies presented in Chapter 2 to grab and hold students' *attention*, such as encouraging students to take notes, minimizing distractions, and providing breaks when

Table 8.3 Enhancing Cognitive Processing in Teacher-Directed Instruction

GENERAL PRINCIPLE	EDUCATIONAL IMPLICATION	EXAMPLE
Ongoing **connections to prior knowledge** help students learn classroom material more meaningfully, provided that students' existing understandings and beliefs are accurate.	Remind students of something they already know—that is, activate their prior knowledge—and point out how a new idea is related. Also, address any erroneous beliefs students have about the topic (see the discussion of conceptual change in Chapter 2).	Draw an analogy between *peristalsis* (muscular contractions that push food through the digestive tract) and the process of squeezing ketchup from a small packet: "You squeeze the packet near one corner and run your fingers along the length of the packet toward an opening at the other corner. When you do this, you push the ketchup through the packet, in one direction, ahead of your fingers, until it comes out of the opening."
An **advance organizer**—a verbal or graphic introduction that lays out the general organizational framework of upcoming material—helps students make meaningful connections among the things they learn.	Introduce a new unit by describing the major ideas and concepts to be discussed and showing how they are interrelated.	Introduce a unit on vertebrates by explaining: "Vertebrates all have backbones. We'll be talking about five phyla of vertebrates—mammals, birds, reptiles, amphibians, and fish—that differ from one another in several ways, including whether their members are warm blooded or cold blooded; whether they have hair, scales, or feathers; and whether they lay eggs or bear live young."
An **organized presentation** of material helps students make appropriate interconnections among ideas.	Help students organize material in a particular way by presenting the information using that same organizational structure.	Use a concept map to depict the main concepts and ideas of a topic and their interrelationships (see the discussion of concept maps in Chapter 1).
Various **signals** built into a presentation (e.g., italicized print, interspersed questions) can draw students' attention to important points.	Emphasize important ideas—for example, by writing them on the board, asking questions about them, or simply telling students what things are most important to learn.	When assigning a textbook chapter for homework, identify several questions that students should try to answer as they read the chapter.
Visual aids help students encode material visually as well as verbally.	Illustrate new material through pictures, photographs, diagrams, maps, physical models, and demonstrations.	When describing major battles of the American Civil War, present a map showing where each battle took place; point out that some battles were fought in especially strategic locations.
Appropriate **pacing** gives students adequate time to process information (see the explanation of cognitive load in Chapter 2).	Pace a presentation slowly enough that students can draw inferences, form visual images, and in other ways engage in effective long-term memory storage processes.	Intersperse lengthy explanations with demonstrations or hands-on activities that illustrate some of the principles you're describing.
Summaries help students review and organize material and identify main ideas.	After a lecture or reading assignment, summarize the key points of the lesson.	At the end of a unit on poems by Emily Dickinson, summarize her work by describing the characteristics that made her poetry so unique and compelling.

Sources: Brophy et al., 2009; Bulgren et al., 2000; Carney & Levin, 2002; Clement, 2008; Corkill, 1992; Dansereau, 1995; Edmonds et al., 2009; E. L. Ferguson & Hegarty, 1995; J. Hartley & Trueman, 1982; Ku et al., 2008; Levin & Mayer, 1993; M. C. Linn & Eylon, 2011 ; Lorch et al., 1993; R. E. Mayer, 2010; R. E. Mayer & Gallini, 1990; M. A. McDaniel & Einstein, 1989; Moreno, 2006; Newby et al., 1994, p. 4 (peristalsis example); R. E. Reynolds & Shirey, 1988; Scevak et al., 1993; M. Y. Small et al., 1993; Verdi & Kulhavy, 2002; Wade, 1992; P. T. Wilson & Anderson, 1986; Winn, 1991; Zook, 1991.

the lecture is long. Teachers can also use strategies from Chapter 5 to *interest* students in the content by modeling curiosity and enthusiasm about the content topics; incorporating novelty, variety, fantasy, or mystery into the lecture; presenting dramatic stories with novel characters and unusual endings; and relating the content to students' individual interests. Finally, lecturers can ensure that students understand why the content is *useful* to their lives. Students are more likely to pay attention and want to learn when they believe that what they are learning is useful to their personal goals in life.[11]

Ask a lot of good questions to promote and assess learning.

Virtually all effective teachers ask students a lot of good questions. By "good questions," we mean questions that promote learning or provide feedback to the teacher about what students have learned. In fact, asking questions during a group lesson or as a follow-up to an independent reading assignment often enhances student learning.[12]

Questions can prompt students to engage in many types of thinking. In Chapter 3, we presented **Bloom's taxonomy** as a way to categorize different types of thinking (i.e., cognitive processes).[13] This taxonomy can also be used to categorize questions based on the types of thinking they elicit. Figure 8.6 shows the categories in Bloom's taxonomy along with some example questions for each category.

Sometimes it's appropriate to ask **lower-level questions** that require students to *remember* information that they have already learned by retrieving knowledge from their long-term memory. Such questions have several benefits:[14]

- They give teachers a good idea of what prior knowledge and misconceptions students have about a topic.
- They help keep students' attention on the lesson in progress, especially when *all* students must respond to each question in some way.

Figure 8.6 Different questions require students to engage in different types of thinking, as shown here for each category of Bloom's taxonomy

Category	Definition	Example Questions
Remember	Retrieving knowledge from long-term memory	• Which one of these is correct? • What is this?
Understand	Constructing meaning from instructional materials and messages	• How would you explain this? • How would you summarize that? • What are some examples of this?
Apply	Using knowledge in a familiar or new situation	• How would you do that? • How could this be used?
Analyze	Dividing information into its constituent parts and identifying how the parts relate to one another and to an overall structure	• How is this different from that? • How could these things be organized?
Evaluate	Making judgments based on certain criteria or standards	• Based on these guidelines, which one of these is better? • Given these criteria, what are some problems with this?
Create	Putting together knowledge and/or procedures to form a new coherent whole or make an original product	• What could we do with these? • How could we create something useful from these?

[11] Chittum & Jones, 2017; Jones, 2020.
[12] Allington & Weber, 1993; Liu, 1990; Munro & Stephenson, 2009; Redfield & Rousseau, 1981.
[13] L. W. Anderson & Krathwohl, 2001.
[14] Airasian, 1994; Brophy, 2006; F. W. Connolly & Eisenberg, 1990; P. W. Fox & LeCount, 1991; Lambert et al., 2006; Wixson, 1984.

- They help teachers assess whether students are learning class material successfully or are confused about particular points.
- They give students the opportunity to monitor their *own* comprehension—to determine whether they understand the information being presented or, instead, should ask for help or clarification.
- When students are asked questions about material they've studied earlier, they must review that material, which should promote greater recall later on.

Following is an example of how one eighth-grade teacher promoted review of a lesson on ancient Egypt by asking questions:

> ***Teacher:*** The Egyptians believed the body had to be preserved. What did they do to preserve the body in the earliest times?
>
> ***Student:*** They dried them and stuffed them.
>
> ***Teacher:*** I am talking about from the earliest times. What did they do? Carey.
>
> ***Carey:*** They buried them in the hot sands.
>
> ***Teacher:*** Right. They buried them in the hot sands. The sand was very dry, and the body was naturally preserved for many years. It would deteriorate more slowly. . . . What did they do later on after this time?
>
> ***Student:*** They started taking out the vital organs.
>
> ***Teacher:*** Right. What did they call the vital organs then?
>
> ***Norm:*** Everything but the heart and brain.
>
> ***Teacher:*** Right, the organs in the visceral cavity. The intestines, liver, and so on, which were the easiest parts to get at.[15]

This type of questioning can be referred to as an **IRE cycle** (an acronym for Initiate, Respond, and Evaluate): A teacher *initiates* an interaction by asking a question, a student *responds* to the question, and the teacher *evaluates* the response.[16] Similar interactions are found in parent–child interactions; for instance, parents may ask their children questions such as "How old are you?" and "What does a cow say?" and praise them when they answer correctly. But not all parents ask questions in this manner, and children who've grown up in some cultural groups aren't familiar with such question-and-answer sessions when they first come to school. Some of them may even be quite puzzled when teachers ask questions to which they already know the answers.[17]

Although lower-level questions serve important purposes, some learning objectives require more complex cognitive processes. In these cases, teachers need to ask **higher-level questions**—questions that require students to use previously learned information in a new way; that is, to engage in one or more complex cognitive processes (see Figure 8.6).[18]

Yet teachers must give students adequate time to respond to their questions. Just as students need time to process new information, they also need time to consider questions and retrieve knowledge relevant to possible answers. As previously noted in the discussion of wait time in Chapter 2, when teachers allow a few seconds to elapse after asking a question, a greater number of students will volunteer answers, and their responses will tend to be more sophisticated. Furthermore, a short wait time is incompatible with the interactional styles of some cultural groups. People from some cultures leave lengthy

[15] Aulls, 1998, p. 62.
[16] Mehan, 1979.
[17] Adger et al., 2007; Crago et al., 1993; Heath, 1989; Rogoff, 2003, 2007.
[18] Brophy, 2006; Meece, 1994; Minstrell & Stimpson, 1996.

pauses before responding as a way of indicating respect, as this statement by a Northern Cheyenne illustrates:

> Even if I had a quick answer to your question, I would never answer immediately. That would be saying that your question was not worth thinking about.[19]

Students from such cultures are more likely to participate in class and answer questions when given several seconds to respond.[20] An extended wait time both allows students to show respect and gives those with limited English proficiency some mental "translation" time.

In addition to considering the types of thinking that their questions elicit, teachers need to ask questions in an appropriate manner. In other words, teachers need to consider *how* they are asking questions. The Classroom Strategies box "Asking Questions to Promote and Assess Learning" presents examples of how teachers ask questions in an appropriate manner.

Classroom Strategies

Asking Questions to Promote and Assess Learning

- **After asking a question, pause for several seconds of *wait time* before calling on a student to answer so that students have time to consider the question and retrieve knowledge relevant to possible answers.**
  Before Ms. Andrews had even finished asking her question, Xavier had his hand raised and was yelling, "Oh, oh, I know that!" Yet the teacher calmly stated, "Hold on Xavier, give everyone a chance to think," and she waited for several more seconds before calling on someone to answer the question.

- **Direct questions to the entire class, not just to a few students who seem eager to respond. Distributing questions equitably among all students can reduce the tendency to call on primarily high-achieving students and those who are more outgoing.**
  Although Ms. Saluja often calls on students who raise their hands, she occasionally calls on those who don't, and she makes sure that she calls on *every* student at least once a week.

- **Provide a means through which all students can write and show their answers.**
  Sometimes a fourth-grade teacher gives each student a laminated board on which to write their answers to questions she asks during whole-class explanations. Other times, when students are already using their tablets, she has them answer questions using an app and they look on the smartboard to see how everyone has answered. She finds that when all of her students can simultaneously answer her questions this way, they're more attentive and less disruptive during lessons.

- **Ask follow-up questions to probe students' reasoning.**
  In a geography lesson on Canada, a teacher points to the St. Lawrence River on a map and asks, "Which way does the water flow: toward the ocean or away from it?" When one student shouts out, "Away from it!" the teacher asks him, "Why do you think so?" The student's explanation reveals a common misconception: that rivers can flow only from north to south, never vice versa.

- **When students initially struggle with a question, provide sufficient scaffolding to enable them to answer correctly.**
  In a second-grade lesson on the food pyramid, a student incorrectly suggests that orange juice is a member of the "milk" group. His teacher nudges him in the right direction with these hints: "Everything in the milk group comes from a cow. What does orange juice come from? . . . Orange juice comes from oranges. If it comes from oranges, which group is oranges? . . . Is it fruit or bread?" The student acknowledges that oranges are fruit and that orange juice must therefore belong to the fruit group.

- **When a question has only a few possible answers, have students vote on the particular answer they think is correct.**
  When beginning a lesson on dividing one fraction by another, a middle school math teacher writes this problem on the board:

$$\frac{3}{4} \div \frac{1}{2} = ?$$

  She asks, "Before we talk about how we solve this problem, how many of you think the answer will be less than 1? How many think it will be greater than 1? How many think it will be *exactly* 1?" She tallies the number of hands that go up after each question and then says, "Hmmm, most of you think the answer will be less than 1. Let's look at how we solve a problem like this. Then each of you will know whether you were right or wrong."

Sources: Brophy et al., 2009, p. 225 (food pyramid example); Good & Lavigne, 2018 (distributing questions equitably explanation); Lambert et al., 2006 (laminated board example); Tofade et al., 2013 (wait time explanation).

[19] Gilliland, 1988, p. 27.

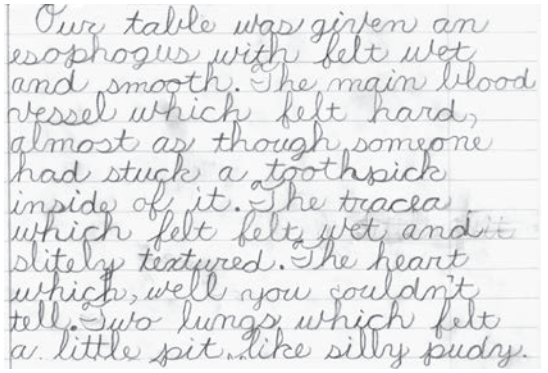
[20] Castagno & Brayboy, 2008; Gilliland, 1988; Mohatt & Erickson, 1981; Tharp, 1989.

Intermingle explanations with examples and opportunities for practice.

You may recall from Chapter 2 that teachers can help students learn concepts effectively by providing examples and nonexamples of the concepts (as well as by providing defining features of the concepts). Providing examples can also help them relate abstract subject matter to real-world objects and events (see Figure 8.7). And by providing many opportunities to practice new knowledge and skills, teachers foster automaticity and increase the likelihood that students will transfer what they've learned to real-world tasks and problems.

An approach known as **direct instruction** makes considerable use of examples and practice opportunities to keep students actively engaged in learning and applying classroom subject matter. This approach involves small and carefully sequenced steps, fast pacing, and a great deal of teacher–student interaction. Each lesson typically involves most or all of the following components:[21]

Figure 8.7 In a unit on anatomy, 10-year-old Berlinda and her classmates gained firsthand experience with components of the respiratory and circulatory systems


Our table was given an esophogus with felt wet and smooth. The main blood vessel which felt hard, almost as though someone had stuck a toothpick inside of it. The trachea which felt felt, wet and slitely textured. The heart which, well you couldn't tell. Two lungs which felt a little pit. like silly putty.

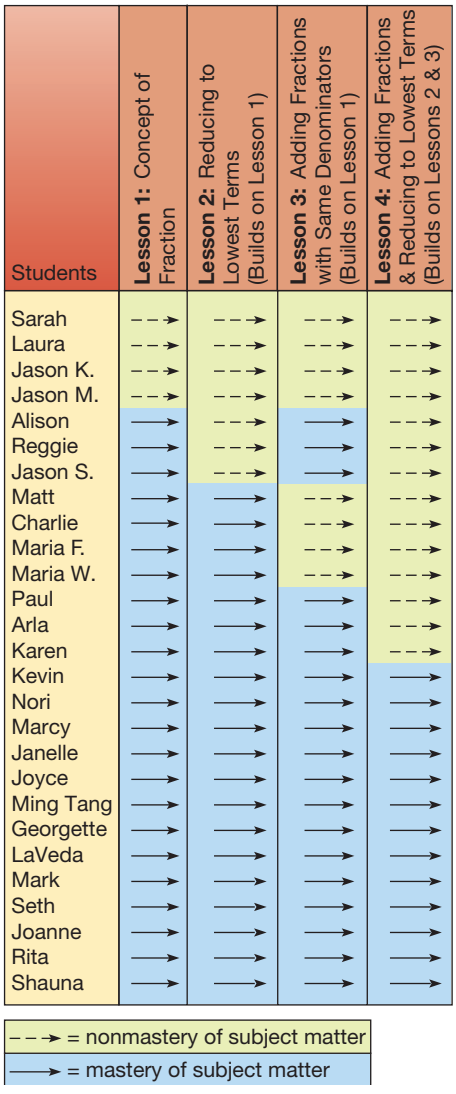
1. **Review of previously learned material.** The teacher reviews relevant content from previous lessons, checks homework assignments involving that content, and reteaches any information or skills that students haven't yet mastered.
2. **Statement of the current lessons' objectives.** The teacher describes one or more concepts or skills that students should master in the new lesson.
3. **Presentation of new material in small, logically sequenced steps.** The teacher presents a small amount of information or a specific skill, perhaps through a verbal explanation, modeling, and one or more examples. The teacher may also provide an advance organizer, ask questions, or in other ways scaffold students' efforts to process and remember the material.
4. **Guided student practice and assessment after each step.** Students have frequent opportunities to practice what they're learning, perhaps by answering questions, solving problems, or performing modeled procedures. The teacher gives hints during students' early responses, provides immediate feedback about their performance, makes suggestions about how to improve, and provides additional instruction as needed. After students have completed guided practice, the teacher checks to be sure they've mastered the information or skill in question, perhaps by having them summarize what they've learned or answer a series of follow-up questions.
5. **Independent practice.** Once students have acquired some degree of competence, they engage in further practice either independently or in small cooperative groups. By doing so, they work toward achieving automaticity for the material in question.
6. **Frequent follow-up reviews.** Over the course of the school year, the teacher provides many opportunities for students to review previously learned material, perhaps through homework assignments, writing tasks, or quizzes.

The teacher moves back and forth among these components as necessary to ensure that all students are truly mastering the subject matter.

Direct instruction is most suitable for teaching information and skills that are "clear-cut" and best taught in a step-by-step sequence.[22] Because of the high degree of teacher–student interaction, it's often implemented more easily with small groups or in one-on-one

[21] Rosenshine, 2009; Rosenshine & Stevens, 1986.
[22] Rosenshine & Stevens, 1986; Spiro & DeSchryver, 2009.

Figure 8.8 Sequential and hierarchical nature of knowledge about fractions



tutoring sessions. Especially in such circumstances, it can lead to substantial gains in achievement.[23] Using direct instruction *exclusively* can be too much of a good thing, however, especially if teachers don't vary instructional methods to maintain students' interest and engagement—for instance, if they just present one drill-and-practice worksheet after another.[24]

Help all students achieve mastery of basic knowledge and skills.

When teachers move through lessons without making sure that all students master the content of each one, they may leave more and more students behind as they proceed. For example, imagine that a class of 27 students, listed in Figure 8.8, is beginning a unit on fractions. The class progresses through several lessons as follows:

> **Lesson 1:** The class studies the basic idea that a fraction represents a part of a whole: The denominator indicates the number of pieces into which the whole has been divided, and the numerator indicates how many of those pieces are present. By the end of the lesson, 23 children understand what a fraction is. But Sarah, Laura, Jason K., and Jason M. are either partly or totally confused.
>
> **Lesson 2:** The class studies the process of reducing fractions to lowest terms (e.g., $\frac{12}{20}$ can be reduced to $\frac{3}{5}$). By the end of the lesson, 20 children understand this process. But Alison, Reggie, and Jason S. haven't mastered the idea that they need to divide both the numerator and denominator by the same number. Sarah, Laura, and the other two Jasons still don't understand what fractions are and so have trouble with this lesson as well.
>
> **Lesson 3:** The class studies the process of adding two fractions, for now looking only at fractions with equal denominators (e.g., $\frac{1}{20} + \frac{11}{20} = \frac{12}{20}$). By the end of the lesson, 19 children can add fractions with the same denominator. Matt, Charlie, Maria F., and Maria W. keep adding the denominators together as well as the numerators (e.g., figuring that $\frac{2}{5} + \frac{2}{5} = \frac{4}{10}$). And Sarah, Laura, Jason K., and Jason M. continue to be puzzled about the general nature of fractions.
>
> **Lesson 4:** The class combines the processes of adding fractions and reducing fractions to lowest terms. They must first add two fractions together and then, if necessary, reduce the sum to its lowest terms (e.g., after adding $\frac{1}{20} + \frac{11}{20}$, they must reduce the sum of $\frac{12}{20}$ to $\frac{3}{5}$). Here we lose Paul, Arla, and Karen because they keep forgetting to reduce the sum to lowest terms. And of course, we've already lost Sarah, Laura, Alison, Reggie, Matt, Charlie, the two Marias, and the three Jasons on prerequisite skills. *We now have only 13 of our original 27 students understanding what they are doing—less than half the class!* (See the rightmost column of Figure 8.8.)

Mastery learning, in which students demonstrate competence in one topic before proceeding to the next, minimizes the likelihood of leaving some students behind as a

[23] Rittle-Johnson, 2006; C. L. Watkins, 1997; Weinert & Helmke, 1995.
[24] Mac Iver et al., 1995; Wasley et al., 1997.

class proceeds to increasingly challenging material.[25] This approach is based on three assumptions:

- Almost every student can learn a particular topic to mastery.
- Some students need more time to master a topic than others.
- Some students need more assistance than others.

As you can see, mastery learning represents a very optimistic approach to instruction. It assumes that most learners *can* learn school subject matter if given sufficient time and instruction. Furthermore, truly mastering a classroom topic increases the odds that students will be able to transfer what they've learned to new situations and problems and to think critically and creatively about it (recall the previous discussions of the *less-is-more* principle in Chapter 2 and Chapter 3).

A mastery learning approach to instruction looks a lot like direct instruction, in that the subject matter is divided into a series of small and logically sequenced steps, numerous opportunities for practice are provided, and learning is assessed after each step. But, in addition, students move to the next step only after demonstrating mastery of the preceding one. Mastery is defined in specific, concrete terms—perhaps answering at least 90% of quiz items correctly. Students engaged in mastery learning often proceed through instructional units at their own pace, and thus different students may be studying different units at any given time.

Mastery learning has several advantages over nonmastery approaches to instruction. In particular, students tend to have a better attitude toward the subject matter, learn more, and perform at higher levels on classroom assessments. The benefits are especially striking for low-ability students.[26]

Mastery learning is most appropriate when the subject matter is hierarchical in nature; that is, when certain concepts and skills provide the foundation for future learning and genuine conceptual understanding. When instructional goals deal with such basics as word recognition, rules of grammar, arithmetic, or key scientific concepts, instruction designed to promote mastery learning may be in order. However, the very notion of mastery may be irrelevant to some long-term instructional goals. For example, skills related to critical thinking, scientific reasoning, and creative writing may continue to improve throughout childhood and adolescence without ever being completely mastered.

Take advantage of well-designed instructional software and websites.

Many instructional software packages, apps, and websites, collectively known as **computer-based instruction (CBI)** (also known as *computer-assisted instruction*), can replace or supplement more traditional instructional methods. The following websites provide some good examples:

Discovery Education: www.discoveryeducation.com

Khan Academy: www.khanacademy.org

National Aeronautic and Space Administration: www.nasa.gov

National Museum of Natural History: www.mnh.si.edu

One especially noteworthy website in the preceding list is Khan Academy, which offers a large and growing collection of instructional videos on a wide variety of topics in math, science, economics, history, art, music, and computing.

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[25] For example, see B. S. Bloom, 1981; Fuchs et al., 2005; Guskey, 1985, 2010; B. J. Zimmerman & Didenedetto, 2008.

[26] Guskey, 2010; Hattie, 2009; C. C. Kulik et al., 1990; Shuell, 1996.

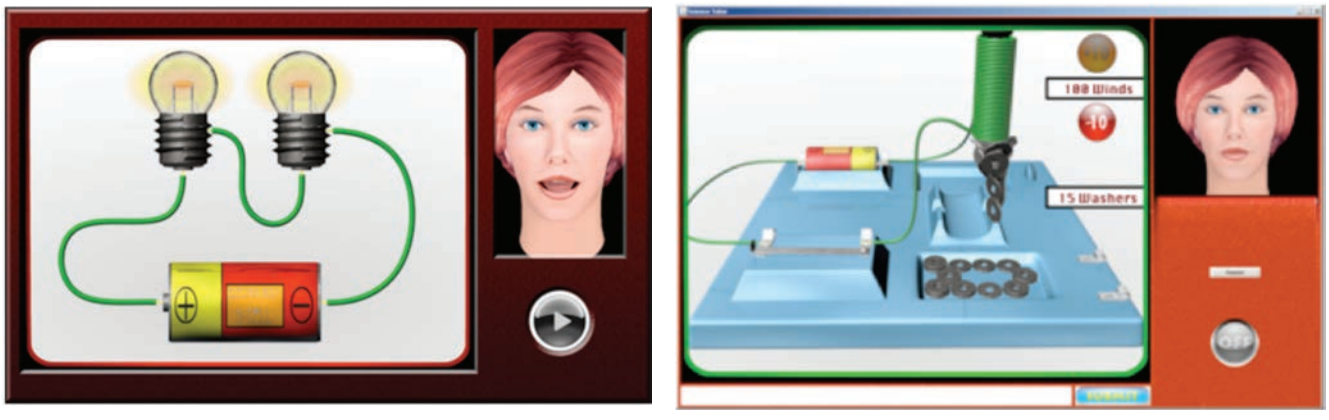
Effective CBI programs incorporate principles of learning and cognition we've considered in earlier chapters. For example, they capture and hold students' attention with engaging tasks and graphics, encourage meaningful learning, and present diverse examples and practice exercises that encourage complex cognitive processes (e.g., problem solving, critical thinking, and scientific reasoning). Students tend to remain physically and cognitively engaged with such programs, in large part because they must continually respond to questions and problems and get regular feedback about how they're doing.

Some CBI programs provide drill and practice of basic knowledge and skills (e.g., math facts, typing, fundamentals of music), helping students develop automaticity in these areas. For example, some high-interest video games can effectively help students practice and master basic math facts.[27] Other CBI programs, known as **intelligent tutoring systems**, skillfully guide students through complex subject matter and can anticipate and address a wide variety of misconceptions and learning difficulties. Still others teach and scaffold complex study strategies, metacognitive skills, and self-regulation (e.g., look once again at Figure 3.9 in Chapter 3 with the screenshot from *Betty's Brain*).

think about it
Think about your own experiences with instructional software and websites. In your view, what qualities enhance learning via computer-based instruction?

A good example of an intelligent tutoring system is *My Science Tutor*, or *MyST*, in which students in the upper elementary grades have one-on-one conversations with "Marni," a computer-animated woman who both talks to them and—through the software's voice recognition and language-processing components—also listens to and understands what they say in response to her questions.[28] Marni typically begins a conversation with a student by activating the student's prior knowledge about the topic, saying something like "What have you been studying in science recently?" Then, after the topic of the lesson has been described, Marni presents a series of illustrations, animations, and interactive simulations and asks more specific questions—for instance, she might ask, "So, what's going on here?" or "What could you do to . . . ?"[29] She tailors subsequent instruction to the student's current understandings and addresses any misconceptions she virtually "thinks" the student might have. Figure 8.9 presents examples of what a student might see on the computer screen in lessons on electric circuits and electromagnetism, respectively.

Figure 8.9 In the intelligent tutoring system *My Science Tutor*, elementary school students converse one-on-one with a virtual tutor, "Marni," who asks questions, "listens" to their answers, and tailors follow-up instruction accordingly. The screenshot on the left shows Marni asking a question about an animated electric circuit. The one on the right shows Marni "watching and listening" as a student experiments with an electromagnet, either increasing or decreasing the number of times the wire winds around the metal core in order to identify its possible effects on the magnet's strength.



Source: From Tom Snyder Productions. Reprinted by permission of Scholastic, Inc.

[27] Plass et al., 2013.
[28] W. Ward et al., 2013.
[29] W. Ward et al., 2013, pp. 1118–1119.

Well-designed CBI programs are often quite effective in helping students learn academic subject matter.[30] They can also be highly motivating, piquing situational interest and giving students the independence and frequent successes that can enhance their feelings of autonomy and competence.[31] But one caveat is in order here: Too *much* independence in choice-making in a program can lead students to flounder aimlessly and not make much progress in their learning. Good CBI programs provide considerable guidance about what students should do at various steps along the way.[32]

A downside of CBI is that it gives students few opportunities for social interaction and therefore does little to address their need for relatedness.[33] Yet it offers several advantages over more traditional instruction. For one thing, CBI programs can include animations, video clips, and spoken messages—components that aren't possible with traditional textbooks and other printed materials. Second, some programs can record and maintain ongoing data for every student, including such information as how far students have progressed in a program, how quickly they respond to questions, and how often they're right and wrong. With such data, teachers can monitor each student's progress and identify students who appear to be struggling with the material. And finally, a computer can be used to provide instruction when teachers aren't able to teach in person. For example, CBI is often used in *distance learning*, a situation in which students receive instruction at a location physically separate from that of their instructor. Distance learning is becoming increasingly common in high schools, where part of students' courseloads might be online courses offered by universities or other accredited agencies.

At later points in the chapter, we explore additional uses of electronic technologies for teaching. Keep in mind, however, that using a digital technology is not, *in and of itself*, necessarily the key to better instruction.[34] New technologies can help students achieve at high levels only when they're consistent with effective instructional principles. Little is gained when a student merely reads information on a computer or tablet screen rather than in a textbook.

Extend the school day with age-appropriate homework assignments.

Students can accomplish only so much during class time, and teachers can increase the length of the school day by assigning **homework**—assignments that students work on outside of regular class time. On some occasions, teachers might use homework to give students extra practice with familiar information and procedures, perhaps as a way of promoting review and automaticity.[35] Or, homework can be used to introduce students to new material, such as when *flipped instruction* is implemented, as we explain in an upcoming section. In other situations, teachers might give homework assignments that ask students to apply classroom subject matter to their outside lives. For example, in a unit on lifestyle patterns, a teacher might ask second-graders to compare their own homes with homes of earlier time periods (e.g., caves, log cabins) and to identify modern conveniences that make their lives easier and more comfortable.[36] On still other occasions, teachers might encourage students to bring items and ideas from home (e.g., small biological specimens from their neighborhood, information about family ancestry) and use them as the basis for in-class activities.[37] When teachers ask students to make connections between classroom material and the outside world through homework assignments, they are promoting

[30] Azevedo & Witherspoon, 2009; Graesser et al., 2014; Kulik & Fletcher, 2016; Ma et al., 2014; Steenbergen-Hu & Cooper, 2014; Tamin et al., 2011.
[31] Blumenfeld et al., 2006; Snir et al., 2003.
[32] Kanar & Bell, 2013; Karich et al., 2014; P. A. Kirschner & van Merriënboer, 2013.
[33] A. Collins & Halverson, 2009; Winn, 2002.
[34] R. E. Clark et al., 2009; Moreno, 2006.
[35] H. Cooper, 1989.
[36] Alleman & Brophy, 1998.
[37] Alleman et al., 2010; Corno, 1996.

transfer and helping students to understand the usefulness of the material, which is critical to keeping students motivated.

Doing homework appears to have a greater effect on achievement in the middle school and high school grades than in the elementary grades.[38] Although homework in elementary school may not enhance achievement very much, it can help students develop some of the study strategies and self-regulation skills they'll need in later years.[39] Undoubtedly the *quality* of assignments—for instance, whether they encourage rote memorization or meaningful learning, whether students find them boring or engaging—makes an appreciable difference both in what and how much students learn and in what kinds of learning and self-regulation strategies they develop.[40]

When assigning homework, teachers must remember that students differ considerably in the time and resources they have at home (e.g., reference books, computers, Internet access), in the amount and quality of assistance they can receive from parents and other family members, and in the extent to which they have the motivation and self-regulation strategies to keep themselves on task.[41] Teachers can maximize the benefits of homework by following a few simple guidelines:[42]

- Use assignments primarily for instructional and diagnostic purposes; minimize the degree to which homework is used to assess learning and determine final class grades.
- Make homework sufficiently intriguing and challenging that students *want* to complete it; for example, give it an authentic, real-world quality, but don't make it so difficult that it leaves students confused and frustrated.
- Provide the information and structure that students need to complete assignments with little or no assistance from others. (And provide enough information that adults or older siblings can understand what's required when students do need assistance.)
- Give a mixture of required and voluntary assignments. (Voluntary ones should help give students a sense of autonomy and control, enhancing their motivation.)
- Discuss homework assignments in class the following day or as soon after that as possible.
- When students have poor self-regulation skills or limited resources at home, establish supervised after-school homework programs.

Teachers must remember, too, that homework is appropriate only to help students achieve important educational goals—*never* to punish students for misbehavior.

8.3 Conducting Student-Directed Instruction

Big Idea 8.3 Sometimes instruction is most effective when it is student-directed—that is, when students have some control over the issues to be addressed and the ways in which to address them.

Student-directed instruction, in which students have considerable control over what and how they learn, often—although not always—involves interaction with classmates. As previously noted in Chapter 4, discussions with peers can enhance learning in

[38] H. Cooper et al., 2006.
[39] H. Cooper & Valentine, 2001; B. J. Zimmerman, 1998.
[40] Dettmers et al., 2010; Trautwein et al., 2006.
[41] Dumont et al., 2012; Eilam, 2001; Fries et al., 2008; Hoover-Dempsey et al., 2001; Xu, 2008.
[42] Alleman et al., 2010; Belfiore & Hornyak, 1998; H. Cooper, 1989; Cosden et al., 2001; Dettmers et al., 2011; Garbe & Guy, 2006; Patall et al., 2010; Trautwein et al., 2006, 2009; Xu, 2008.

numerous ways. For instance, when learners talk about and exchange ideas, they must elaborate on and organize their thoughts, can discover gaps and inconsistencies in their current understandings, and may encounter explanations that are more accurate and useful than their own. Not only can a group of learners engage in such *co-construction* of meaning, but they can also scaffold one another's learning efforts. Clearly, then, learners have a great deal to gain from interacting frequently not only with their teachers but also with one another.

In this section, we explain several strategies that can enhance the effectiveness of student-directed lessons and activities. A summary of these student-directed approaches is provided in Table 8.4.

Table 8.4 Student-Directed Approaches to Instruction

STUDENT-DIRECTED INSTRUCTIONAL APPROACHES	DEFINITION	BEST USED FOR . . .
Discussion **Related approaches** • Debate • Structured controversy	Approach to instruction in which the teacher and students talk to each other with the purpose of exploring or developing students' knowledge, skills, and/or feelings	• Teaching multifaceted and controversial topics • Engaging students in critical thinking • Fostering perspective taking
Cooperative learning **Related approaches** • Jigsaw • Reciprocal teaching	Approach to instruction in which students work with a small group of peers to achieve a common goal and help one another learn	• Teaching content that students can help one another learn • Promoting complex cognitive processes • Fostering perspective taking • Forming personal relationships between students
Inquiry-based learning **Related approaches** • Discovery learning • WebQuest	Approach to instruction in which students answer questions through investigations, such as by conducting experiments, making observations, or collecting information, with the ultimate goal of identifying underlying concepts or principles	• Teaching concepts or principles • Promoting cognitive development • Practicing complex cognitive processes (e.g., self-regulation, metacognition, critical thinking)
Problem-based learning **Related approaches** • Project-based learning • Design-based learning • Engineering design	Approach to instruction in which students acquire new knowledge and skills as they work on a complex problem similar to certain real-world problems	• Developing problem-solving skills • Helping students to transfer knowledge and skills to new situations • Practicing complex cognitive processes (e.g., self-regulation, metacognition, transfer, creativity, critical thinking)
Service-learning **Related approach** • Experiential learning	Approach to instruction in which students (1) provide service to meet a need in a community; (2) learn by applying academic concepts, content, and/or skills to the service experience; and (3) learn by reflecting on the service experience	• Providing authentic, real-world experiences
Instructional simulation	Approach to instruction that simulates real-world activities to provide learners with experiences that promote learning	• Fostering student engagement • Providing individualized feedback • Practicing critical thinking and problem solving • Teaching procedures (e.g., dissection)
Peer tutoring **Related approach** • Apprenticeship	Approach to instruction in which one student provides instruction to help another student master a classroom topic	• Teaching subject matter that the tutor knows well • Teaching students who can benefit from one-on-one instruction (they need more detailed feedback, more time to work on assignments, have more questions, lack motivation) • Allowing students to gain experience teaching others (i.e., to serve as a tutor) • Forming personal relationships between students
Computer-supported collaborative learning • Can be used to support many of the other approaches	Approach to instruction in which students communicate and collaborate via computer technology and the Internet	• Promoting interaction among students • Providing peer feedback • Enhancing motivation • Fostering perspective taking

Have students discuss issues that lend themselves to multiple perspectives, explanations, or approaches.

Class **discussion** is an instructional approach in which the teacher and students talk to each other with the purpose of exploring or developing students' knowledge, skills, and/or feelings. Discussions of multifaceted and possibly controversial topics appear to have several benefits. Students are more likely to voice their opinions if they know there are multiple possible answers. They may, of their own accord, seek out new information that resolves seemingly contradictory data—in other words, they may be motivated to resolve inconsistencies (this an example of cognitive dissonance from Chapter 5 and of Piaget's idea of disequilibrium from Chapter 6). They might reexamine and possibly revise their positions on issues. And they're more apt to develop a meaningful and well-integrated understanding of the subject matter they're studying.[43]

Student discussions can be fruitful in virtually any academic discipline. For example, in language arts, students might discuss various interpretations of classic works of literature, addressing questions with no easy or definitive right answers.[44] In history classes, students can read and discuss various documents related to a single historical event and, as a result, come to recognize that history isn't necessarily as cut-and-dried as traditional textbooks portray it (recall the discussion of epistemic beliefs in Chapter 3).[45] In science classes, discussions of various and conflicting explanations of physical and biological phenomena can enhance scientific reasoning skills, promote conceptual change, and help students begin to understand that science is a dynamic and continually evolving set of concepts and principles rather than just a collection of discrete facts.[46] (This point, too, has implications for students' epistemic beliefs.) And in mathematics, discussions that focus on alternative approaches to solving a single problem can promote more complete understanding, more creative problem solving, and better transfer to new situations and problems.[47]

Academic controversies and conflicts can also engage students in critical thinking as they use evidence to support their positions. Debates and structured controversies are teaching approaches that can be especially useful in structuring discussion to foster critical thinking. *Debates* can be structured in many different ways, but typically they involve one group of students discussing a specific viewpoint with one or more other groups who have different viewpoints. *Structured controversies* are more structured debates in which teachers assign students to research and debate two different positions (see Figure 8.10 for the steps involved).[48] In the end, students develop a report that summarizes their best arguments for both positions, which can develop their critical thinking, synthesis, and evaluation skills.

Students gain more from class discussions when they participate actively in them.[49] However, differences in students' personalities and cultures can affect their participation, as noted in the following examples:

- **Participation in large groups.** Some students may enjoy speaking in front of their classmates. However, others may be less willing to speak in large groups but more willing to speak openly when their audience is only two or three peers rather than the class as a whole. These differences can be especially noticeable for girls and

[43] Jadallah et al., 2011; D. W. Johnson & Johnson, 2009b; Kuhn, 2015; Murphy et al. 2009; Reznitskaya & Gregory, 2013; Sinatra & Mason, 2008.
[44] Applebee et al., 2003; McGee, 1992; Wu et al., 2013.
[45] Leinhardt, 1994; vanSledright & Limón, 2006.
[46] Andriessen, 2006; Bell & Linn, 2002; K. Hogan et al., 2000; M. C. Linn, 2008.
[47] M. M. Chiu, 2008; Cobb et al., 1991; J. Hiebert & Wearne, 1996; Lampert, 1990; Webb et al., 2008.
[48] D. W. Johnson & Johnson, 1988.
[49] Lotan, 2006; A. M. O'Donnell, 1999; Webb, 1989.

Figure 8.10 Steps involved in implementing a structured controversy

Procedures for a Structured Controversy

1. The teacher chooses a topic with two well-documented positions and gathers resources to give to students
2. The teacher places students in a group of 4 students, with 2 students assigned to each one of the 2 positions
3. The teacher explains instructions and provides resources
4. Students use resources to plan how to advocate for their position
5. Two students argue persuasively for their position while the other two students listen, take notes, and ask for clarifications; then the other two students do the same for their position
6. Students switch positions and argue persuasively for the other position; then the other two students argue for the opposite position
7. All 4 students summarize the best arguments for both positions and write a report using evidence to support their rationale for both positions

Source: Johnson, D. W., & Johnson, R. T. (1988). Critical thinking through structured controversy. Educational Leadership, 45(8), 58–64.

students with disabilities.[50] On some occasions, then, teachers may want to have students discuss an issue in small groups first—thereby giving them the chance to express and possibly gain support for their ideas in a relatively private context—before bringing them together for a whole-class discussion.[51]

- **Talkativeness.** Relatively speaking, mainstream Western culture is a chatty one. People often say things to one another even when they have little to communicate, making small talk as a way of maintaining interpersonal relationships and filling awkward silences.[52] Furthermore, in some African American, Hawaiian, and Jewish cultures, adults and children alike may speak spontaneously and simultaneously, perhaps to show personal involvement in a conversation or perhaps to avoid being excluded from the conversation altogether.[53] In certain other cultures, however, silence is golden. For example, in many parts of the world, children are expected to learn primarily by close, quiet observation of adults, rather than by asking questions or otherwise interrupting what adults are doing.[54] In fact, in some cultures—for instance, in many Mexican American and Southeast Asian communities, and in some African American communities—children learn very early in life that they should engage in conversation with adults only when their participation has been directly solicited.[55]
- **Assertiveness.** Some talkative cultures are also assertive ones, in that people readily voice their opinions, perhaps even interrupting those who are speaking; for example, this is the case for many African Americans, European Americans, and Hawaiians. People from quieter cultures, such as many Hispanic and Asian American students, tend to be more subtle and tentative in expressing their opinions—for instance, they might begin a sentence by saying "I'm not sure, but perhaps . . . "—and they aren't as likely to reveal their emotions during conversations.[56]

By teaching students that these types of differences exist among people and that these differences are normal, teachers and students can work to create a classroom environment that is accepting of different cultures and participation styles.

[50] A.-M. Clark et al., 2003; Hattie & Gan, 2011; Théberge, 1994.
[51] D. W. Johnson & Johnson, 2009b; Minstrell & Stimpson, 1996.
[52] Gay, 2010; Trawick-Smith, 2003.
[53] Farber et al., 1988; Gay, 2010; Hale-Benson, 1986; Tharp, 1989; Tyler et al., 2008.
[54] Correa-Chávez et al., 2005; Gutiérrez & Rogoff, 2003; Kağitçibaşi, 2007; J. Li & Fischer, 2004.
[55] Delgado-Gaitan, 1994; C. A. Grant & Gomez, 2001; Ochs, 1982.
[56] Gay, 2010; Morelli & Rothbaum, 2007; Tyler et al., 2008; C. Ward et al., 2001.

Create a classroom atmosphere conducive to open debate and the constructive evaluation of ideas.

Students are more likely to discuss their ideas and opinions if their teacher is supportive of multiple viewpoints, if disagreeing with classmates is socially acceptable, and if students feel comfortable volunteering answers that turn out to be incorrect.[57] The following strategies can be used to promote effective discussions:[58]

- Communicate the message that understanding a topic at the end of a discussion is more important than having the correct answer (if there is one) at the beginning of the discussion.
- Communicate the beliefs that asking questions reflects curiosity, that differing perspectives on a controversial topic are both inevitable and healthy, and that changing one's opinion can be a sign of thoughtful reflection.
- Ask students to explain their reasoning and to try to understand one another's explanations.
- Help clarify a student's line of reasoning for classmates.
- Suggest that students build on one another's ideas whenever possible.
- Encourage students to be open in their agreement or disagreement with their classmates—that is, to "agree to disagree."
- Stress that although it's acceptable to critique ideas, it *isn't* acceptable to criticize people.
- When students' perspectives reflect misconceptions or errors in reasoning, gently guide them toward more productive understandings.
- Depersonalize challenges to a student's line of reasoning by framing questions in a third-person voice—for example, "What if someone were to respond to your claim by saying . . . ?"
- Occasionally ask students to defend a position that directly opposes what they actually believe.
- Require students to develop compromise solutions that take into account opposing perspectives.

Not only can such strategies promote more productive classroom discussions and develop students' critical thinking abilities, but they can also help to create a sense of community among students. We look at the benefits of creating a sense of community in Chapter 9.

When students become comfortable with disagreeing in a congenial way, they often find their interactions highly motivating, especially if they're emotionally involved in the topic under discussion (recall the concept of hot cognition, described in Chapter 5).[59] One fourth-grader said this about her class's frequent small-group discussions:

> I like it when we get to argue, because I have a big mouth sometimes, and I like to talk out in class, and I get really tired of holding my hand up in the air. Besides, we only get to talk to each other when we go outside at recess, and this gives us a chance to argue in a nice way.[60]

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[57] A.-M. Clark et al., 2003; Hadjioannou, 2007; E. M. Nussbaum, 2008.

[58] Hadjioannou, 2007; Hatano & Inagaki, 2003; Herrenkohl & Guerra, 1998; K. Hogan et al., 2000; D. W. Johnson & Johnson, 2009b; Lampert et al., 1996; E. M. Nussbaum, 2008; Sinatra & Mason, 2008; Staples, 2007; Walshaw & Anthony, 2008; Webb et al., 2008.

[59] Hadjioannou, 2007; C. L. Smith, 2007.

[60] A.-M. Clark et al., 2003, p. 194.

Furthermore, students often acquire effective social skills during their class discussions. For example, when students meet in small, self-directed groups to discuss children's literature, they may develop and model for one another such skills as expressing agreement ("I agree with Kordell because . . . "), disagreeing tactfully ("Yeah, but they could see the fox sneak in"), justifying an opinion ("I think it shouldn't be allowed because if he got to be king, who knows what he would do to the kingdom"), and seeking everyone's participation ("Ssshhh! Be quiet! Let Zeke talk!").[61]

Conduct activities in which students must depend on one another for their learning.

In addition to discussion, many other instructional approaches can also foster student interactions. As an illustration, try the next exercise.

See For Yourself

Free Sandwich

Imagine yourself as a student in each of the three classrooms described here. How would you behave in each situation if you really liked the sandwiches at a local sandwich shop?

1. Mr. Alexander tells your class, "Let's find out which students can learn the most in this week's unit on the human digestive system. The three students who get the highest scores on Friday's quiz will get a coupon for a free sandwich at a local sandwich shop."
2. Ms. Bernstein introduces her lesson this way: "I'm hoping that all of you will master the basics of human digestion this week. If you get a score of at least 90% on this Friday's quiz, I'll give you a coupon for a free sandwich at a local sandwich shop."
3. Mr. Camacho begins the same lesson like this: "Beginning today, you'll be working in groups of three to study the human digestive system. On Friday, I'll give you a quiz to see how much you've learned. If all three members of your group score at least 90% on the quiz, everyone in your group will get a coupon for a free sandwich at a local sandwich shop."

In which class(es) are you likely to work hard to get a free coupon? How might you work *differently* in the three situations?

The first class (Mr. Alexander's) is obviously a very competitive one: Only the three best students will get a coupon for a free sandwich. Will you try to earn a sandwich? It all depends on what you think your chances are of being a top scorer on Friday's quiz. If you've been doing well on quizzes all year, you'll undoubtedly study harder than ever during this week's unit. If, instead, you've been doing poorly in class despite your best efforts, you probably won't work for something you're unlikely to get. But in either case, will you help your fellow students learn about the digestive system? Not if you want the free sandwich yourself!

In Ms. Bernstein's class, there's no competition for a coupon. As long as you get a score of 90% or higher on the quiz, you'll get a coupon. But will you help your classmates understand what the pancreas does or learn the difference between the large and small intestines? Maybe—*if* you have the time and are feeling altruistic.

Now consider Mr. Camacho's class. Whether or not you get a coupon depends on how well you *and two other students* score on Friday's quiz. Are you going to help those two students learn about salivation and digestive enzymes? And can you expect them, in turn, to help you understand where the liver fits into the whole system? Absolutely!

[61] R. C. Anderson et al., 2001, pp. 16, 25; Certo, 2011.

In **cooperative learning**, students work with a small group of peers to achieve a common goal and help one another learn.[62] Unlike a competitive classroom such as Mr. Alexander's (where one student's success partly depends on the *failure* of others) or an individualistic classroom such as Ms. Bernstein's (where one student's success is unrelated to peers' achievement), students in a cooperative learning environment such as Mr. Camacho's work together to achieve joint successes. When students engage in cooperative learning, they reap the many benefits of student dialogue, including greater comprehension and integration of the subject matter, recognition of inadequacies or misconceptions in understanding, and increased perspective taking. Furthermore, when students cooperatively tackle a complex, challenging task, they can share the heavy cognitive load the task might involve and provide scaffolding for one another's efforts. Thus, they're apt to have a higher self-efficacy for accomplishing the task successfully, which can lead to increased motivation to engage in the task.[63]

When designed and structured appropriately, cooperative learning activities can promote high achievement in students of all ability levels, including many who have historically been at risk for academic failure.[64] Cooperative learning activities may also promote complex cognitive processes. Students essentially think aloud, modeling various learning and problem-solving strategies for one another and developing greater metacognitive awareness as a result.[65] An additional, nonacademic benefit is that students are more likely to believe that their classmates like them, and friendships across racial-ethnic groups and between students with and without disabilities are apt to form.[66]

Cooperative learning activities have potential pitfalls, however. Some students may be more interested in meeting social and performance goals (e.g., creating a good impression, getting an acceptable answer quickly) than they are in mastering the material, and thus their willingness to assist one another or ask for help may be compromised.[67] Students who do most of the work and most of the talking are likely to learn more than other group members.[68] Furthermore, students may occasionally agree to use an incorrect strategy or method that a particular group member has suggested, or they may share misconceptions about the topic they're studying.[69] And in some cases, students may simply not have the skills to cooperate and help one another learn.[70]

It's important to note that although students work in groups during cooperative learning, cooperative learning differs from *group work* in which students are placed in groups to work on an assignment. In group work, students may simply divide up the work and complete their parts without learning the other parts. Or, one or two students may complete all the work while the other students do little or nothing. Instead, in cooperative learning, teachers structure the groups in such a way that cooperation is not only helpful for academic success but actually necessary for it.[71] The Classroom Strategies box "Enhancing the Effectiveness of Cooperative Learning" presents and illustrates several strategies for conducting effective cooperative group activities.

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[62] Some theorists distinguish between *cooperative* learning and *collaborative* learning, with various theorists drawing the dividing line somewhat differently. Here we are using *cooperative learning* broadly to include collaborative approaches to learning.

[63] T. L. Good et al., 1992; D. W. Johnson & Johnson, 2009a; F. Kirschner et al., 2009; A. M. O'Donnell & O'Kelly, 1994; Webb & Palincsar, 1996.

[64] Ginsburg-Block et al., 2006; Lou et al., 1996; Rohrbeck et al., 2003; Slavin & Lake, 2008; S. M. Williams, 2010.

[65] T. L. Good et al., 1992; D. W. Johnson & Johnson, 2009a; A. King, 1999.

[66] Lou et al., 1996; J. H. Pfeifer et al., 2007; Slavin et al., 2003.

[67] Levy et al., 2000; Moje & Shepardson, 1998; Wentzel, 2009.

[68] Gayford, 1992; Lotan, 2006; Webb, 1989.

[69] T. L. Good et al., 1992; Stacey, 1992.

[70] Ladd et al., 2012; Webb & Mastergeorge, 2003.

[71] D. W. Johnson & Johnson, 2009a; Slavin, 2011; van Drie et al., 2006.

Classroom Strategies

Enhancing the Effectiveness of Cooperative Learning

- **Choose challenging tasks that students may have trouble accomplishing alone but *can* accomplish when several of them coordinate their efforts.**
  Although they haven't yet been taught how to divide by fractions, students in a fourth-grade class are asked to solve the following problem: *Mom makes small apple tarts, using three-quarters of an apple for each small tart. She has 20 apples. How many small apple tarts can she make?* They work in small groups to identify possible approaches to the problem. (An example of one group's discussion appears in the section "Social Interaction as Context" in Chapter 4.)

- **Form groups of students who are likely to work together productively and who each have unique knowledge and skills to offer.**
  Ms. Schram divides her class into cooperative groups of three or four students each to design posters depicting significant historical events they've been studying. She makes sure that each group includes students of various ethnic backgrounds and students who will be able to contribute different skills to the task at hand (e.g., students with artistic skills, organizational skills). She also splits up students who don't work well together (e.g., close friends who get off task when they're together).

- **Provide clear goals toward which groups should work.**
  Students in a high school Spanish class work in small groups to create an episode of a soap opera *(telenovela)* spoken entirely in Spanish. Over the course of a 3-week period, each group (1) writes a short screenplay, (2) collects the necessary props and costumes, and (3) videotapes the episode so that their classmates can eventually watch it.

- **Structure tasks so that group members are dependent on one another for success.**
  A high school biology teacher asks cooperative groups to prepare for an upcoming class debate on the pros and cons of mosquito control in the community. Each group member is given a unique function. For example, one student acts as *reader* of information about the issue, another acts as *recorder* of group members' arguments, and a third acts as *checker* to determine whether all group members agree with each argument.

- **Provide clear guidelines about how to behave.**
  A seventh-grade math teacher forms cooperative groups in which students will work on a series of math problems. Before the students begin the task, the teacher has them brainstorm ground rules for working effectively in their groups. Students volunteer such ideas as "Talk quietly so you don't disturb other groups," "If you see someone in your group is in trouble, help them," and "Be patient with them."

- **Monitor group interactions.**
  A social studies teacher asks cooperative groups to identify a possible plan for helping homeless people secure suitable housing. When one student disparages another because of a difference of opinion, the teacher reminds the group that students should criticize ideas rather than people.

- **Provide critical information and insights when (but only when) a group is unlikely or unable to provide such information and insights for itself.**
  The social studies teacher from the previous example tells a group, "The solution you've developed assumes that most taxpayers would be willing to pay much higher taxes than they do now. Is that realistic?"

- **Make students individually accountable for their achievement.**
  An elementary school teacher has incorporated cooperative learning into a unit on calculating perimeters of squares, rectangles, and triangles. Later, students complete a quiz to assess their individual mastery of perimeters.

- **Reinforce group success.**
  The elementary school teacher in the previous example awards a few extra points to groups in which every member can demonstrate mastery of perimeters.

- **Ask students to evaluate their effectiveness in working as a group.**
  After cooperative groups have completed their assigned tasks, the teacher asks the groups to respond to statements such as these by putting their thumbs up to agree, down to disagree, or sideways to somewhat agree: "All group members actively participated." "Group members asked questions when they didn't understand one another." "Group members criticized ideas rather than people."

Sources: Blumenfeld et al., 1996; E. G. Cohen, 1994; Crook, 1995; Deutsch, 1993; Esmonde, 2009; J. D. Finn et al., 2003; Gillies & Ashman, 1998; Ginsburg-Block et al., 2006; J. Hiebert et al., 1997, p. 118 (apple tarts problem); D. W. Johnson & Johnson, 1991, 2009b; Karau & Williams, 1995; Linnenbrink-Garcia et al., 2011; Lotan, 2006; Lou et al., 1996; A. M. O'Donnell & O'Kelly, 1994; Slavin, 2011; van Drie et al., 2006; Webb & Farivar, 1999; Webb & Palincsar, 1996.

One specific approach to cooperative learning is the *Jigsaw* approach, which requires students to become "experts" of some content and teach it to other students in their small group, as described in Figure 8.11. Another approach related to cooperative learning is reciprocal teaching. In Chapter 6, we explained **reciprocal teaching** as an approach to teaching reading and listening comprehension strategies in which students learn to ask one another questions about textbook passages or literature. Through this social interaction with one another, students help each other practice and internalize effective reading strategies.

Figure 8.11 Steps involved in implementing the Jigsaw approach

Procedures for the Jigsaw Approach

1. Students are divided into groups of about five students and each student is given a different part of the content to be learned (either content A, B, C, D, or E).
2. Students are told that they need to become the "experts" of their content because they're going to teach it to the other members of their group.
3. Teachers give each expert their content materials (electronically or on paper) and students are given time to study and learn it.
   - Alternatively, the experts on each topic can meet together to learn their content and discuss how they can best teach it to their group members. That is, all the content A experts meet together, all the content B experts meet together, and so forth.
4. Students meet back in their groups and each expert teaches the others about their content.
5. Students take a test covering all the content and earn points for their group score.

Sources: Aronson & Patnoe, 2011; Slavin, 1995.

Have students answer questions through their own research or investigations.

Teachers can place students in control of their learning by having *them* find the answers to questions related to the class content. When the answers to questions can be found by searching the Internet, teachers can post links to appropriate websites on their class website and ask students to search the websites to answer questions. Alternatively, teachers might use a **WebQuest** activity, in which students use predetermined websites to answer questions and complete interesting and challenging tasks that require higher-level thinking skills (see WebQuest.org for examples). In using such strategies, teachers should give students explicit instructional objectives they need to accomplish as they conduct their searches; for instance, by giving them specific questions to which they need to find answers.[72]

When the purpose of the instruction is for students to answer questions that ultimately lead to identifying underlying concepts or principles, it's appropriate to use an instructional approach known as **inquiry-based learning**.[73] In Chapter 6, we discussed how inquiry-based learning and **discovery learning** could help students to *see* concepts or principles in action by conducting experiments, making observations, or collecting information (see the Classroom Strategies box "Conducting Effective Discovery and Inquiry-Based Learning Activities" in Chapter 6). As a result, these instructional approaches can promote students' cognitive development by allowing them to connect the concrete objects and events they observe during inquiry to more abstract underlying concepts or principles. As an example, consider students who observe metal balls of different weights and sizes rolling down an inclined plane to determine whether either weight or size influences acceleration. With their results, students can draw conclusions about the effects of gravity, and thus learn the abstract underlying principles about gravity.

Have students work on complex, real-world problems, projects, and designs.

In Chapter 3, we explained how using **authentic activities**—activities similar or identical to those that students might encounter in real-world contexts—could help students transfer their knowledge and skills to new situations. We then discussed how teachers could engage students in authentic activities by using *problem-based learning*, *project-based learning*, *design-based learning*, and *engineering design*. We bring up these teaching approaches again

[72] Niederhauser, 2008.
[73] Alfieri et al., 2011; Lazonder & Harmsen, 2016.

here to remind you of these approaches and to provide more details about how they can be implemented.

In **problem-based learning**, students acquire new knowledge and skills as they work on an ill-defined problem similar to certain real-world problems.[74] The key features of problem-based learning that distinguish it from other approaches are that (1) the outcome is the problem solution (as opposed to a product or design) and (2) when given the problem, students don't have enough knowledge to solve it (which requires them to seek information and, as a result, acquire knowledge and understanding during the process). An example problem is: Given that fossil fuel energy sources increase the level of carbon dioxide in the atmosphere (which is having negative effects on the environment), what other sources of energy could be used to reduce carbon dioxide levels? As students work in collaborative groups of about four students, the teacher serves as a facilitator to guide students through the problem-solving process. The left side of Figure 8.12 shows the steps that were presented in Chapter 3 to creatively solve ill-defined problems. Because these steps may be unclear or vague for some K–12 students, teachers may want to change these steps into the actionable tasks shown on the right side of Figure 8.12.[75] The teacher's main roles are to ask students open-ended questions to help them move through the process and to keep all students involved in it.

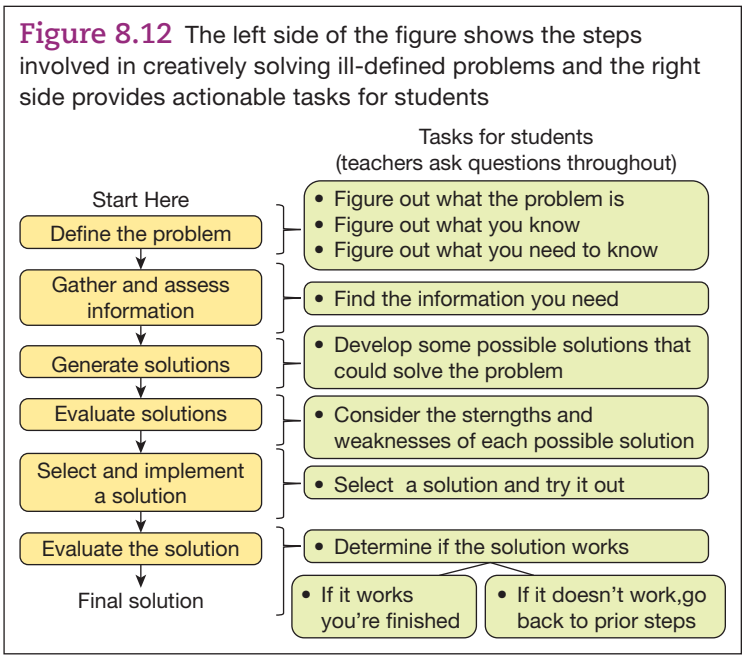


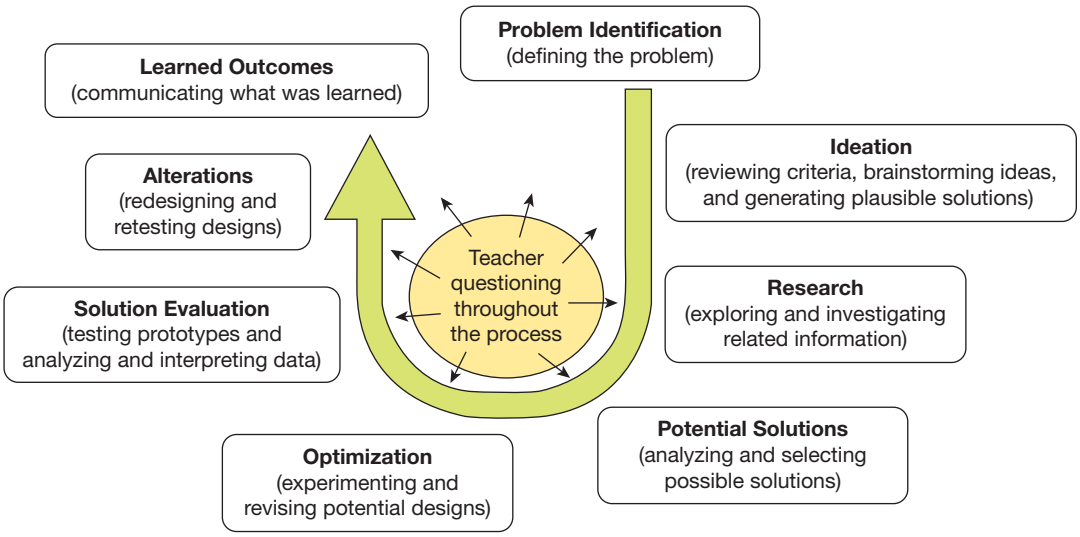
Figure 8.12 The left side of the figure shows the steps involved in creatively solving ill-defined problems and the right side provides actionable tasks for students

Project-based learning is similar to problem-based learning except that the solution yields a concrete end product instead of a solution. In this respect, project-based learning is similar to other approaches such as *design-based learning* and **engineering design**—devising a system, component, or process that meets a human need.[76] Engineering design problems and problems that require the integration of STEM (science, technology, engineering, and mathematics) abilities require students to use many different complex thinking skills. For example, in the PIRPOSAL Model, students solve engineering design problems through an initial question that leads to further questions, which require convergent and divergent thinking.[77] Students can work through the eight phases shown in Figure 8.13 as they solve the problem. These phases don't necessarily occur in order; instead, as students need to know certain information, they work through the different phases or the teacher guides students to certain phases as needed.

As an example of an engineering design activity, middle school students could be asked to do the following: Given the negative effects of carbon dioxide emissions on the environment, design, build, test, and retest a model solar-powered car that relies on energy from the sun instead of energy from fossil fuels. Students could be given the basic materials needed to make the cars that would allow them to test different types of solar panels, motors, and ways of transferring motion from the motor to the wheels. Students could test and compare their final designs by finding out how much weight their cars could pull (pulling more weight would be one indicator of a better design).[78]

[74] L. W. Anderson & Pellicer, 1998; Christenson & Thurlow, 2004; Tate, 1995; Wirkala & Kuhn, 2011.
[75] Hmelo-Silver, 2004; Mumford & McIntosh, 2017; Mumford et al., 1991.
[76] ABET Engineering Accreditation Commission, 2017; National Research Council, 2013.
[77] Wells, 2016.
[78] Based on an engineering design activity described in Chittum et al., 2017.

Figure 8.13 Eight phases that students work through (not necessarily in order) as they engage in engineering design problems



Source: Wells, J. G. (2016). PIRPOSAL model of integrative STEM education: Conceptual and pedagogical framework for classroom implementation. Technology and Engineering, 75(6), 12–19.

As you can see, the steps in this engineering design model (see Figure 8.13) are similar to the steps involved in problem-based learning (see prior Figure 8.12): They both require students to use a variety of complex cognitive processes as they engage in problem-solving and design activities. One of the biggest differences is the form of the final outcome. In problem-based learning, students work toward a solution to a problem, whereas in engineering design, students work toward an optimal design that meets the specified criteria. Both problem-based learning and engineering design activities can occur as part of students' regular in-school classwork or as part of out-of-school programs.[79]

In addition, these types of authentic activities can occur in the outside community, as noted in Chapter 3. For example, as part of **service-learning**, students work on service projects in the community that are closely connected to the classroom curriculum. Specifically, during service-learning projects, students (1) provide service to meet a need in a community; (2) apply academic concepts, content, and/or skills to the service experience; and (3) reflect on the service experience.[80] Service-learning is an example of a broader approach to instruction called *experiential learning* that focuses on providing students with experiences from which they can learn. As an example of a service-learning project, children in the primary grades might regularly monitor the quantity of house pet "poop" in an environmentally sensitive city park, use their mathematics skills to graph their findings over time, and present their findings to the park manager to consider if there's a problem with the frequency.[81] To complete the service-learning project, the students would reflect on their experiences in some way, perhaps by considering what they learned from the experience and how they could improve their strategies in the future. Although both service-learning and *community service* involve service to a community, service-learning activities are different in that they connect the service experience to class content and provide opportunities for students to reflect on their experiences. These service experiences could be particularly powerful for adolescents who have a need to contribute and

[79] Evans et al., 2016.
[80] Eyler & Giles, 1999; Furco & Norvell, 2019.
[81] Pickens, 2006.

provide support to others.[82] And in addition to the social, moral, and motivational benefits of these experiences, those that are closely tied to important instructional goals can enhance classroom learning.[83]

When real-world tasks are impractical or impossible, consider using simulations and games.

Not all real-world tasks are possible and practical to complete either in or outside of school, and in such instances **instructional simulations**—simulating real-world activities to provide learners with experiences that promote learning—can provide a good alternative.[84] For example, students might conduct a mock trial of a historical figure (e.g., Alexander the Great, Adolf Hitler), test the aerodynamic effectiveness of variously shaped paper airplanes, or role-play various characters in classic works of literature.[85] Computer-based or online simulations can also be highly effective (for examples, see https://phet.colorado.edu). For instance, children can learn a great deal about fractions with virtual "manipulatives" on a tablet screen, and adolescents can systematically test various hypotheses that affect earthquakes or avalanches in a computer-simulated world. A particular advantage of computer-based simulations is that they can be designed in ways that keep students' cognitive load within reasonable bounds and appropriately scaffold students' efforts.[86] And students may spend more time on simulations that they find challenging and engaging, which can significantly enhance their critical thinking and problem-solving skills.[87]

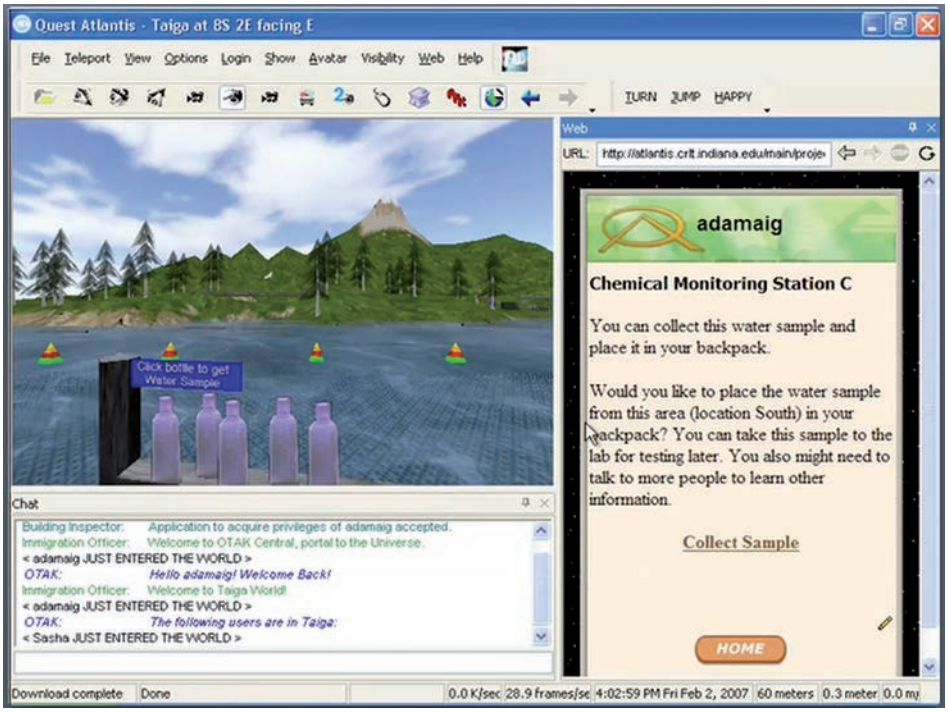
Some computer-based simulations involve many students—they may even involve many schools—working together on common problems. For example, in an online simulation called GlobalEd (www.globaled.uconn.edu), middle school social studies classes become representatives for particular countries (e.g., one class might be France, another might be Nigeria), with different members of a class tackling different global issues (e.g., international conflicts, human rights, environmental issues). Students study their countries and issues and then electronically communicate with representatives from other "countries" (i.e., students in other schools) to share perspectives and negotiate treaties. Not only does the simulation enhance students' understanding of global issues, but it also enhances their perspective-taking ability and interest in social studies as a discipline.[88]

In another simulation, Atlantis Remixed (ARX), students take on various roles (e.g., scientist, historian, mathematician) to tackle complex worldwide problems related to certain environmental or social issues, and they make decisions and take actions that have significant virtual "effects" on long-term outcomes.[89] Figure 8.14 shows a screenshot in ARX's series called World Games. In this particular simulation, students examine water quality in an effort to determine why fish populations are declining in a three-dimensional fictional world.

In some cases, computer-based simulations have a distinctly gamelike nature. Despite their obvious element of play, some video games and other high-tech games can foster significant improvements in students' learning and achievement.[90] As an illustration, in an online game called "Whyville" (www.whyville.net), older children and young adolescents become "citizens" who enter, explore, experiment, compete, and collaborate in a

[82] Fuligni, 2019.
[83] Celio et al., 2011; Dymond et al., 2007; Thapa et al., 2013.
[84] For example, see B. K. Lee et al., 2015; Martin & Betrus, 2019; Vogel-Walcutt et al., 2013.
[85] For example, see B. K. Lee et al., 2015.
[86] Baroody et al., 2013; de Jong, 2011; Kafai & Dede, 2014; Kuhn & Pease, 2010; Sarama & Clements, 2009.
[87] Anderson et al., 1996.
[88] Gehlbach et al., 2008.
[89] Barab et al., 2009, 2010.
[90] For in-depth discussions of this point, see Barab et al., 2010; Squire, 2011; Tobias & Fletcher, 2011.

Figure 8.14 This screenshot from Atlantis Remixed illustrates a computer-based simulation activity in which students examine water quality in an effort to determine why fish populations are declining in a three-dimensional virtual world



Source: Screenshot provided courtesy of Atlantis Remixed. Copyright © by Atlantis Remixed. Reprinted by permission.

colorful, multifaceted virtual world with its own government, economy, and ecosystem. After creating personal avatars, "Whyvillians" can earn "clams" (Whyville's virtual currency) and contribute to their community's collective knowledge and well-being by building energy-efficient homes, developing a new vaccine, creating a community recycling program, or identifying new species in a local coral reef (see Figure 8.15). In such a virtual environment, students not only learn and apply academic subject matter but also practice prosocial strategies and leadership skills.[91]

Have students work one-on-one with another student or a teacher.

Having some students provide instruction to other students—**peer tutoring**—can often be an effective student-directed approach to teaching fundamental knowledge and skills. For example, a teacher might have students within a single class tutor one another. Alternatively, two or more collaborating teachers might have older students teach younger ones—for instance, by having fifth-graders teach students in first grade.[92] The high school that one of us authors attended many years ago had a schoolwide tutoring program coordinated by the school's chapter of the National Honor Society.

Peer tutoring can lead to considerable gains in academic achievement.[93] One possible reason for its effectiveness is that it gets students actively and mentally engaged with the subject matter—something that doesn't necessarily happen in teacher-directed whole-class explanations. It also provides a context in which struggling students can ask questions

[91] Kafai & Fields, 2013; Tobias & Fletcher, 2011; Wouters et al., 2013.
[92] Dietrichson et al., 2017; D. R. Robinson et al., 2005; J. R. Sullivan & Conoley, 2004.
[93] Ginsburg-Block et al., 2006; Graesser et al., 2011; K. C. Leung, 2015; D. R. Robinson et al., 2005; Roscoe & Chi, 2007.

Figure 8.15 In this screenshot from Whyville, students' avatars encounter a variety of coral reef species as they SCUBA dive in a virtual coral reef. By identifying and counting these organisms, students learn about the reef ecosystem and keep track of the health of the reef. For more information, go to reef.whyville.net

Source: Screenshot provided courtesy of Numedeon, Inc. the creators of Whyville. Copyright © by Numedeon, Inc. Reprinted by permission.

when they don't understand something and can get regular feedback about their performance.[94]

Typically, peer-tutoring sessions benefit tutors as well as those being tutored.[95] Students are more motivated to learn something if they know they'll have to teach it to someone else, and they're apt to engage in considerable elaboration as they study and explain it.[96] Furthermore, in the process of directing and guiding other students' learning and problem solving, tutors may more fully internalize the cognitive strategies involved (recall the discussion of internalization in Chapter 6) and so become better able to direct and guide their *own* learning and problem solving. In other words, peer tutoring can foster greater self-regulation.[97] Peer tutoring has nonacademic benefits as well. Cooperation and other social skills improve, behavior problems diminish, and friendships form among students of different ethnic groups and between students with and without disabilities.[98]

think about it
Have you personally benefited from being either the tutor or the learner in a peer-tutoring session? If so, in what way(s) did you benefit? If not, how might the session have been conducted differently?

Students don't always have the knowledge and skills that will enable them to become effective tutors, however, especially in the elementary grades.[99] In most cases, then, tutoring sessions should be limited to subject matter that the tutors know well (we'll see an exception in just a moment). Training in effective tutoring skills is also helpful. For example, a teacher might show tutors how to establish a good relationship with the students they're tutoring, how to break a task into simple steps, and how and when to give feedback.[100]

[94] Graesser & Person, 1994; J. R. Sullivan & Conoley, 2004.
[95] Graesser et al., 2011; K. C. Leung, 2015; D. R. Robinson et al., 2005.
[96] Benware & Deci, 1984; A. M. O'Donnell, 2006; Roscoe & Chi, 2007.
[97] Biemiller et al., 1998; Graesser et al., 2011.
[98] Cushing & Kennedy, 1997; DuPaul et al., 1998; Greenwood et al., 1988; D. R. Robinson et al., 2005.
[99] Graesser et al., 2011; Greenwood et al., 1988; D. Wood et al., 1995.
[100] Fong et al., 2019; Fueyo & Bushell, 1998; D. R. Robinson et al., 2005.

Providing a structure for tutoring sessions often helps students facilitate their classmates' learning, especially in situations in which all students are novices with respect to the subject matter.[101] In one approach, students are given question "starters" that help them formulate higher-level questions to ask one another—for instance, "What is the difference between _____ and _____?" and "What do you think would happen to _____ if _____ happened?"[102] In the following dialogue, two seventh-graders use question starters as they work together to learn more about muscles, a topic that neither of them has previously known much about:

> ***Jon:*** How does the muscular system work, Kyle?
>
> ***Kyle:*** Well . . . it retracts and contracts when you move.
>
> ***Jon:*** Can you tell me more? . . . Um, why are muscles important, Kyle?
>
> ***Kyle:*** They are important because if we didn't have them we couldn't move around.
>
> ***Jon:*** But . . . how do muscles work? Explain it more.
>
> ***Kyle:*** Um, muscles have tendons. Some muscles are called skeletal muscles. They are in the muscles that—like—in your arms—that have tendons that hold your muscles to your bones—to make them move and go back and forth. So you can walk and stuff.
>
> ***Jon:*** Good. All right! How are the skeletal muscles and the cardiac muscles the same? . . .
>
> ***Kyle:*** Well, they're both a muscle. And they're both pretty strong. And they hold things. I don't really think they have much in common.
>
> ***Jon:*** Okay. Why don't you think they have much in common?
>
> ***Kyle:*** Because the smooth muscle is—I mean the skeletal muscle is voluntary and the cardiac muscle is involuntary. Okay, I'll ask now. What do you think would happen if we didn't have smooth muscles?
>
> ***Jon:*** We would have to be chewing harder. And so it would take a long time to digest food. We would have to think about digesting because the smooth muscles—like the intestines and stomach—are *in*voluntary . . . .
>
> ***Kyle:*** Yeah, well—um—but, do you think it would *hurt* you if you didn't have smooth muscles?
>
> ***Jon:*** Well, yeah—because you wouldn't have muscles to push the food along—in the stomach and intestines—you'd get plugged up! Maybe you'd hafta drink liquid—just liquid stuff. Yuk.[103]

Notice how the boys ask each other questions that encourage elaboration and metacognitive self-reflection (e.g., "Why don't you think they have much in common?" "Do you think it would hurt you if you didn't have smooth muscles?"). Through such structured interactions, students at the same grade and ability levels can provide valuable scaffolding for one another's learning efforts.[104]

Ideally, *all* students should have an opportunity to tutor others at one time or another. This is often easier said than done, because a few students may consistently achieve at a lower level than most of their peers. One strategy is to ask low-achieving students to tutor younger children, or they may be able to tutor same-age classmates who have cognitive or physical disabilities.[105] Another possibility is to teach the students specific tasks or procedures they can share with their higher-achieving, but in this case uninformed, classmates.[106]

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[101] Fantuzzo et al., 1992; Fuchs et al., 1996; Mathes et al., 2001; Spörer & Brunstein, 2009.
[102] A. King, 1997, p. 230.
[103] A. King et al., 1998, p. 141.
[104] A. King, 1998.
[105] Greenwood, 1991; J. R. Sullivan & Conoley, 2004.
[106] Cushing & Kennedy, 1997; J. R. Sullivan & Conoley, 2004; Webb & Palincsar, 1996.

In addition to working with other *students* one-on-one, students can work with *teachers* in one-on-one mentorships known as **apprenticeships** to teach students how to perform complex new skills.[107] As explained in Chapter 6, apprenticeships can be used to introduce students to particular skills (e.g., playing a musical instrument) and trades (e.g., carpentry, culinary arts). And when the expert in an apprenticeship also provides guidance in how to *think about* tasks, they're participating in a **cognitive apprenticeship**.

Use computer technology to enhance communication and collaboration.

Effective student interactions don't necessarily have to be face-to-face. Through such mechanisms as texting, e-mail, online chat, social media, online forums, video conferencing, websites, and other apps, technologies enable students to communicate with their peers (either locally or around the world), exchange perspectives, brainstorm, and build on one another's ideas. Interactions of this nature are collectively known as **computer-supported collaborative learning (CSCL)**.[108] Of course student interactions don't need to be limited to student-to-student interactions, students can also contact adults who may provide useful information about specific topics. For example, in an agriculture science class, students could contact a farmer, producer, or industry specialist to learn more about the dairy industry.

CSCL may not be as much of a teaching approach itself as it is a means to use technologies to implement many of the other collaborative approaches we've presented so far. As examples, video conferencing can be used to support discussions with students at other schools or in other countries. Students can use other technologies, such as wikis and Google docs, to work together on cooperative learning activities and collaborative writing activities. Another project called Knowledge Forum (knowledgeforum.com) provides a multimedia database that enables students to jointly construct a body of shared knowledge about a particular topic, such as aerodynamics, optics, or the American Civil War. Students post their work in the form of reports, problem solutions, diagrams, flowcharts, short stories, and the like. Their classmates regularly respond by giving feedback, building on ideas, offering alternative perspectives, or synthesizing what the group has collectively learned. The electronic nature of interactions gives students the time they may need to reflect on one another's ideas and may be especially welcoming for students who are shy or for other reasons feel uncomfortable communicating with peers more publicly. In essence, the software provides the foundation for a computer-based community of learners in which most students feel psychologically comfortable and "safe."[109]

As an example of how CSCL can be used as part of inquiry-based learning, the GLOBE Program (www.globe.gov) allows student groups from around the world to collaborate on inquiry-based projects related to environmental and earth sciences. Students collect and analyze data about various environmental topics (e.g., climate change, watershed dynamics), write reports, and share their findings with students and professional scientists elsewhere.

CSCL appears to have several benefits. By making their findings and logical thinking processes clearly visible to one another, students can more easily reflect on and evaluate their own and others' ideas. Furthermore, students tend to focus on truly understanding classroom subject matter rather than on simply "getting things done" (i.e., they adopt mastery goals rather than performance goals) and, as a result, they can better remember

[107] Collins, 2006; Lave & Wenger, 1991; Rogoff, 1990.
[108] Kreijns et al., 2013.
[109] Hewitt & Scardamalia, 1998; Scardamalia & Bereiter, 2006, 2014.

and apply classroom subject matter.[110] Furthermore, multinational student-to-student collaborations are an excellent way to get young learners thinking and acting as *global* citizens as well as citizens of a particular community and country. Such experiences could enhance their ability to take the perspective of others.

8.4 General Instructional Strategies

Big Idea 8.4 Different instructional strategies are appropriate for different instructional goals and for different students.

In planning and conducting lessons—whether they involve teacher-directed instruction, student-directed instruction, or some combination of the two—many of the strategies we've identified in previous chapters are relevant, such as:

- Encourage effective long-term memory storage processes (Chapter 2)
- Pursue topics in depth rather than superficially (Chapter 3)
- Consider students' broader cultural and societal contexts (Chapter 4)
- Create conditions that support learners' motivation and engagement (Chapter 5)
- Accommodate developmental differences and diversity (Chapter 6)
- Support students who face challenges (Chapter 7)

The remainder of this section builds on these ideas and provides additional strategies that can be useful for both teacher-directed and student-directed instruction.

Take group differences into account.

Some instructional strategies are a better fit with students' cultural backgrounds than others. For example, students from cultures that especially value interpersonal cooperation (e.g., many Hispanic and Native American communities in the Western Hemisphere, Māori communities in New Zealand) are apt to achieve at higher levels in classrooms that have many interactive and collaborative activities. In contrast, recent immigrants from some Asian countries may be more accustomed to teacher-directed instruction than to student-directed classroom activities; such may also be true for children in certain indigenous groups around the world.[111]

Gender differences must also be considered. Many boys thrive on competition, and they can be fairly assertive in their efforts to achieve their goals.[112] In contrast, girls tend to do better when classroom activities involve cooperation rather than competition. Girls can be intimidated by whole-class discussions, however, and are more likely to participate when discussions and activities take place in small groups.[113] Because boys sometimes take charge of small-group activities, teachers may occasionally want to form all-female groups. By doing so, they're likely to increase girls' participation and encourage them to take leadership roles.[114]

Teachers' choices of instructional strategies may be especially critical in schools in low-income neighborhoods. Students in such schools often have more than their share of drill-and-practice work in basic skills—work that's hardly conducive to fostering

[110] Bereiter & Scardamalia, 2006; Gehlbach et al., 2008; Greaves et al., 2012; Miyake, 2008; Scardamalia & Bereiter, 2006; Zhang et al., 2009.
[111] Castagno & Brayboy, 2008; Lillemyr et al., 2010; Macfarlane et al., 2014; Tyler et al., 2008.
[112] Benenson et al., 2002; Eisenberg et al., 1996; Maccoby, 2002.
[113] Théberge, 1994.
[114] Fennema, 1987; MacLean et al., 1995; Slavin et al., 2003.

excitement about academic subject matter.[115] Mastering basic knowledge and skills is essential, to be sure, but teachers can often incorporate these things into engaging lessons that ask students to apply what they're learning to individual interests and real-world contexts. For example, in a curriculum called "Kids Voting USA," students at all grade levels have age-appropriate lessons about voting, political parties, and political issues, and they relate what they learn to local election campaigns.[116] Depending on the grade level, they might conduct their own mock elections, analyze candidates' attacks on opponents, or give speeches about particular propositions on a ballot.

It's important to remember, too, that students from low-income families may not have had as much access to and experience with computers and the Internet as their more economically advantaged peers have had. This is certainly *not* to say that teachers should avoid using technology with low-income students—quite the contrary!—but instead that teachers might need to provide more scaffolding for computer-related activities and assignments. And as noted earlier in the chapter, homework assignments should be technology-free unless it's clear that all students have equal access to any needed high-tech resources.

Consider how you might productively modify or supplement instructional strategies for the benefit of English learners in your classroom.

Unless they have significant disabilities, virtually all children acquire proficiency in at least one language before they reach school age. That language may or may not be English. School-age children who are fluent in their native language but not in English are often referred to as **English learners (ELs)** or English Language Learners. To the extent that elementary and secondary school students have limited knowledge of English, they're apt to have trouble with schoolwork in an English-based classroom.

The ideal situation for most ELs is **bilingual education**, in which they receive intensive instruction in English while studying other academic subject areas in their native language, with the transition to English-only instruction occurring quite gradually over a period of several years.[117] Simple knowledge of basic conversational English—knowledge collectively known as **basic interpersonal communication skills (BICS)**—isn't enough for academic success in an English-only curriculum. Ultimately, students must have sufficient mastery of English vocabulary and syntax that they can easily understand and learn from English-based textbooks and lectures; in other words, they must have **cognitive academic language proficiency (CALP)**. Such mastery of English takes considerable time to achieve—often 5 to 7 years.[118]

It's obviously unreasonable to expect classroom teachers to be proficient in the native languages of all of their ELs. Nevertheless, teachers can do many things to facilitate classroom learning and achievement for these students. The Classroom Strategies box "Working with English Learners" offers a few suggestions.

Also take developmental levels, individual differences, and special educational needs into account.

Instructional strategies must depend on students' ages and developmental levels, at least to some extent. Strategies that involve teaching well-defined topics in a structured manner and giving students a lot of guidance and feedback (e.g., direct instruction, mastery learning) are often more appropriate for younger students than for older ones. Lectures (which

[115] Duke, 2000; R. Ferguson, 1998; Pianta & Hamre, 2009; Portes, 1996.
[116] M. McDevitt & Chaffee, 1998, 2002; M. McDevitt & Kiousis, 2006; also see www.kidsvotingusa.org.
[117] Dixon et al., 2012; Garcia & Jensen, 2009; Marsh et al., 2002; Tong et al., 2008.
[118] Carhill et al., 2008; Cummins, 2000, 2008; Dixon et al., 2012; Padilla, 2006.

Classroom Strategies

Working with English Learners

- **If you don't speak a student's native language yourself, recruit and train parents, community volunteers, or other students to assist in providing instruction in that language.**
  A boy in a kindergarten class has grown up speaking Hmong, a language spoken in some Asian immigrant communities in the United States. His teacher recruits a fourth-grader who can read an English picture book to the boy and translate it into Hmong. At one point the teacher points to a lily pad on a page of the book and asks the fourth-grader to describe a lily pad in Hmong, as the boy has never encountered lily pads in his own life.
- **If possible, teach early reading skills in students' native languages.**
  When working with students whose families recently immigrated from Mexico, a first-grade teacher teaches basic letter–sound relationships and word decoding skills in Spanish (e.g., showing how the printed word *dos*, meaning "two," can be broken up into the sounds "duh," "oh," and "sss").
- **When using English to communicate, speak more slowly than you might otherwise, and clearly enunciate each word.**
  A middle school teacher is careful that he always says "going to" rather than "gonna" and "want to" rather than "wanna."
- **Use bilingual software.**
  Conducting a quick Google search using the key terms *bilingual*, *educational*, and *software*, a teacher finds many educational software programs with both English and Spanish options, including some free programs he can easily download to his classroom computers.
- **Use visual aids to supplement verbal explanations.**
  A high school history teacher uses photographs she has downloaded from the Internet to illustrate her verbal description of ancient Egypt. She also gives students a one-page outline that identifies the main ideas in her lesson.
- **During small-group learning activities, encourage same-language students to communicate with one another in their native language.**
  When a high school science teacher breaks students into cooperative groups to study the effects of weight, length, and amount of push on a pendulum's oscillation rate, she puts three native Chinese speakers in a single group. She suggests that they talk in either English or Chinese as they conduct their experiments.
- **Have students work in pairs to make sense of textbook material.**
  As two middle school students read a section of their geography textbook, one reads aloud while the other listens and takes notes. They frequently stop to talk about what they've just read or to switch roles.
- **Encourage—but don't force—students to contribute to class discussions in English; be understanding of students who are initially reluctant to participate.**
  A high school social studies teacher often breaks his class into small groups to discuss controversial social and political issues. He intentionally places two recent immigrants with peers who are likely to be supportive as these English learners struggle in their efforts to communicate.

Sources: Strategies are based on research and recommendations by Carhill et al., 2008; Comeau et al., 1999; Duff, 2001; Egbert, 2009; Espinosa, 2007; Garcia, 1995; Herrell & Jordan, 2004; Igoa, 1995; Janzen, 2008; Krashen, 1996; McClelland, 2001; Padilla, 2006; Slavin & Cheung, 2005; Solórzano, 2008; Tong et al., 2008; Valdés et al., 2005.

are often somewhat abstract) and lengthy homework assignments tend to be more effective for older students—provided, of course, that they engage students' interest and attention and encourage meaningful learning.[119]

The knowledge and skills that students bring to a lesson must also be a consideration.[120] Structured, teacher-directed approaches are usually most appropriate when students know little or nothing about the subject matter. But when students have mastered basic knowledge and skills, and particularly when they're self-regulating learners, they should begin directing some of their own learning, perhaps in small-group discussions, authentic activities, or independent research through hypermedia and online.

Even when working with a single age group or grade level, teachers need to take into consideration students' individual differences. In Chapter 6, we explained how **differentiated instruction**—the practice of individualizing instructional methods, specific

[119] Ausubel et al., 1978; H. Cooper et al., 2006; Rosenshine & Stevens, 1986.
[120] C. M. Connor et al., 2009; Corno, 2008; Kalyuga & Sweller, 2004.

content, and/or instructional goals to align with each student's existing knowledge, skills, and needs—can be used to accommodate students' individual differences. Differentiated instruction can be especially important for students with special educational needs, such as those with learning disabilities.

Provide sufficient scaffolding to ensure successful accomplishment of assigned tasks.

In discussions of various instructional strategies in this chapter, the word *scaffold* has often come up. Regardless of whether instruction is teacher-directed or student-directed, students need enough structure and guidance that they know what they're supposed to do and can achieve some degree of success.[121] Yet teachers need to strike a happy medium here. They certainly don't want to structure classroom tasks to the point where only simple tasks and thought processes are required, with little room for students' independent decision making. Ultimately, teachers want students to develop and use complex cognitive processes—for example, to think analytically, critically, and creatively—and they must have classroom assignments and activities that promote such processes.

Individual and cultural differences also need to be considered when providing scaffolding. Some students are more reserved than others in asking for help and support from teachers. In some cases, such as with some African American males, students don't want to ask for help because they're afraid that doing so will be viewed as a sign of weakness or vulnerability.[122] Teachers can help these students by being very explicit with directions and explaining concepts in detail to leave little room for confusion.

Combine several instructional approaches into a single lesson.

It should be clear by now that *there is no single best overall approach to classroom instruction*. Every instructional strategy has its merits, and each is useful in different situations. Table 8.5 lists several general instructional goals teachers are likely to have and suggests general instructional strategies that might be appropriate for each one. Notice that many of the strategies described in this chapter appear in two or more places in the table, reflecting the multiple purposes for which they might flexibly be used. A successful classroom—one in which students are acquiring and using school subject matter in truly meaningful ways—is undoubtedly a classroom in which a variety of approaches to instruction can be found, possibly even within the same lesson.[123]

One way to combine both teacher-directed and student-directed instruction is to "flip" your classroom instruction. The term **flipped classroom** refers to the idea that classwork and homework are flipped so that traditional classwork is completed as homework and traditional homework is completed in class.[124] It doesn't usually work exactly like that, but a typical example is that students acquire the main content by watching teacher-made videos of the content for homework. Then during class, students engage in some type of student-directed instruction, such as those presented in this chapter. There are many different variations of flipping, but the main ideas are that in-class time is devoted to student-directed instruction and the content is made available through other means, such as videos or readings that can be accessed outside of class time.

[121] Belland et al., 2013; N. Carr, 2011; Jeong & Hmelo-Silver, 2016; van de Pol et al., 2010; Weinert & Helmke, 1995.

[122] Ford, 2016; Smith & Hope, 2020; Whiting, 2006.

[123] Ashman et al., 2020; Trninic, 2018.

[124] Bergmann & Sams, 2014.

Table 8.5 Choosing an Instructional Strategy

WHEN YOUR GOAL IS TO HELP STUDENTS . . .	CONSIDER USING . . .
Obtain an organized, relatively abstract body of knowledge about a topic	• Lecture and readings • Lecture-discussion • Mastery learning • Computer-based instruction (websites, intelligent tutoring systems)
Master and review basic skills	• Direct instruction • Mastery learning • Computer-based instruction (some types) • Homework assignments (some types) • Cooperative learning • Instructional simulation • Peer tutoring and apprenticeship
Gain firsthand, concrete experience with a particular topic	• Inquiry-based learning and discovery learning • Problem-based learning, project-based learning, design-based learning, and engineering design • Service-learning and experiential learning • Instructional simulations (role-playing activities, instructional software programs)
Connect school subject matter to real-world contexts and problems	• Inquiry-based learning and discovery learning • Problem-based learning, project-based learning, design-based learning, and engineering design • Service-learning and experiential learning • Instructional simulations • Computer-based instruction (some types) • Homework (some types)
Acquire advanced understandings about a topic and/or develop higher-level cognitive processes (e.g., problem solving, critical thinking, scientific reasoning)	• Discussion • Cooperative learning • Inquiry-based learning • Problem-based learning, project-based learning, design-based learning, and engineering design • Service-learning • Instructional simulations (some types) • Peer tutoring (some types) and apprenticeship • Computer-supported collaborative learning
Acquire increased self-regulation strategies and metacognitive awareness	• Cooperative learning and reciprocal teaching • Problem-based learning, project-based learning, design-based learning, and engineering design • Peer tutoring (for tutor and tutee) and apprenticeship • Computer-based instruction (some types) • Homework (some types)
Acquire technological literacy skills	• Computer-based instruction • WebQuests • Instructional simulations • Computer-supported collaborative learning
Acquire effective strategies for interacting and working with others	• Discussion • Cooperative learning, Jigsaw, reciprocal teaching • Inquiry-based learning • Problem-based learning, project-based learning, design-based learning, and engineering design • Peer tutoring • Computer-supported collaborative learning • Computer-based instruction (some types, such as multiplayer video games)

Summary

Two central roles of any teacher are planning and carrying out instruction. The four Big Ideas presented at the beginning of the chapter can help us summarize basic principles that should guide these activities.

8.1 Planning Instruction

Big Idea 8.1 Effective teachers identify the knowledge and abilities they want students to acquire, and they plan instruction accordingly.

Good teachers engage in considerable advance planning. They identify the general instructional goals and more specific instructional objectives they would like students to accomplish. They align some of these goals and objectives with existing content-area standards, but they also include goals related to students' general academic and social development. In addition, good teachers conduct task analyses to break complex tasks into smaller and simpler components, consider how they can capture and keep students' interest and attention during instructional activities, and develop lesson plans that spell out the activities and assessments they'll use each day. Many teachers create class websites through which they can communicate detailed information about expectations and assignments and provide ongoing scaffolding for students' learning activities.

8.2 Conducting Teacher-Directed Instruction

Big Idea 8.2 Sometimes instruction is most effective when it is teacher-directed—that is, when the teacher chooses the specific topics to be studied and the general course of a lesson.

A good deal of teacher-directed instruction involves presenting information in essentially the same form in which students are expected to learn it. In some cases (e.g., lecture), teacher-directed instruction is largely one way in nature, with information going primarily from the teacher or some other expert to students. In other cases (e.g., lecture-discussion), it's more two way, with information flowing regularly back and forth between the teacher (or perhaps a virtual "teacher," such as a computer) and students. For instance, direct instruction, mastery learning, and computer-based instruction all involve many opportunities for student practice and teacher feedback. Teacher-directed instruction is, like all instruction, most effective when it promotes effective cognitive processes; for instance, when it captures students' attention and encourages students to elaborate on and apply what they're learning.

8.3 Conducting Student-Directed Instruction

Big Idea 8.3 Sometimes instruction is most effective when it is student-directed—that is, when students have some control over the issues to be addressed and the ways in which to address them.

The term *student-directed instruction* refers to a variety of instructional approaches in which, to a considerable degree, students control the flow of events. Examples of student-directed approaches to instruction include discussion, cooperative learning, inquiry-based learning, problem-based learning, service-learning, instructional simulation, peer tutoring, and computer-supported collaborative learning. Student-directed instruction is most useful when topics and tasks lend themselves to multiple perspectives and approaches, when the teacher creates an atmosphere conducive to open debate, and when students have some ability to regulate their own learning and behavior. Even so, students may need some structure and guidance to help them accomplish assigned tasks successfully.

8.4 General Instructional Strategies

Big Idea 8.4 Different instructional strategies are appropriate for different instructional goals and for different students.

Some instructional strategies are important to consider regardless of the overall instructional approach used. For example, teachers need to take into account the diversity of students in their class and how different instructional approaches fit with students' characteristics, developmental levels, English language abilities, special needs, and cultural backgrounds. Some instructional approaches are more appropriate than others for some students and learning goals. For example, direct instruction or mastery learning is often advisable when students must learn basic skills to automaticity, whereas authentic and simulated activities are more appropriate when the goal is for students to apply those skills to real-world situations and problems. Small-group cooperative learning activities may be especially effective for girls, as well as for students whose cultural groups nurture and expect cooperation with others. Abstract lectures can sometimes be useful when working with high-achieving adolescents, whereas more concrete approaches (e.g., direct instruction) are often preferable for younger students, for students who have a history of low academic achievement, and for students who have little prior knowledge about the topic or skill in question. Truly effective teachers tailor their instructional strategies to their students' individual ability levels, predispositions, and needs.

Case Study Practice Exercises

Cooperative Learning Project

On Monday morning, Ms. Mihara begins the unit "Customs in Other Lands" in her fourth-grade class. She asks students to choose two or three students with whom they would like to work to study a particular country. After the students have assembled into six small groups, she assigns each group a country: Australia, Colombia, Greece, Haiti, Japan, or South Africa. She tells the students, "Today we'll go to the school library, where your group can find information on the customs of your country, print out relevant materials you find on the Internet, and check out books and magazines you think might be useful. Every day over the next 2 weeks, you'll have time to work with your group. A week from Friday, each group will give an oral report to the class."

During the next few classes, Ms. Mihara runs into many more problems than she anticipated. She realizes that the high achievers have gotten together to form one of the groups, and many socially oriented, "popular" students have flocked to two others. The remaining two groups are composed of whichever students were left over. Some groups get to work immediately on their task, others spend their group time joking and sharing gossip, and still others are neither academically nor socially productive.

As the unit progresses, Ms. Mihara hears more and more complaints from students about their task: "Janet and I are doing all the work; Xiao and Mary Kay aren't helping at all," "Sachiel thinks he can boss the rest of us around because we're studying Haiti and he's Hatian," "We're spending all this time but just can't seem to get anywhere!" The group reports at the end of the unit differ markedly in quality: Some are carefully planned and informative, whereas others are disorganized and have little substance.

1. **Constructed-response question**

   Describe two things you might do to improve Ms. Mihara's cooperative learning activity. Base your improvements on research findings related to cooperative learning or on contemporary principles and theories of learning, development, or motivation.

2. **Multiple-choice question**

   Ms. Mihara never identifies an instructional objective for her unit "Customs in Other Lands." Which one of the following statements reflects recommended guidelines about how instructional goals and objectives should be formulated?

   a. "The teacher should expose students to many differences in behaviors and beliefs that exist in diverse cultures (e.g., eating habits, ceremonial practices, religious beliefs, moral values)."
   b. "The teacher should use a variety of instructional practices, including (but not limited to) lectures, direct instruction, textbook readings, and cooperative learning activities."
   c. "Students should study a variety of cultural behaviors and beliefs, including those of countries in diverse parts of the world."
   d. "Students should demonstrate knowledge of diverse cultural practices—for example, by describing three distinct ways in which another culture is different from their own."

Chapter 9

Strategies for Creating Effective Classroom and School Environments

Photo by Unsplash

Big Ideas to Master in this Chapter

9.1 Effective teachers create a caring, respectful classroom environment in which students are consistently focused on accomplishing instructional goals and objectives.

9.2 Teachers are most effective when they coordinate their efforts with colleagues, outside agencies, and parents.

9.3 Effective interventions for reducing unproductive school behaviors are tailored to the circumstances, with students' long-term development and well-being as the ultimate goals.

9.4 Minimizing aggression and violence at school requires a three-tiered approach: (1) creating a respectful and supportive school environment, (2) intervening early for students at risk for social failure, and (3) providing intensive interventions for chronically aggressive students.

Case Study: A Contagious Situation

After receiving a teaching certificate in May, Ms. Cornell has accepted a position as a fifth-grade teacher. She spent the summer identifying instructional goals for the year and planning lessons that would help students achieve those goals. She has jumped headlong into the curriculum she planned, but after 2 weeks, three problems have presented themselves in the forms of Eli, Jake, and Vanessa.

These three students seem determined to disrupt the class at every possible opportunity. They move around the room without permission, intentionally annoying others as they walk to the pencil sharpener or wastebasket. They talk out of turn, often making disrespectful remarks to their teacher and peers. They rarely complete assignments, preferring instead to engage in horseplay or practical jokes. They seem especially prone to misbehavior during downtimes in the daily schedule—for example, at the beginning and end of the school day, before and after recess and lunch, and whenever Ms. Cornell is preoccupied with other students.

Ms. Cornell continues to follow her daily lesson plans, ignoring the problem students and hoping they'll eventually shape up. Yet, after 2 more weeks, the disruptive behavior continues with the three of them delighting in one another's antics. Furthermore, the misbehavior has spread to other students. At almost 2 months into the school year, Ms. Cornell's classroom is out of control, and the few students who are still interested in learning something are having a hard time doing so.

Please answer the following two questions before you continue reading.

1. In what ways has Ms. Cornell planned in advance for her classroom?
2. In what ways has she *not* planned?

As a first-year teacher, Ms. Cornell is well prepared in some respects but not at all prepared in others. She has carefully identified her instructional goals and planned relevant lessons. But she has neglected to think about how she might keep students on task or how she might adjust lessons based on how students are progressing. And she hasn't considered how she might nip behavior problems in the bud before they begin to interfere with instruction and learning. In the absence of such planning, no curriculum can be very effective—not even one grounded firmly in sound principles of learning, motivation, and child development.

As we proceed through the chapter, we occasionally return to the opening case to identify reasons why Eli, Jake, and Vanessa are so disruptive and why their misbehaviors spread to other students. But we must make one point clear at the very beginning: The problem in Ms. Cornell's classroom is *not* one of too much noise and activity. Effective **classroom management**—creating and maintaining a class environment conducive to learning and achievement—has little to do with noise or activity level. A well-managed classroom is one in which students are consistently engaged in productive learning activities and in which students' behaviors rarely interfere with their own or others' achievement of instructional goals.

Creating and maintaining an environment in which students are continually engaged in productive activities can be a challenging task indeed. Teachers must attend to the unique needs of many students, must sometimes coordinate several activities at the same time, and must often make quick decisions about how to respond to unanticipated events. Furthermore, teachers must adjust their classroom management strategies to the particular instructional activities in progress. For example, cooperative learning

Chapter Outline

Case Study: A Contagious Situation

9.1 Creating an Environment Conducive to Learning

9.2 Expanding the Sense of Community Beyond the Classroom

9.3 Reducing Unproductive Behaviors

9.4 Addressing Aggression and Violence at School

Summary

Case Study Practice Exercises: The Good Buddy

activities call for different management strategies than direct instruction does. So it's not surprising that many beginning teachers mention classroom management as their number one concern.[1]

A good general model of effective classroom management is *authoritative parenting*, a parenting style described in Chapter 7.[2] (Note that throughout this chapter we're using the term "parent" to refer to any type of primary caregiver.) As you may recall, authoritative parents:

- Hold high expectations and standards for children's behavior
- Explain why some behaviors are acceptable and others are not
- Consistently enforce rules for behavior
- Provide a loving and supportive environment
- Include children in decision making
- Provide age-appropriate opportunities for autonomy

As we explore classroom management strategies in the following sections, we often see one or more of these characteristics of authoritative parenting at work. These characteristics provide students with *structure* (e.g., high standards, rules for acceptable behavior) and *support* (e.g., loving environment, opportunities for decision making), both of which are important for effective classroom management.[3] We begin our discussion by looking at proactive, *preventive* strategies—those designed to establish a productive learning environment right from the start. These preventive strategies include developing students' social and emotional abilities associated with self-discipline—an approach discussed in Chapter 7 called **social and emotional learning**.[4] Then, we turn to strategies for addressing the unproductive behaviors that sometimes occur even in the best-managed classrooms.

9.1 Creating an Environment Conducive to Learning

Big Idea 9.1 **Effective teachers create a caring, respectful classroom environment in which students are consistently focused on accomplishing instructional goals and objectives.**

When we talk about the classroom environment, to some extent we're talking about the actual physical setup; for instance, the arrangement of tables and chairs, the availability of tools and resources (painting supplies, computers, etc.), and the use of bulletin boards and other wall surfaces. But even more important is the psychological environment, or **classroom climate**.[5] The ideal classroom is one in which students feel safe and secure, make learning a high priority, and are willing to take chances and make mistakes as they tackle challenging new tasks. Such a climate is especially important for students who are at risk for academic failure and dropping out of school.[6]

The following recommendations summarize many strategies that researchers and experienced educators have identified for creating and maintaining an environment conducive to students' learning and academic achievement.

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[1] Evertson & Weinstein, 2006; V. Jones, 1996.
[2] Bear, 2015; Gregory et al., 2011; J. M. T. Walker & Hoover-Dempsey, 2006.
[3] Gregory et al., 2010.
[4] Durlak et al., 2015; Wentzel, 2019; Wentzel & Ramani, 2016.
[5] Hardré et al., 2007; Patrick et al., 2007; Reyes et al., 2012.
[6] Hamre & Pianta, 2005; V. E. Lee & Burkam, 2003; Rumberger, 2011.

Arrange the classroom to maximize attention and minimize disruptions.

When teachers design their classroom layout—arrange furniture, identify places to put instructional materials and equipment, and determine where students will sit and work—they should consider the effects that various arrangements are likely to have on students' behavior. Here are several widely recommended strategies:[7]

- Arrange desks, tables, and chairs so that you and your students can easily interact and so that you can regularly survey the entire classroom for signs of possible confusion, frustration, or boredom.
- Establish traffic patterns that allow students to move around the classroom without disturbing one another.
- Liven up walls with some graphic displays, but don't create such a visually "busy" classroom that students are easily distracted from lessons.
- Keep intriguing materials out of sight and reach until they're needed.
- Split up friends who easily get off task when they're together (e.g., put them on opposite sides of the room).
- Place chronically misbehaving or uninvolved students close at hand (e.g., seated near the front of the room or near the teacher's desk).

Communicate caring and respect for every student.

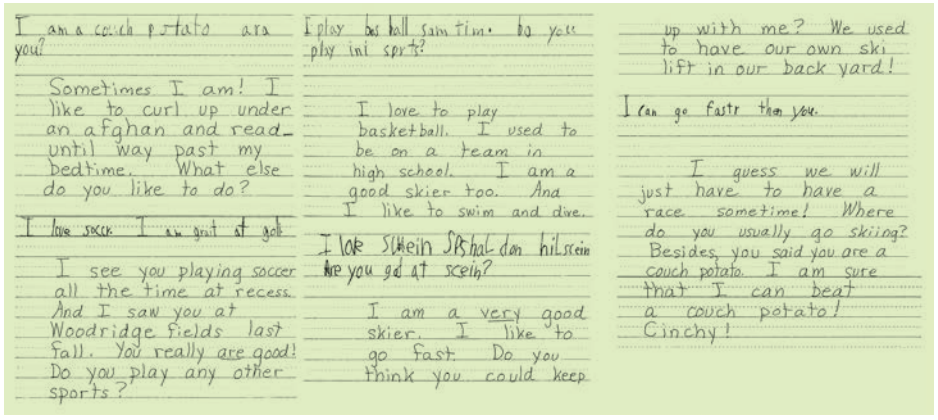
As you should recall from Chapter 5, *caring* is one of the five categories of strategies in the MUSIC Model of Motivation because when students believe that teachers and classmates care about their learning and well-being, they're more likely to be motivated to engage in learning activities.[8] And when students are engaged in productive learning activities, they're not engaged in the types of unproductive behaviors we saw in the opening case study from Eli, Jake, and Vanessa. Teachers can show students that they care about them by demonstrating, through the many little things they do, that they respect students as people and are concerned about their well-being.[9] A smile and warm greeting at the beginning of the day, a compliment about a new haircut, and a concerned inquiry when a student comes to school angry or upset—all of these behaviors communicate caring and respect. One high school student described caring teachers this way:

> They show it. You might see them in the hallway and they ask how you're doing, how was your last report card, is there anything you need. Or, maybe one day you're looking a little upset. They'll pull you to the side and ask you what's wrong, is there anything I can do.[10]

As this example demonstrates, open communication is a critical part of maintaining good teacher–student relationships. It's important to establish one or more mechanisms through which students can communicate with their teacher *in private*. One option, especially for older students, is e-mail, perhaps through a class website. Another alternative is a "What's Up?" form on which students can occasionally write and submit information about especially noteworthy or challenging events in their personal lives.[11] A third

[7] Bicard et al., 2012; K. Carter & Doyle, 2006; W. Doyle, 1986; Emmer & Evertson, 2009; A. V. Fisher et al., 2014; Gettinger & Kohler, 2006.
[8] Jones, 2009, 2018, 2020; Wentzel & Ramani, 2016.
[9] Allday et al., 2011; Certo et al., 2002; J. Ellis et al., 2010; D. K. Meyer & Turner, 2002.
[10] Certo et al., 2002, p. 15.
[11] A. K. Smith, 2009.

Figure 9.1 Six-year-old Matt and his first-grade teacher (the indented responses) communicate regularly through a two-way dialogue journal



possibility is the use of two-way *dialogue journals*, in which individual students and their teacher both write one or more times each week. Figure 9.1 shows several entries in 6-year-old Matt's journal; each entry is followed by a response from his first-grade teacher. Notice that Matt feels comfortable enough with his teacher to engage in playful one-upmanship ("I can go fastr then you"). Although his writing skills are far from perfect—for instance, he writes *especially downhill skiing* as "spshal don hilscein"—they're certainly adequate to communicate his thoughts. Notice, too, that his teacher doesn't correct his misspellings. Her primary purposes are to encourage him to write and to open the lines of communication; giving negative feedback about spelling here might interfere with both of these goals.

Yet it isn't enough simply to be "warm and fuzzy" with students. To show genuine caring and respect for them, teachers must also do these things:[12]

- Be well prepared for class and in other ways demonstrate a commitment to using effective teaching practices.
- Communicate high yet realistic expectations for performance and provide the support students need to meet those expectations.
- Include students in decision making and in evaluations of their work.
- Acknowledge that students can occasionally have an "off" day.

The quality of teacher–student relationships is one of the most influential factors affecting students' emotional well-being, motivation, and achievement at school. When students have positive, supportive relationships with teachers, they have higher self-efficacy and more motivation to learn, engage in more self-regulated learning, are more likely to ask for help when they need it, are less apt to cheat on classroom assignments, exhibit fewer behavior problems, and achieve at higher levels.[13]

Teacher affection, respect, and support are especially important for students who face exceptional hardships at home (e.g., extreme poverty, uninvolved or abusive families, violent neighborhoods). When such students have one or more caring, trustworthy adults in their lives—and when they regularly come to a classroom that's warm, predictable, and

[12] L. H. Anderman et al., 2002, p. 274; M.-L. Chang & Davis, 2009; H. A. Davis, 2003; H. A. Davis et al., 2001; J. M. T. Walker & Hoover-Dempsey, 2006; Wentzel et al., 2010.

[13] J. N. Hughes et al., 2008; Jones, 2020; Kiuru et al., 2014; Marchand & Skinner, 2007; McLean et al., 2020; Murdock et al., 2004; E. O'Connor et al., 2011; Pianta et al., 2008; Roorda et al., 2011.

dependable—they're more likely to have a strong sense of self-worth and to rise above their many challenges to succeed both in the classroom and in the outside world (recall the discussion of resilient students in Chapter 7).[14]

Work hard to improve relationships that have gotten off to a bad start.

Occasionally students come to school with an apparent chip on their shoulder, distrusting their teachers from day 1 because of previous hurtful relationships with parents or other adults. At other times teachers get relationships with certain students off to a bad start through their own actions—perhaps because they incorrectly attribute a student's low achievement to lack of effort rather than lack of skill or perhaps because they accuse a temperamentally high-energy child of being intentionally disobedient. Oftentimes students who have the poorest relationships with teachers are the ones most in need of *good* ones.[15]

Regardless of the initial causes of poor teacher–student relationships, teachers must work hard to turn them into productive ones. The first step, of course, is to *identify* poor relationships using such signs as these:[16]

- A teacher has hostile feelings (e.g., dislike, anger) toward a student.
- A teacher rarely interacts with a student.
- A teacher's messages to a student usually involve criticism or fault-finding.
- A teacher has a sense of learned helplessness about working effectively with a student.

Several strategies can help teachers repair these relationships. One is to think actively—perhaps in a brainstorming session with colleagues—about alternative hypotheses for why the student behaves inappropriately, being sure that the list of hypotheses offers potential solutions. Another is to meet one-on-one with the student to talk openly about the problem and possible ways to fix it. Still another strategy is to find out if the student participates in any school clubs, musical groups, or sports teams and, if so, attend an event and mention it to the student.

Create a sense of community and belongingness.

In Chapter 4, we described another means through which students can feel cared for by others in their learning environment: participating in a **community of learners**—a class in which teachers and students collaborate to build a body of knowledge and help one another learn about it. Ultimately, teachers should also create a general **sense of community** in the classroom—a sense that they and their students share common goals, are mutually respectful and supportive of one another's efforts, and believe that everyone makes an important contribution to classroom learning.[17] Creating a sense of community engenders feelings of **belongingness**—students see themselves as important and valued members of the classroom—and can also meet students' *need for relatedness*.[18]

When students share a sense of community, they're more likely to exhibit prosocial behavior, stay on task, express enthusiasm about classroom activities, and achieve at high levels. Furthermore, a sense of classroom community is associated with lower rates of emotional distress, disruptive classroom behavior, truancy, and dropping out.[19] And consistent

[14] Becker & Luthar, 2002; Juvonen, 2006; Masten, 2001; E. O'Connor & McCartney, 2007; D. A. O'Donnell et al., 2002; Werner & Smith, 2001.

[15] M.-L. Chang & Davis, 2009; Houts et al., 2010; Juvonen, 2006; Keogh, 2003; Stipek & Miles, 2008; Wentzel et al., 2009.

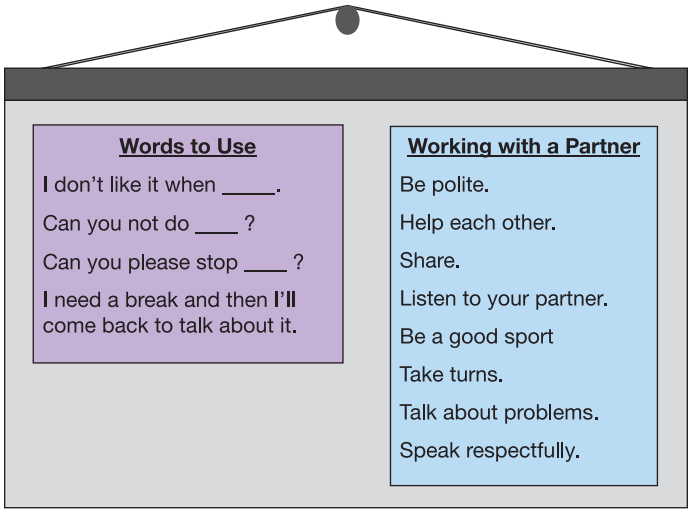
[16] M.-L. Chang & Davis, 2009; Hand, 2010; Pianta, 1999; Sutherland & Morgan, 2003.

[17] Ciani et al., 2010; Hamm et al., 2012; D. Kim et al., 1995; Osterman, 2000.

[18] E. M. Anderman, 2002; J. Ellis et al., 2010.

[19] Hom & Battistich, 1995; Juvonen, 2006; Osterman, 2000; Patrick et al., 2007; Rumberger, 2011.

Figure 9.2 Especially in the elementary grades, many students benefit from visual reminders about how to interact with classmates, as illustrated in these two posters displayed in a second-grade classroom



Posters courtesy of Christina Fox.

experiences with caring and equitable classroom communities help students internalize attitudes essential for a successful democratic society, including a commitment to fairness and justice for everyone.[20]

The Classroom Strategies feature "Creating and Enhancing a Sense of Classroom Community" offers several strategies for helping students believe that they're valued members of the classroom. Perhaps the most important strategy is the first one: stressing that students must always treat one another with kindness and respect. Even when students must take issue with something that one of their classmates has said or done, they can do so tactfully and respectfully (e.g., see Figure 9.2).

Create a goal-oriented and business-like (but nonthreatening) atmosphere.

Although caring relationships with students are essential, teachers and students alike must recognize that they're at school to get certain things accomplished. Accordingly, a relatively business-like atmosphere should prevail in the classroom most of the time. This isn't to say that class activities must be boring and tedious. On the contrary, they should be interesting and engaging, and they can sometimes be quite exciting. Entertainment and excitement shouldn't be thought of as goals in and of themselves, however. Rather, they're means to a more important goal: mastering academic subject matter.[21]

Despite this emphasis on business, the classroom atmosphere should never be uncomfortable or threatening. As noted in Chapter 5, students who are excessively anxious are unlikely to perform at their best. How can teachers be business-like without being threatening? They can hold students accountable for achieving instructional objectives yet not place students under continual surveillance. They can point out errors without making students feel like failures. They can focus students' attention on personal progress rather than on how each one's performance compares to that of classmates. And they can admonish students for misbehavior but communicate that each new day is an opportunity for a fresh start.[22]

Create a psychologically safe environment for all students.

To complement the suggestions provided so far, we also want to emphasize the need for teachers to create a psychologically safe environment for all students. **Psychological safety** is the extent to which students feel comfortable being themselves in the learning environment.[23] In psychologically safe classes, students are able to address concerns and disagreements publicly, feel free to behave in ways consistent with their values, and engage directly with others in constructive conflict or confrontation to resolve issues. A psychologically safe environment can increase students' participation in class and foster their identity development.[24]

[20] C. A. Flanagan et al., 2007.
[21] Brophy, 2006; G. A. Davis & Thomas, 1989; Gettinger & Kohler, 2006.
[22] Dijkstra et al., 2008; K. L. Fletcher & Cassady, 2010; Patrick et al., 2011; C. R. Rogers, 1983; Spaulding, 1992.
[23] Edmondson, 1999; Edmondson & Lei, 2014; Ladson-Billings, 1994; Woodson, 2020.
[24] Edmondson & Lei, 2014; Wanless et al., 2013; Williams et al., 2016.

Classroom Strategies

Creating and Enhancing a Sense of Classroom Community

- **Consistently communicate the message that *all* students deserve the kindness and respect of their classmates and are important members of the classroom community.**
  A middle school language arts class has three students with reading disabilities that are quite obvious in much of the students' oral and written work in class. The teacher doesn't publicly identify the students with disabilities because doing so would violate their right to confidentiality. However, she frequently communicates the message that students at any grade level vary widely in their reading abilities—usually through no fault of their own—and continually stresses that it is the class's responsibility to help *everyone* improve their literacy skills.
- **Create mechanisms through which students can all help to make the class run smoothly and efficiently.**
  An elementary school teacher creates several "helper" roles (e.g., distributing art supplies, feeding the class goldfish) that he assigns to different students on a rotating basis.
- **Emphasize such prosocial values as sharing and cooperation and provide opportunities for students to help one another.**
  As students work on in-class assignments each day, a math teacher sometimes asks, "Who has a problem that someone else might be able to help you solve?"
- **Make frequent use of interactive and collaborative teaching strategies.**
  In assigning students to cooperative learning groups, a social studies teacher puts a student with poor social skills in a group with two or three more socially proficient students. Before the groups begin their work, the teacher reminds students of the class's rules for cooperative group work, such as "Listen to others politely and attentively" and "Address differences of opinion in respectful and constructive ways."
- **Solicit students' ideas and opinions and incorporate them into class discussions and activities.**
  A first-grade teacher regularly has students vote on the storybook she should read during "settling-down" time after lunch each day. She first reads the book that gets the most votes, but she assures students who voted differently that she'll read their choices later in the week, saying, "It's important that everyone has a say in what we read."
- **Use competition only to create an occasional sense of playfulness in the class and only when all students have an equal chance of winning.**
  A high school Spanish teacher assigns a long-term cooperative group project in which students write and videotape Spanish soap operas (*telenovelas*). A few weeks later the teacher holds an "Academy Awards Banquet"—a potluck dinner for the students and their families. At the banquet, the teacher shows all the videos and then awards a variety of "Oscars." Although she gives only one group an Oscar for best telenovela, she gives every student an Oscar for some aspect of his or her performance.
- **Encourage students to be on the lookout for classmates on the periphery of ongoing activities and to ask these children to join in.**
  Teachers at an elementary school all adhere to and enforce the same *no-exclusion* policy on the playground: Any student who wants to be involved in a play activity *can* be involved.
- **Work on social skills with students whose interpersonal behaviors may victimize or alienate others.**
  A third-grader often behaves aggressively toward classmates who have something she wants. For example, when waiting for her turn at the class computer, she may yell, "*I* need to use it now!" or, instead, shove its current user out of the chair. In a private conference, her teacher points out the importance of patience and turn taking and suggests several ways she might politely make her needs known (e.g., "When might you be finished with the computer? Can I use it after you're done?"). The teacher also has the student practice the strategies in various role-playing scenarios.

Sources: M.-L. Chang & Davis, 2009; Evertson & Emmer, 2009; Hamovitch, 2007; J. N. Hughes, 2012; D. Kim et al., 1995; Osterman, 2000; A. M. Ryan & Patrick, 2001; Sapon-Shevin et al., 1998 (playground example); Stipek, 1996; Turnbull et al., 2000; M.-T. Wang & Holcombe, 2010; Wentzel et al., 2012.

As an example of a learning environment in which a student does *not* feel psychologically safe, let's consider the explanation of Monica, who is described as shy, inquisitive, creative, and mature.[25] She is a self-identified Black adolescent girl enrolled in a high school social studies class taught by Mrs. Thompson (a White female teacher). Monica believes that her teacher's expectations of appropriate behavior for Black girls are based on the stereotype that Black girls are loud, which is disconcerting for Monica because she is shy and introverted. For the first part of the school year Monica resisted her teacher's expectations to be loud. But by the middle of the year, her teacher warned her that if she didn't

[25] Woodson, 2020.

speak more in class, her grade for class participation would be lowered. Over time, Monica figured out a way to behave in a manner consistent with her teacher's expectations:

> I'll be like Ms. Thom-as-son I need your help! I need your help! The thing with her is she always needs receipts, like if I do not put on my White girl voice she will not come over to my side of the room at all. She'll just ignore me. So loud Black female in a White girl voice, that's the equation.[26]

Monica's strategy for participation may or may not be effective, but clearly it demonstrates that she doesn't perceive the class as psychologically safe for her: she wasn't able to be herself and the class did not allow her to develop her own identity. Instead, she felt forced to act like a stereotypical Black girl with a White girl voice.

Monica's experience reminds us of how important it is for teachers to examine their own cultural lenses and stereotypes—points we addressed in Chapter 4. You may also recall our discussion in Chapter 7 about differences in students' personality traits, such as extraversion. Although it may be true that some of the other Black girls in Mrs. Thompson's class are loud, Monica is not; she's introverted. On the one hand, it's not appropriate to expect Monica to act like an extravert. On the other hand, it is appropriate to expect Monica to participate in the class. To do so, the teacher could talk privately with Monica, acknowledge that she's an introvert, and discuss strategies that Monica could use to participate more actively in class. It's unlikely that Monica is the only introvert in the class and strategies that work with Monica will likely work with other students as well.

Establish reasonable rules and procedures.

In the opening case study, Ms. Cornell failed to provide guidelines about how students should behave, which is something she should have done the first week of school. A class without guidelines for appropriate behavior is apt to be chaotic and unproductive. Students must know that certain behaviors simply won't be tolerated, especially those that cause physical or psychological harm, damage other people's property, or interfere with classmates' learning and performance. Setting reasonable limits on classroom behavior not only fosters a more productive learning environment but also helps prepare students to become productive members of adult society (recall the discussion of socialization in Chapter 4).

Effective classroom managers establish and communicate certain rules and procedures right from the start.[27] They identify acceptable and unacceptable behaviors—not only about social interactions but also about punctuality and preparedness for each day's class. They develop consistent procedures and routines for such things as completing seatwork, asking for help, and turning in assignments. They have procedures in place for nonroutine events such as school assemblies, field trips, and fire drills. Taking time to clarify rules and procedures—and periodically reviewing them—seems to be especially important in the early elementary grades, when students may not be familiar with how things are typically done at school.[28]

Students should understand that rules and procedures aren't merely the result of a teacher's personal whims but are designed to help the class run smoothly and efficiently. As you may recall from Chapter 5, the empowerment component of the MUSIC model indicates that students are more likely to be motivated when the teacher fosters their autonomy. One strategy to empower students is to include them in decision making about the rules and procedures by which the class will operate—a strategy that's likely to enhance their sense of ownership of and adherence to those rules and procedures.[29]

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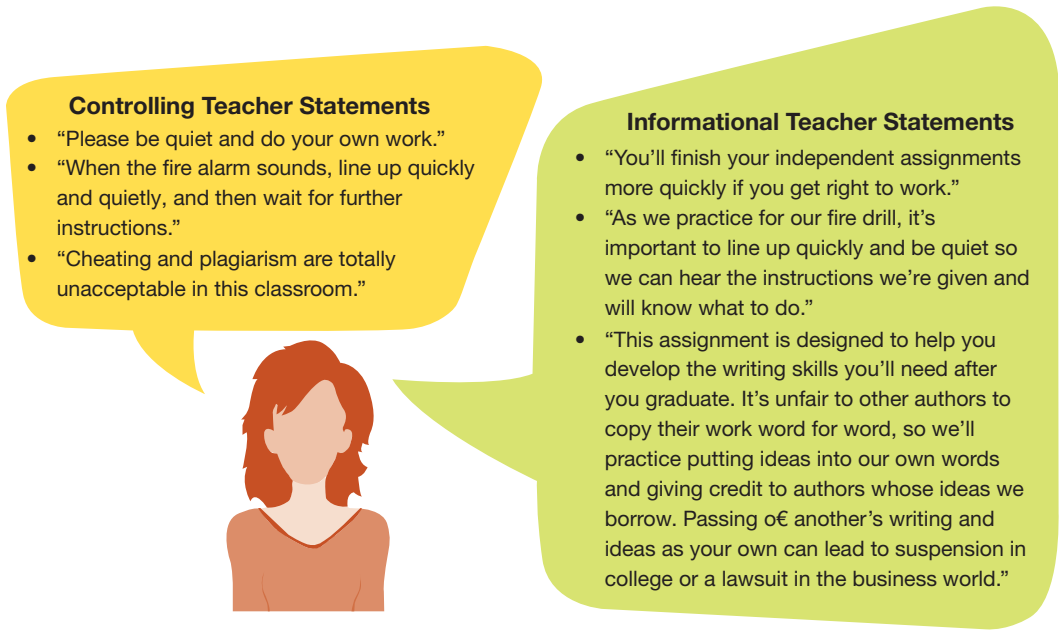
[26] Woodson, 2020, p. 575.

[27] Borko & Putnam, 1996; W. Doyle, 1990; Emmer & Evertson, 2009; Gettinger & Kohler, 2006.

[28] K. Carter & Doyle, 2006; W. Doyle, 1990; Gettinger & Kohler, 2006; K. L. Lane et al., 2011.

[29] Evertson & Emmer, 2009; Nucci, 2009; M. Watson, 2008.

Figure 9.3 Students are more likely to be motivated to follow classroom rules and procedures if teachers present them as items of information rather than as forms of control



Another empowerment strategy for preserving students' sense of autonomy is to present rules and requirements as *information*—for instance, as conditions that can help students accomplish classroom goals—rather than as mechanisms of *control* over students.[30] The right-hand side of Figure 9.3 presents three examples of rules and procedures presented in an informational manner; notice how each example provides one or more reasons for a teacher's request. The statements in the left-hand side of Figure 9.3 are more controlling, which may decrease students' perceptions of autonomy.

Keep in mind that rules and procedures are easier to remember and therefore easier to follow if they're relatively simple and few in number.[31] Effective classroom managers tend to stress only the most important rules and procedures at the beginning of the school year and introduce additional rules and procedures as needed later on. Also keep in mind that although some order and predictability are essential for student productivity, *too much* order can make school a boring, routine place—one without an element of fun and spontaneity. Classrooms don't necessarily need rules and procedures for everything!

Enforce rules consistently and equitably.

Classroom rules are apt to be effective only if they're consistently enforced. For example, in the opening case study, Ms. Cornell imposes no consequences when Eli, Jake, and Vanessa misbehave. As we discovered in Chapter 4, imposing no adverse consequence for inappropriate behavior—especially when that consequence has been spelled out in advance—can actually be a form of *reinforcement* for the misbehavior. Not only do the three troublesome students continue to disrupt class, but other students start to behave similarly, reflecting the *peer-contagion* phenomenon described in Chapter 7. Students have essentially learned that "anything goes" in Ms. Cornell's classroom.

[30] Deci, 1992; Koestner et al., 1984; Reeve, 2009.
[31] W. Doyle, 1986; Emmer & Gerwels, 2006; K. L. Lane et al., 2011.

We consider guidelines for administering punishment later in the chapter, but for now, we should note that consistency in enforcing classroom rules should apply not only across occasions but also across *students*. Teachers almost invariably like some students more than others (e.g., they're apt to prefer high achievers), but they must keep their preferences to themselves. Students can be quite resentful of teachers who grant special favors to and overlook rule infractions of a few "pet" students.[32] And students who are unfairly accused or punished are, of course, even more resentful, as one high school student explains:

> Because like if you had a past record or whatever like in middle school if you got in trouble like at all, they would think that you're a slight trouble maker and . . . if you were anywhere that something bad happened or something against the rules or whatever, they pick you first because they think that you have a past. So they wouldn't like pick the kids that had never done anything.[33]

think about it
Thinking back to your years in elementary and secondary school, can you recall at least one student who was a "teacher's pet"—someone who was clearly a favorite and had special privileges? Can you also recall a few students who were continually blamed for misdeeds, even when they weren't always the actual culprits?

Thus, consistency and equitable treatment for all students—or the lack thereof—is likely to have a significant effect on teacher–student relationships and overall classroom climate.[34]

Keep students productively engaged in worthwhile tasks.

As effective teachers plan lessons and classroom activities, they also plan specific ways of keeping students on task—something Ms. Cornell neglected to do in the opening case study. One strategy, of course, is to make the subject matter interesting and relevant to students' personal goals (see Chapter 5). Another is to incorporate variety into lessons, perhaps by using colorful audiovisual aids, conducting novel activities (e.g., small-group discussions, class debates), or occasionally moving to a different location (e.g., a computer lab or the school yard).[35] But above all else, effective teachers make sure students always have something to do. Thanks to their basic need for arousal, human beings have a hard time doing *nothing at all* for any length of time (again see Chapter 5). Students often misbehave when they have nothing to do or when they are bored with what they *are* doing.[36]

Effective classroom managers make sure there's little "empty" time in which nothing is going on. Following are several strategies for keeping students productively engaged:[37]

- Have something specific for students to do each day, even on the first day of class.
- Have materials organized and equipment set up before class.
- Conduct activities that ensure *all* students' involvement and participation.
- Maintain a brisk pace throughout each lesson (but not so fast that students can't keep up).
- Ensure that students' comments are relevant and helpful but not excessively long-winded. (For example, take chronic time-monopolizers aside for a private discussion about giving classmates a chance to speak.)
- Spend only short periods of class time assisting individual students unless other students are able to work independently and productively in the meantime.
- Ensure that students who finish an assigned task quickly have something else to do (e.g., reading a book or writing in a class journal).

[32] Babad, 1995; Babad et al., 2003; J. Baker, 1999.
[33] Certo et al., 2002, p. 25.
[34] Babad et al., 2003; Peter & Dalbert, 2010; Wentzel et al., 2010.
[35] Brophy et al., 2009; G. A. Davis & Thomas, 1989; Munn et al., 1990.
[36] Gettinger & Kohler, 2006; J. Hunter & Csikszentmihalyi, 2003; Shernoff et al., 2003.
[37] W. Doyle, 1986; Emmer & Evertson, 2009; Emmer & Gerwels, 2006; Gettinger, 1988; K. L. Lane et al., 2011; Munn et al., 1990.

Plan for transitions.

In the opening case study, Eli, Jake, and Vanessa often misbehave at the beginning and end of the school day, as well as before and after recess and lunch. Misbehaviors most frequently occur during transition times—as students end one activity and begin a second, or as they move from one classroom to another. Effective classroom managers take steps to ensure that transitions proceed quickly and without a loss of momentum.[38] For example, they establish procedures for moving from one activity to the next, and they ensure that there's little slack time in which students have nothing to do. And especially in the secondary grades, when students change classes every hour or so, effective classroom managers typically have a task for students to complete as soon as they enter the classroom. Consider these examples:

- An elementary school teacher has students follow the same procedure each day as lunchtime approaches: (1) Place completed assignments in the teacher's "In" basket, (2) put away supplies, (3) get out any home-packed lunches, and (4) line up quietly by the door.
- A middle school math teacher has students write down the next homework assignment as soon as they come to class.
- As students first enter the classroom, a middle school social studies teacher always hands them a short "Do It Now" assignment. For example, on one occasion he hands out a map of U.S. states and state capitals and instructs students to identify place names that might have Native American names and those that probably have European roots—a task that leads to a class discussion on the origins of place names.
- Before each class period begins, a ninth-grade creative writing teacher writes a topic or question on the board (e.g., "My biggest pet peeve"). Students know that when they come to class, they should immediately begin to write on the topic or question of the day.
- A high school physical education teacher has students begin each class session with 5 minutes of stretching exercises.

Although very different in nature, all of these strategies share the common goal of keeping students focused on productive activities.

Keep in mind that some students may have difficulty moving from one activity to another, especially if they're deeply engaged in what they're doing. Accordingly, it's often helpful to give students advance warning that a transition is coming, describe what the subsequent activity will be, and remind them of the usual procedures for switching from one task to another.[39]

Take individual and developmental differences into account.

Earlier, we mentioned the importance of consistency and equity in enforcing classroom rules. But when it comes to *preventing* off-task behavior and encouraging more productive ones, optimal strategies may differ considerably from one student to the next. For example, during independent seatwork assignments, some students may work quite well with classmates close by, whereas others can be easily distracted unless they can work in a quiet spot, perhaps near a teacher's desk. And during small-group work, some groups may function quite effectively on their own, whereas others may need considerable guidance and supervision.

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[38] W. Doyle, 1984, 2006; Gettinger & Kohler, 2006. A phenomenon known as *behavioral momentum* is relevant here—e.g., see Ardoin et al., 1999; Belfiore et al., 1997; Mace et al., 1988.

[39] K. Carter & Doyle, 2006; Emmer & Gerwels, 2006.

Students' classroom behaviors are affected by their **traits**—the typical ways in which a person behaves, thinks, and feels across situations and time (see Chapter 7). To be truly effective classroom managers, teachers must realize that students' vastly different classroom behaviors may be due, in part, to biological predispositions that aren't entirely within students' control. Such a realization should influence teachers' beliefs about why students act as they do—that is, it should influence teachers' *attributions*—and these beliefs will, in turn, affect teachers' willingness to adapt classroom strategies to foster productive classroom behavior.[40]

Other individual difference variables that influence classroom behavior are students' ability levels and perceptions of competence. Students are more likely to work diligently on their classwork when they have tasks and assignments appropriate for their current knowledge and skills. They're apt to misbehave when they're asked to do things that they perceive—either accurately or not—to be exceptionally difficult.[41] (Such may have been the case for Eli, Jake, and Vanessa in the opening case study.) Chapter 5 presented many strategies to help students believe that they could achieve success, including enhancing their self-efficacy and self-worth, presenting appropriate challenges, communicating optimistic expectations and attributions, minimizing competition, and focusing on mastery goals.

Developmental differences, too, must dictate classroom management strategies to some degree. Table 9.1 presents several developmental considerations, along with examples of how teachers might accommodate them in classroom practice.

Continually monitor what students are doing.

Effective teachers communicate something called **withitness**: They know—and their students *know* that they know—what students are doing at all times. These teachers regularly scan the classroom, often move from one spot to another, and make frequent eye contact

Developmental Trends

Table 9.1 Effective Classroom Management at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
Photo by Unsplash **K–2**	• Anxiety about being in school, especially in the first few weeks and especially for students without preschool experience • Lack of familiarity with unspoken rules about appropriate classroom behavior • Short attention span and distractibility • Little self-regulation • Desire for teacher affection and approval • Considerable individual differences in social skills	Immediately after lunch on the first day of school, a first-grade teacher gathers her students at the front of the room for a storybook reading. Before she begins to read, she explains the importance of sitting quietly so that everyone can hear the story, and when students occasionally behave in ways that might distract others, she gently reminds them of appropriate school behaviors.	• Invite students and their parents to visit the classroom before the school year begins. • In the first week of the school year, place a high priority on establishing a warm, supportive relationship with every student. • Create a gathering place (e.g., a carpet) where students can sit close at hand for whole-class discussions. • Keep assignments relatively short and focused. • Create areas where students can work independently on tasks of their choosing (e.g., a reading center where students can listen to storybooks on a tablet). • Give students frequent opportunities to release pent-up energy. • Be explicit about acceptable classroom behavior; correct inappropriate behavior gently but consistently.

[40] W. Johnson et al., 2005; Keogh, 2003; A. Miller, 2006; Rothbart, 2011.

[41] Mac Iver et al., 1995; Moore & Edwards, 2003; S. L. Robinson & Griesemer, 2006.

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
JohnnyGreig/E+/ Getty images **3–5**	• Continuing desire for teacher approval, but with increasing concern about peer approval as well • Greater attentiveness to teachers who are emotionally expressive (e.g., teachers who often smile and show obvious concern in times of distress) • Increasing self-regulation skills • Gradually improving ability to reflect on one's own and others' thoughts and motives (i.e., increasing social cognition) • Increasing disengagement from school if students are consistently encountering academic or social failure	Nine-year-old Bailey is often disruptive and socially inappropriate—so much so that her classmates avoid her as much as possible. On several occasions her teacher takes her aside and respectfully requests more productive behavior. For example, on one occasion the teacher says, "Bailey, I'm very happy to have you in my class. But it would really help me—and I think it would help you, too—if you could raise your hand before you answer a question. That way, other kids also get a chance to answer questions."	• In both words and actions, consistently show students that you care about their academic progress and emotional well-being. • Provide increasing opportunities for independent work, but with enough structure to guide students' efforts. • Use two-way journals to communicate regularly with students about academic and personal issues. • In times of disagreement or conflict among classmates, ask students to reflect on one another's thoughts and feelings. • Make an extra effort to establish close, supportive relationships with students who appear to be academically and socially disengaged.
Photo by Unsplash **6–8**	• Considerable anxiety about the transition to middle school, often as a result of more distant and less supportive relationships with teachers • Decrease in motivation to learn academic subject matter • Increasing tendency to challenge traditional school norms for behavior—for instance, norms regarding clothing and hairstyle (for some students) • Increase in cheating behaviors; cheating is less common when students think teachers respect them and are committed to helping them learn • Heightened concern about ability to fit in and be accepted by peers • Increase in bullying behaviors	As the son of a neglectful single mother, 14-year-old D.J. has frequently moved from one relative's home to another. He is now spending a second year in seventh grade, where he's extremely disruptive and disrespectful. When he calls a classmate a "fag," his teacher takes him aside and says, "I won't tolerate that offensive word. But I know you're going through a lot at home, and I really want you to be successful here at school. How can I help?" D.J. admits that he has gay friends who wouldn't like the word he just used, and his teacher's obvious concern for his well-being soon leads to better behavior in class. Furthermore, he starts asking the teacher for help on assignments.	• Make an effort to interact with students outside of class (e.g., chat with them in the hallway, attend sporting events, chaperone school dances). • Plan lessons that are engaging and relevant to students' lives and needs. • Provide sufficient academic support that students have no reason to cheat; nevertheless, be on the lookout for possible cheating. • Do not tolerate bullying and other forms of aggression; address their underlying causes (see the discussion of aggression in Chapter 7). • Reach out to students who seem socially disconnected (e.g., invite them to join you for lunch in your classroom).
Photo by Unsplash **9–12**	• Anxiety about the transition to high school, especially if seventh and eighth grades have been part of elementary school (as is true in some small school districts) • Social and romantic relationships often a source of distraction • Considerable self-regulation skills in some but not all students • High incidence of cheating, in part because peers communicate that cheating is acceptable • Disdain for classmates who work too hard for teacher approval (i.e., "brown-nosers") • Tendency for some adolescents to think that misbehavior will gain the admiration of classmates • Increase in violent behaviors, especially at schools in low-income neighborhoods	When a high school teacher sees 16-year-old Jerrod standing alone at a school dance, he approaches the boy to express empathy. "I remember my first school dance," the teacher tells him. "Boy, did I feel awkward! I was too shy to ask a girl to dance, and I was so afraid of making a fool of myself. What do you think we might do to make these events less intimidating?" Jerrod smiles and admits that he feels the same way his teacher once did, and they brainstorm ideas for helping students feel more comfortable at future dances.	• Remember that even in the high school grades, students achieve at higher levels when they have close, supportive relationships with teachers. • Regularly plan activities that involve social interaction; if possible, move desks and chairs to allow students to interact more easily. • Provide guidance and support for students who have few self-regulation skills to keep themselves on task. • Describe the various forms that cheating might take, and explain why cheating in *any* form is unacceptable. • Communicate approval privately rather than publicly. • Proactively address violence (see the section "Addressing Aggression and Violence at School" later in the chapter).

Sources: Some characteristics and suggestions based on Blanton & Burkley, 2008; Blugental et al., 1999; K. Carter & Doyle, 2006; Castagno & Brayboy, 2008; Cizek, 2003; Emmer & Gerwels, 2006; Espinoza & Juvonen, 2011; Fingerhut & Christoffel, 2002; Hamre & Pianta, 2005; J. N. Hughes et al., 2008; Ladd et al., 2008; Mainhard et al., 2011; Mehan, 1979; Murdock et al., 2001; E. O'Connor & McCartney, 2007; Pellegrini, 2002; many other ideas derived from discussions in earlier chapters.

with individual students. They know what misbehaviors are occurring *when* those misbehaviors occur, and they know who the perpetrators are.[42] Consider the following classroom example:

> As a second-grade teacher works with a small reading group at the front of the classroom, she situates herself with her back to the wall so that she can simultaneously keep an eye on the other students who are working independently at their seats. She sends a quick and subtle signal—perhaps a stern expression, a finger to the lips, or a callout of a student's name—to any student who gets off task.

When teachers demonstrate such withitness, especially at the beginning of the school year, students are more likely to behave appropriately, stay on task, and achieve at high levels.[43]

9.2 Expanding the Sense of Community Beyond the Classroom

Big Idea 9.2 **Teachers are most effective when they coordinate their efforts with colleagues, outside agencies, and parents.**

Students' learning and development depend not only on what happens inside a particular classroom but also on what happens in other parts of the school building, in the neighborhood and community, and at home. Effective teachers coordinate their efforts with other influential individuals in students' lives—with other school faculty members, with professionals at community agencies, and especially with students' parents or other primary caregivers. Ideally, teachers should think of such joint efforts as *partnerships* in which everyone is working together to promote students' long-term development and learning. Following are several recommendations.

Collaborate with colleagues to create an overall sense of school community.

Teachers are far more effective if they coordinate their efforts with other faculty members through strategies such as these:[44]

- Identify common goals regarding what students should learn and achieve.
- Work together to identify and overcome obstacles to students' academic achievement.
- Establish a shared set of standards for students' behavior, along with systematic, schoolwide procedures for encouraging productive behaviors.
- Jointly and explicitly insist on respect for people with diverse backgrounds and needs—a strategy that translates into prohibitions against malicious teasing, derogatory rumor spreading, bullying, and other forms of peer harassment.

Thus, effective teachers not only create a sense of community within their individual classrooms but also create an overall **sense of school community**.[45] Students should consistently get two messages from teachers: (1) All faculty members are working together to help students become informed and productive citizens and (2) students can and should *help and support one another.* A sense of school community involves close student–student

[42] Gettinger & Kohler, 2006; T. Hogan et al., 2003; Kounin, 1970; K. L. Lane et al., 2011.
[43] W. Doyle, 1986; Gettinger & Kohler, 2006; Woolfolk & Brooks, 1985.
[44] Battistich et al., 1997; Espelage & Swearer, 2004; K. L. Lane et al., 2009; J. Lee & Shute, 2010; T. J. Lewis et al., 2006; O'Brennan et al., 2014; M. Watson & Battistich, 2006.
[45] Battistich et al., 1995, 1997; M. Watson & Battistich, 2006.

relationships not only within individual classrooms but also across classrooms and grade levels. Cross-class peer tutoring, participation in extracurricular activities, student involvement in school decision making, frequent use of school mascots and other traditional school symbols—all of these help create a sense that students are members of a mutually supportive school "family."[46]

When teachers and students share an overall sense of school community, students have more positive attitudes toward school, are more motivated to achieve at high levels, exhibit more prosocial behavior, and interact more often with peers from diverse backgrounds. Furthermore, when teachers collaborate in their efforts, they often have higher *collective self-efficacy*—a belief that by working as a team, they can definitely have an impact on students' learning and achievement (see Chapter 5)—and this collective self-confidence is correlated with students' academic performance.[47] Such a team spirit provides an additional advantage for beginning teachers: It provides the support structure (scaffolding) they sometimes need, especially when working with students who are at risk for school failure.[48]

Work cooperatively with other agencies that play key roles in students' lives.

Many students have regular contact with other institutions besides their schools—possibly with community recreation centers, social services, churches, hospitals, mental health clinics, or local judicial systems. Teachers are most effective if they think of themselves as part of a larger community team that promotes children's overall development and well-being. Thus, they should keep in contact with other people and institutions that play major roles in students' lives, coordinating efforts whenever possible.[49] Keep in mind, however, that school–agency cooperation regarding *individual* students—especially if it involves sharing potentially sensitive information—can typically occur only with written permission from students' parents.

Communicate regularly with parents and other primary caregivers.

Without a doubt, productive parent–teacher relationships enhance students' learning and achievement in the classroom, and ongoing communication between school and home is critical for these relationships.[50] At a minimum, teachers must stay in regular contact with parents and other primary caregivers about students' progress. Regular communication also provides a means through which families can give teachers information (e.g., about current circumstances at home or about effective motivational strategies). Following are several common mechanisms for enhancing school–family communication:

- **Parent–teacher conferences.** In most school districts, formal parent–teacher conferences are scheduled one or more times a year. Teachers sometimes invite students or other family members who share caregiving responsibilities (e.g., grandparents) to participate.
- **Paper communications.** Paper communications can take a variety of forms, including (1) homework slips explaining each night's assignments, (2) informal notes acknowledging significant accomplishments, (3) teacher-constructed checklists that describe academic progress, and (4) general newsletters describing ongoing classroom activities.

think about it
Did the schools you attended have formal or informal relationships with other institutions? If so, how did these relationships benefit students?

[46] Juvonen, 2006; Nucci, 2009; D. R. Robinson et al., 2005.
[47] Goddard et al., 2000; Hoy et al., 2006; J. Lee & Shute, 2010.
[48] Chester & Beaudin, 1996.
[49] J. L. Epstein, 1996; Kincheloe, 2009.
[50] P. A. Edwards & Turner, 2010; Gutman & McLoyd, 2000; J. Hughes & Kwok, 2007; Reschly & Christenson, 2009; Smith et al., 2020.

- **Electronic communications.** Electronic communications refer to things such as phone calls, e-mails, texts, video conferences, class websites (with instructional goals, assignments, and the like; see Chapter 8), and social media posts. As an example, Figure 9.4 shows one of the "weekly update" e-mail letters that a fourth-grade teacher regularly sends to her students' parents and other primary caregivers. Notice that, with students' diverse family structures in mind, she addresses the letter to "Families" rather than "Parents." Also notice how the letter simultaneously serves several purposes to (1) request appropriate outdoor clothing, (2) remind family members about scheduled parent–teacher conferences and other upcoming events, (3) keep families in the loop about current academic lessons and projects, and (4) encourage families to contact her with any questions or concerns. Obviously, electronic communications are appropriate only when parents have access to the technologies and check them regularly. Using a new app to communicate may seem like a good

Figure 9.4 In weekly e-mail messages like this one, a fourth-grade teacher in Virginia keeps in regular contact with her students' parents and other primary caregivers. "SOL" refers to the Standards of Learning tests, which are Virginia's statewide achievement tests administered near the end of each school year. Her "cumulative" classroom tests, which may include material from any previous point in the school year, are intended to encourage students to continue reviewing all of the topics and skills they have studied.

Families,

I hope everyone enjoyed a wonderful fall weekend! As the weather gets cooler, please remind your child to dress appropriately—we will go outside as long as the weather cooperates. So please send a coat, hat, etc.

This week is conference week. If you do not know your conference time, please let me know. I sent reminder forms home last week with most students. I really look forward to meeting with you all!

Here is what we have planned for this week:

Math: We will begin discussing place value. We will make and expand numbers, compare whole numbers, examine number lines, and look at numbers to the millions.

Language Arts: We will have word study this week. I have adjusted a few of the word study groups according to everyone's needs. We have begun the typing program in the computer lab. Although you do not have access to this at home, there is another typing program that is free: [the teacher includes a hotlink to the program]. This is a very important skill, so please encourage your child to type at home! We will be continuing to work on our *Titanic* projects and hope to have these finished by Friday. We will also begin a mystery mini-unit and will be reading quite a few short mysteries. We will also continue book club with *The Tale of Despereaux*. In writing, we will wrap up our personal narratives and begin brainstorming for each student's Winning Choices Essay. This essay is part of a contest sponsored by the Rotary Club and Montgomery County. We will be working on it together at school as our first major school writing project.

Science: We will continue to study weather. We will have a quick quiz tomorrow about weather tools. We have learned about types of clouds and will begin learning about temperature and air pressure this week.

History: We will wrap up our unit on First Virginians this week and have a test early next week. Just a reminder that all of our tests will be cumulative in an effort to continue to study for our end-of-the-year SOL test.

Important Dates:
10/24 - No school (conferences)
10/25 - PTA Fall Festival (6:00–8:00 pm)
11/1 - Early release
11/4 - Center for the Arts concert field trip (during school hours)
11/5 - No school (election day)
11/7 - End of grading period
11/14 - Field trip to BHS (during school hours—we will watch a Cinderella play)

As always, please let me know if you ever have questions or concerns.

Enjoy the week,

Ashleigh

idea, but parents might find it frustrating to have to check another app, especially if different teachers use different apps. Teachers need to consider not only what is most convenient for them, but also what is practical and useful for parents.

When communicating with students' families, teachers don't necessarily have to limit themselves to what's happening in the classroom. Many parents welcome teachers' suggestions about how best to help their children at home. For instance, parents are often grateful for suggestions about how to assist with homework or how to foster their children's development more generally.[51] And they appreciate knowing what kinds of behaviors are and are not normal for a particular age group.[52]

Invite families and community members to participate in the academic and social life of the school.

In general, effective schools are *welcoming* schools that encourage not only students but also family and community members to participate in school activities.[53] Some parents are available on weekdays and are happy to assist with occasional field trips and class parties; a few may even be able to provide one-on-one tutoring for certain students. Many other parents are available in the evenings and can attend school open houses, school plays, band and choir performances, and fund-raising events. Some teachers have successfully used parent *coffee nights* during which they explain a new instructional strategy or *author teas* during which students read poems or short stories they've written.

In some instances, teachers or other faculty members might assemble a group of parents to discuss issues of mutual interest.[54] For example, they might use such a group as a sounding board when selecting topics to include in the classroom curriculum or thinking about assigning potentially controversial works of literature. Alternatively, teachers can use an online or face-to-face discussion group as a mechanism through which teachers and parents alike can share ideas about how best to promote students' academic, personal, and social development on the home front.

Community members may also be available and willing to share their experiences and knowledge with students. For example, local authors, scientists, artists, or business owners could come to a class or school assembly to share their knowledge related to specific instructional goals. Scientists might explain how viruses spread and artists may describe how they try to evoke certain emotions in their work. Community members might also share job opportunities available in the community or career paths within their field.

Make an extra effort with seemingly "reluctant" parents.

Despite many opportunities to participate, some parents remain uninvolved in their children's education; for example, they may never attend scheduled parent–teacher conferences. Rather than jumping to the conclusion that these parents are also *uninterested* in their children's education, teachers must recognize several possible reasons that parents might be reluctant to make contact with their children's teachers. Some may have an exhausting work schedule or lack adequate child care. Others may know little English, have difficulty finding their way through the school system, or believe it's inappropriate to bother teachers with their concerns. Still others may have had such bad experiences when they themselves were students that they feel uncomfortable in a school building. And a few parents

[51] Not all parents use good judgment in their own, independent efforts to help their children with homework. Some parents' strategies can actually be counterproductive, especially if they create a source of conflict and stress in the family; see Dumont et al., 2012.

[52] C. Davis & Yang, 2005; J. M. T. Walker & Hoover-Dempsey, 2006.

[53] J. L. Epstein, 1996; N. E. Hill et al., 2004; G. R. López, 2001; Serpell et al., 2005.

[54] J. L. Epstein, 1996; Fosnot, 1996; Rudman, 1993.

may be victims of mental illness or substance abuse, limiting their ability to support their children financially, academically, or otherwise.[55]

In some cases, a personal invitation can make a difference, as this parent's statement illustrates:

> The thing of it is, had someone not walked up to me and asked me specifically, I would not hold out my hand and say, "I'll do it." . . . You get parents here all the time, Black parents that are willing, but maybe a little on the shy side and wouldn't say I really want to serve on this subject. You may send me the form, I may never fill the form out. Or I'll think about it and not send it back. But you know if that principal, that teacher, my son's math teacher called and asked if I would. . . .[56]

Experienced educators have offered additional recommendations for getting seemingly reluctant parents more involved in their children's schooling:[57]

- Encourage parents to be assertive when they have questions or concerns.
- Invite other important family members to participate in school activities, especially if a student's cultural background places high value on extended families.
- Offer suggestions about learning activities that parents can easily do with their children at home.
- Find out what things certain family members do exceptionally well (e.g., carpentry, cooking) and ask them to share their talents with students.
- Provide opportunities for parents to volunteer for jobs that don't require them to leave home (e.g., to be someone whom students can call when unsure of homework assignments).
- Identify specific individuals (e.g., bilingual parents) who can translate for those who speak little or no English.
- Conduct parent–teacher conferences or parent discussions at times and locations convenient for families; make use of home visits *if* such visits are welcomed.
- Offer resources for parents at the school building (e.g., contacts with social and health services; classes in English, literacy, home repairs, arts and crafts).

Still another potentially effective strategy is to reinforce *parents* as well as students when the students do well at school. One administrator at a school serving many immigrant students put it this way:

> One of the things we do . . . is that we identify those students that had perfect attendance, those students that passed all areas of the [statewide achievement tests] and were successful. We don't honor the student, we honor the parents. We give parents a certificate. Because, we tell them, "through your efforts, and through your hard work, your child was able to accomplish this."[58]

A few parents may resist all efforts to get them involved. Especially in such circumstances, teachers must never penalize students for their parents' actions or inactions. Teachers must also realize that *they themselves* are apt to be among the most important academic and emotional resources in these students' lives.

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[55] Bornstein & Cote, 2010; Cazden, 2001; Dantas & Manyak, 2010; P. A. Edwards & Turner, 2010; C. L. Green et al., 2007; J.-S. Lee & Bowen, 2006.

[56] A. A. Carr, 1997, p. 2.

[57] Castagno & Brayboy, 2008; Dantas & Manyak, 2010; C. Davis & Yang, 2005; J. L. Epstein, 1996; Finders & Lewis, 1994; Hidalgo et al., 1995; G. R. López, 2001; Salend & Taylor, 1993; M. G. Sanders, 1996; J. M. T. Walker & Hoover-Dempsey, 2006.

[58] G. R. López, 2001, p. 273.

9.3 Reducing Unproductive Behaviors

Big Idea 9.3 **Effective interventions for reducing unproductive school behaviors are tailored to the circumstances, with students' long-term development and well-being as the ultimate goals.**

Despite teachers' best efforts, students sometimes behave in ways that significantly disrupt classroom activities and interfere with learning. For purposes of our discussion, we define a **misbehavior** as any action that can potentially disrupt learning and planned classroom activities, puts one or more students' physical safety or psychological well-being in jeopardy, or violates basic moral and ethical standards. Some misbehaviors are relatively minor and have little long-term impact on students' achievement and general well-being. Such behaviors as talking out of turn, writing brief notes to classmates during a teacher-directed lesson, and submitting homework assignments after their due date—especially if these behaviors occur infrequently—generally fall in this category. Other misbehaviors are far more serious, in that they definitely interfere with the learning or well-being of one or more students. For example, when students scream at their teachers, hit their classmates, or habitually refuse to participate in ongoing activities, then classroom learning—certainly that of the "guilty party" and sometimes that of other students as well—can be adversely affected, as can the overall classroom climate.

As is true in the opening case study, typically only a few students are responsible for the great majority of misbehaviors in any single classroom.[59] Such students are apt to be among teachers' greatest challenges, and it can be all too tempting to write them off as lost causes. Yet teachers must work vigorously to point these students in more productive directions. Without active interventions by teachers and other caring adults, students who are consistently disruptive or in other ways off task in the early grades may continue to show behavior problems later on.[60]

Teachers need to plan ahead about how they'll address students' misbehaviors. Although teachers must certainly be consistent in the consequences they impose for blatant rule infractions (recall our earlier discussion of consistency and equity), different strategies for reducing counterproductive behaviors over the long run may be more or less useful under different circumstances. Following are a number of possibilities.

Consider whether instructional strategies or classroom assignments might be partly to blame for off-task behaviors.

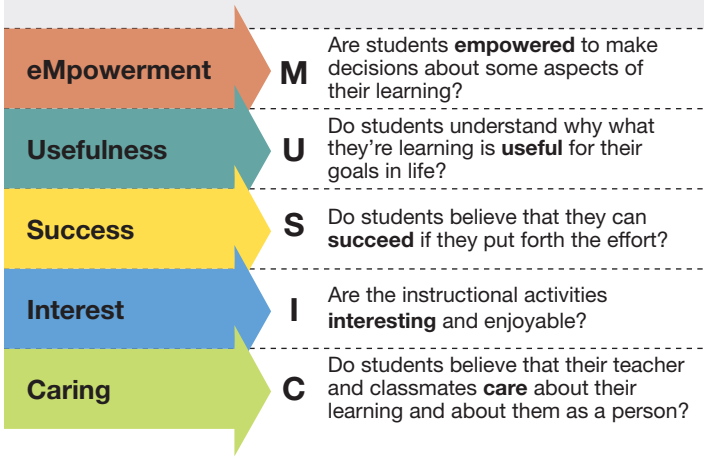
Principles of effective classroom management go hand in hand with principles of learning and motivation. When students are learning and achieving successfully and when they clearly want to pursue the class's instructional goals, they're apt to be busily engaged in productive activities for most of the school day. In contrast, when they have trouble understanding classroom subject matter or have little interest in learning it, they're likely to exhibit the nonproductive or counterproductive classroom behaviors that result from frustration or boredom.[61]

think about it
Can you think of times during your schooling when you were not on-task during class because the instructional strategies or classroom assignments were not engaging?

When students misbehave, beginning teachers often think about what the students are doing wrong. In contrast, experienced teachers are more likely to think about what *they themselves* could do differently to keep students engaged, and they modify their plans accordingly.[62] We've already explained many different ways to engage students in

[59] W. Doyle, 2006.
[60] Dishion et al., 2008; Emmer & Gerwels, 2006; Vitaro et al., 2005.
[61] Gettinger & Kohler, 2006; K. L. Lane et al., 2011; Metcalfe et al., 2013; Pekrun et al., 2010.
[62] Emmer & Stough, 2001; Sabers et al., 1991; H. L. Swanson et al., 1990.

Figure 9.5 Students are more likely to be engaged in class activities when the answers to these questions are yes. Teachers can remember these categories of engaging strategies by using the acronym MUSIC.



Sources: Jones, 2009, 2018, 2020.

Chapter 5 and we encourage you to refer back to that chapter for the details. Here, we just want to remind you that engagement strategies can be organized using the five categories of the **MUSIC Model of Motivation**, as summarized in Figure 9.5.[63] Students are more likely to be engaged in class activities when they (1) have control over some aspect of their learning (empowerment; see the student-directed approaches to instruction presented in Chapter 8), (2) believe that what they are learning is useful for their goals in life (usefulness), (3) believe that they can succeed if they try (success), (4) are interested in what they're learning (interest), and (5) believe that their teacher and classmates care about their learning and about them as a person (caring).

Occasionally students are justifiably preoccupied with current events on the local or national scene—perhaps a tragic car accident involving classmates or a contentious political event—to the point that they can't focus on classroom subject matter. In such circumstances, teachers may want to abandon their lesson plans altogether, at least for a short time.

Consider whether cultural background might influence students' classroom behaviors.

As teachers determine which behaviors are truly unacceptable in their classrooms, they must keep in mind that some behaviors that their own culture deems inappropriate may be quite acceptable in another culture.[64] These cultural mismatches are likely one reason why some groups of students, such as low-income and minority students, receive more suspensions and expulsions than other students (beyond what can be attributed to higher levels of misbehavior).[65] The following exercise presents three examples.

See For Yourself

Identifying Misbehaviors

As you read each of the following scenarios, consider these questions:

- Would you classify the behavior as a *mis*behavior?
- What cultural group(s) might think that the behavior is acceptable?
- How might you deal with the behavior?

1. A student is frequently late for school, sometimes arriving more than an hour after school has started.
2. Two students are sharing answers as they take a quiz.
3. Several students are exchanging insults that become increasingly derogatory.

Tardiness (Example 1) interferes with learning because the student loses valuable instructional time; thus, it might reasonably be construed as a misbehavior. However, a student who is chronically tardy may live in a community that doesn't observe strict schedules and timelines—a pattern common in some Hispanic and Native American

[63] Jones, 2009, 2018, 2020.
[64] For example, see Gay, 2006.
[65] Welsh & Little, 2018.

groups. Furthermore, arrival time may not be entirely within the student's control. For instance, perhaps the student has household responsibilities or transportation issues that make punctuality difficult. A private conversation with the student, perhaps followed by a conference with family members, might be the most effective way to determine the root of the problem and identify potential solutions (more about such strategies shortly).

Sharing answers during a quiz (Example 2) is a misbehavior *if* students have been specifically instructed to do their own work. Because a quiz helps a teacher determine what students have and haven't learned, inaccurate quiz scores affect the teacher's instructional planning and so indirectly affect students' future learning. Although the behavior represents cheating to many people, it might reflect the cooperative spirit and emphasis on group achievement evident in the cultures of many Native American, Mexican American, and Southeast Asian students. An adverse consequence is in order *if* a teacher has previously explained what cheating is in a way that students understand and *if* the teacher has clearly described situations in which collaboration is and isn't appropriate—in other words, if students know full well that their behavior violates classroom policy. A teacher who *hasn't* yet laid this groundwork must quickly do so in order to prevent such behavior from occurring again. Either way, if it's part of some students' culture to work together, the teacher should think about how to incorporate some activities that would allow students to collaborate productively.

Exchanging insults (Example 3) might be psychologically harmful for the students involved and adversely affect the overall classroom climate. Alternatively, however, it might simply be an instance of a playful verbal interaction involving creative one-upmanship common in some communities. How a teacher handles the situation must depend on the spirit in which students seem to view the exchange. Their body language—whether they're smiling or scowling, whether they seem relaxed or tense—can reveal a great deal. If the insults truly signal escalating hostilities, an immediate intervention is in order, perhaps by separating the students, imposing an appropriate consequence, and following up with a private conference. If, instead, the insults reflect creative verbal play, a teacher may simply need to establish reasonable boundaries (e.g., racial and ethnic slurs are unacceptable).

Notice that in all three of these scenarios, it's possible that the students are fully responsible for their behavior and that cultural mismatches are not the cause of their misbehavior. Yet, it's also possible that the teachers are expecting minority students to cater to the norms of the dominant culture in ways that disenfranchise and marginalize these students. In these cases, teachers need to consider how their dispositions and biases may lead to cultural clashes with students and if the behavior management rules can be modified in ways to be more accommodating to *both* the student's culture and the school's culture.[66] In the prior examples, the teachers tried to accomplish this by talking to the student and family members to identify potential solutions (Example 1), by considering how to incorporate collaborative activities (Example 2), and by allowing insults that are playful and fall withing reasonable boundaries (Example 3).

Ignore misbehaviors that are temporary, minor, and unlikely to be repeated or copied.

On some occasions, the best course of action is *no* action, at least nothing of a disciplinary nature. For example, consider these situations:

> Dimitra rarely breaks class rules. But one day, after you've just instructed students to work quietly and independently at their seats, you see her briefly whisper to the girl beside her. None of the other students seems to notice that Dimitra is temporarily disobeying your instructions.

[66] Welsh & Little, 2018.

> Herb is careless in chemistry lab and accidentally knocks over a small container of liquid—a harmless one, fortunately. He quickly apologizes and cleans up the mess.

Will these behaviors interfere with Dimitra's or Herb's academic achievement? Are they "contagious" behaviors that will spread to other students, as the horseplay does in Ms. Cornell's class in the opening case study? The answer to both questions is probably not and, therefore, ignoring the misbehavior is probably the best thing to do.

Whenever a teacher stops an instructional activity to deal with a misbehavior, even for a few seconds, the teacher may disrupt the momentum of the activity and draw students' attention to the misbehaving classmate. Furthermore, by drawing class attention to a particular misbehavior, the teacher may unintentionally be reinforcing it.

Ignoring misbehavior is often reasonable in circumstances such as these:[67]

- When the behavior is a rare occurrence and probably won't be repeated
- When the behavior is unlikely to spread to other students
- When the behavior is the result of unusual and temporary conditions (e.g., the last day of school before a holiday, unsettling events in a student's personal life)
- When the behavior is typical for the age group (e.g., kindergartners becoming restless after sitting for an extended time, sixth-graders not wanting to hold hands with others during dance instruction in physical education class)
- When the behavior's natural consequence is unpleasant enough to deter a student from doing it again
- When the behavior isn't seriously affecting classroom learning

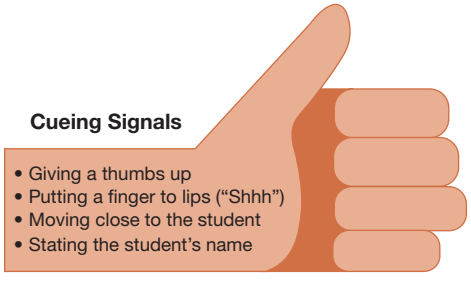
Give signals and reminders about what is and is not appropriate.

Some off-task behaviors, although not serious in nature, really do interfere with classroom learning and must be discouraged. Consider these situations as examples:

> As you're explaining a difficult concept, Marjorie is busily writing. At first, you think she's taking notes, but then you see her pass the paper across the aisle to Kang. A few minutes later Kang passes the same sheet back to Marjorie. It appears that the two students are writing personal notes when they should be attending to the lesson.

> You've separated your class into small groups for a cooperative learning activity. One group is frequently off task and probably won't complete its task if its members don't get down to business soon.

Figure 9.6 Cueing can take many different forms



Effective classroom managers handle such minor behavior problems as unobtrusively as possible. They don't stop the lesson, distract other students, or call unnecessary attention to the troublesome behavior.[68] In many cases they use **cueing** by using simple signals to indicate that a certain behavior is desired or that a certain behavior should stop (a strategy introduced in Chapter 4).

Cueing takes a variety of forms, including nonverbal and verbal. As examples, a teacher might use nonverbal cues by giving a thumbs-up to reinforce a good behavior, putting a finger to the lips to signal "Shhh" when students are too noisy, or moving close to a student and standing there until the problem behavior stops (Figure 9.6). When such nonverbal signals don't

[67] G. A. Davis & Thomas, 1989; W. Doyle, 1986, 2006; Munn et al., 1990; Silberman & Wheelan, 1980; Wynne, 1990.

[68] K. Carter & Doyle, 2006; W. Doyle, 1990; Emmer, 1987.

work, a brief verbal cue—stating a student's name, reminding students of correct behavior, or (if necessary) specifically describing an inappropriate behavior—may be in order. Ideally, a verbal cue should focus students' attention on what *should* be done rather than on what *isn't* being done.[69] For instance, instead of chastising students for being overly noisy during a cooperative group activity, a teacher might say, "As you exchange ideas, remember to use your *indoor voices* so that you don't distract other groups."

Some effective teachers use a bit of humor to take the sting out of verbal cues that might otherwise undermine productive teacher–student relationships.[70] For example, when a student comes into class late because he's been talking too long with friends in the hall, his teacher might teasingly tell him, "John, I know you have quite a fan club out there, but your fans in here—including *me*—are feeling a bit slighted that you don't want to spend time with us." Notice how this statement conveys that John has an admirable quality—he's a likeable guy—while also reminding him that punctuality is important.

Get students' perspectives about their behaviors.

Sometimes brief cues are insufficient to change a student's behavior. Consider these situations:

> Alonzo is almost always a few minutes late to your third-period algebra class. When he finally arrives, he takes several more minutes to pull his textbook and other class materials out of his backpack. You've often reminded him about the importance of coming to class on time, yet his tardiness continues.
>
> Trudy rarely completes class assignments. In fact, she often doesn't even *begin* them. On many previous occasions you've gently tried to get her on task, but usually without success. Today, when you look Trudy in the eye and ask her point blank to get to work, she defiantly responds, "I'm not going to do it. You can't make me!"

In such situations, talking privately with the student might be the next logical step. The discussion should be *private* for several reasons. First, as noted earlier, calling peers' attention to a problem behavior may actually reinforce the behavior rather than discourage it. Or, instead, the attention of classmates may cause a student to feel excessively embarrassed or humiliated—feelings that may make the student overly anxious about being in the classroom in the future. Finally, when a teacher spends too much class time dealing with a single misbehaving student, other students are apt to get off task.[71]

Private conversations with individual students give a teacher a chance to explain why certain behaviors are unacceptable and must stop (recall the discussion of induction in Chapter 7). They also give students a chance to explain why they behave as they do. For instance, Alonzo might explain his chronic tardiness by revealing that he has diabetes and must check his blood sugar level between his second- and third-period classes. He can perform the procedure himself but would prefer to do it in the privacy of the school nurse's office on the other side of the building. Meanwhile, Trudy might reveal her long-standing frustration with subject matter and assignments she perceives as being impossible to make sense of. A boy with a reading disability once voiced such frustration in an interview with a researcher:

> They [teachers] used to hand us all our homework on Mondays. One day my teacher handed me a stack about an inch thick and as I was walking out of class there was a big trash can right there and I'd, in front of everybody including the teacher, just drop it in

[69] Evertson & Emmer, 2009; K. L. Lane et al., 2011.
[70] Henley, 2010.
[71] W. Doyle, 2006; Emmer & Gerwels, 2006; Scott & Bushell, 1974.

> the trash can and walk out. I did this because I couldn't read what she gave me. It was kind of a point that I wanted to get the teacher to realize. That while I'm doing it, inside it kind of like hurt because I really wanted to do it but I couldn't and just so it didn't look like I was goin' soft or anything like that I'd walk over to the trash and throw it in.[72]

Students' explanations often provide clues about how best to deal with their behavior over the long run. For example, given his need to go to the nurse's office between classes, Alonzo might always be a bit late; accordingly, his teacher might reassign him to a seat by the door so that he can join class unobtrusively when he arrives. Trudy's frustration with her schoolwork suggests that she needs additional scaffolding to help her succeed. It also hints at a possible undiagnosed learning disability that may warrant a referral to the school psychologist or another diagnostician. In some cases, conversations with students can reveal maladaptive interpretations of social situations. For instance, a chronically aggressive student may express the inaccurate belief that classmates "are always trying to pick a fight" (recall the discussion of hostile attributional bias in Chapter 7). In this instance, a teacher might consult with the school counselor about how to help the student interpret social interactions more productively.

Students won't always provide explanations that lead to such straightforward solutions, however. For example, it may be that Alonzo is chronically late to class simply because he sees no point in being punctual. Or perhaps Trudy says she doesn't want to do her assignments because, she says, "I'm sick and tired of other people always telling me what to do." In such circumstances, it's essential that teachers not get in a power struggle—a situation in which one person wins by dominating over the other in some way. Several strategies can minimize the likelihood of a power struggle:[73]

- Speak in a calm, matter-of-fact manner, describing the problem as you see it. ("You haven't turned in a single assignment in the past 3 weeks. You and I would both like for you to do well in my class, but that can't happen unless we work together to make it happen.")
- Present the problem as one involving unproductive behavior, *not* a personality flaw. ("You've come to class late almost every day this month.")
- Listen empathetically to what the student has to say, being openly accepting of the student's feelings and opinions. ("I get the impression that you don't enjoy classroom activities very much; I'd really like to hear what your concerns are.")
- Summarize what you think the student has told you and seek clarification, if necessary. ("It sounds as if you'd rather not let your classmates know how much trouble you're having with your schoolwork. Is that the problem, or is it something else?")
- Describe the effects of the problem behavior, including your personal reactions to it. ("When you come to class late each day, I worry that you're getting further and further behind. Sometimes I even feel a little hurt that you don't seem to value your time in my classroom.")
- Give the student a choice from among two or more acceptable options. ("Would you rather try to work quietly at your group's table, or would it be easier if you sat somewhere by yourself to complete your work?")
- Especially when working with an adolescent, try to identify a solution that enables the student to maintain credibility in the eyes of peers. ("I suspect you might be worrying that your friends will think less of you if you comply with my request. What could you and I do to address this problem?")

[72] Zambo & Brem, 2004, p. 6.

[73] Colvin et al., 1997; Emmer & Evertson, 2009; Henley, 2010; Keller & Tapasak, 2004; K. Lane et al., 2006.

Ultimately, a teacher must communicate three things: (1) interest in the student's long-term school achievement, (2) concern that the misbehavior is interfering with that achievement, and (3) commitment to working cooperatively with the student to resolve the problem.

Teach self-regulation techniques.

Sometimes students need one-on-one guidance in how they might better control their own behaviors. Consider these examples:

> Bradley's performance on assigned tasks is usually rather poor. You know he's capable of better work because he occasionally submits assignments of exceptionally high quality. The root of Bradley's problem seems to be that he's off task most of the time—perhaps sketching pictures of sports cars, mindlessly fiddling with objects he's found on the floor, or simply daydreaming. Bradley would really like to improve his academic performance but doesn't seem to know how to do it.
>
> Georgia often talks without permission—for instance, blurting out answers to questions, interrupting classmates who are speaking, and initiating off-task conversations at inopportune times. On several occasions, you've spoken with Georgia about the problem, and she always promises to exercise more self-control in the future. Her behavior improves for a day or so, but after that, her mouth is off and running once again.

Bradley's off-task behavior interferes with his own learning, and Georgia's excessive chattiness interferes with the learning of her classmates. Cueing and private discussions haven't led to any improvement. But both Bradley and Georgia have something going for them: They *want* to change their behavior.

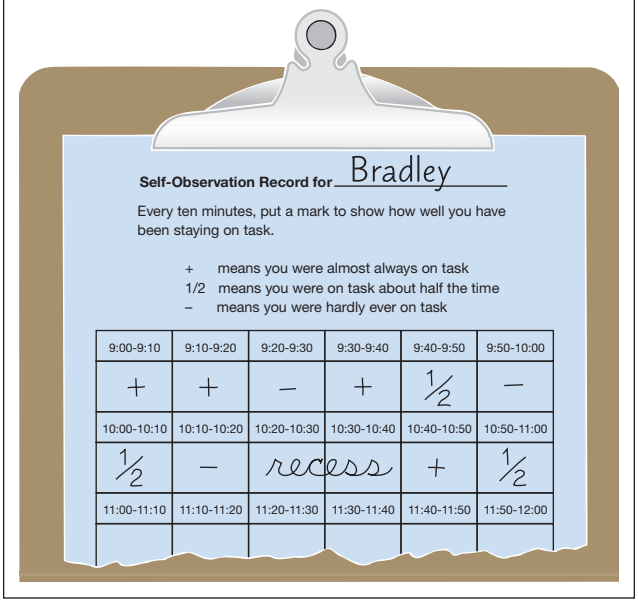
In Chapter 3 we examined a variety of strategies for promoting self-regulated learning and behavior, and some of them might be helpful for Bradley and Georgia. *Self-monitoring* is especially useful when students need a reality check about the severity of a problem. For instance, Bradley may think he's on task far more often than he really is. To help him get a sense of how frequently he's *off* task, his teacher might give him a timer set to beep every 10 minutes and ask him to record whether he's been on task each time he hears a beep. (Figure 9.7 shows the kind of recording sheet he might use.) Similarly, Georgia may not realize how frequently she prevents her classmates from speaking. To alert her to the extent of the problem, her teacher might ask her to make a check mark on a tally sheet every time she talks without permission.

If self-monitoring alone doesn't do the trick, *self-instructions* might help Georgia gain some self-restraint in classroom discussions:

1. *Button* my lips (by holding them tightly together).
2. *Raise* my hand.
3. *Wait* until I'm called on.

In addition, both students might use *self-imposed contingencies* to give themselves a motivational boost. For example, Bradley might award himself a point for each 10-minute period he's been on task. Georgia might give herself 5 points at the beginning of each school day and then subtract a point each time she speaks out of turn. By accumulating a certain number of points, the students could earn opportunities to engage in favorite activities.

Figure 9.7 Example of a self-monitoring sheet for staying on task



Self-Observation Record for Bradley

Every ten minutes, put a mark to show how well you have been staying on task.

\+ means you were almost always on task
1/2 means you were on task about half the time
– means you were hardly ever on task

9:00-9:10	9:10-9:20	9:20-9:30	9:30-9:40	9:40-9:50	9:50-10:00
+	+	–	+	1/2	–
10:00-10:10	10:10-10:20	10:20-10:30	10:30-10:40	10:40-10:50	10:50-11:00
1/2	–	recess	+	1/2	
11:00-11:10	11:10-11:20	11:20-11:30	11:30-11:40	11:40-11:50	11:50-12:00

Some students may initially need considerable scaffolding to help them learn to self-regulate their behaviors.[74] For example, in the first few days or weeks, a teacher might use one or more simple technological devices—perhaps a small buzzer the teacher can remotely activate from the other side of the room—to remind students of things they should be doing or give them feedback that they're doing something well.

Self-regulation strategies have several advantages. They help teachers avoid power struggles with students about who's in charge. They increase students' sense of autonomy and thus also increase students' motivation to learn and achieve in the classroom. Furthermore, self-regulation techniques benefit students over the long run, promoting productive behaviors that are likely to continue long after students have moved on from a particular classroom or school. And when students learn how to monitor and modify their own behavior, rather than depend on adults to do it for them, their teachers become free to do other things—for example, to teach!

When administering punishment, use only those consequences that have been shown to be effective in reducing problem behaviors.

In a well-managed classroom, reinforcement for productive behavior occurs far more often than punishment for inappropriate behavior. But consider the following scenarios:

> Bonnie doesn't handle frustration very well. Whenever she encounters an obstacle she can't immediately overcome, she responds by hitting, kicking, or breaking something. Once, during a class Valentine's Day party, she accidentally drops her cupcake. When she discovers that it's no longer edible, she throws her carton of milk across the room, hitting another child on the head.
>
> Two days before a high school football game against a cross-town rival, several members of the football team are caught spray-painting obscene words on the bleachers of the rival school's stadium.

Some misbehaviors interfere significantly with classroom learning or reflect a total disregard for other people's rights and welfare. These actions require an immediate remedy, and teachers or school administrators must impose consequences sufficiently unpleasant to discourage them. In other words, educators must occasionally use *punishment*. Punishment is especially useful when students appear to have little motivation to change their behavior.

As a general rule, teachers should use relatively mild forms of punishment in the classroom.[75] Severe punishment—for instance, something that lasts for several weeks or months, or something that seriously undermines students' sense of self-worth—can lead to such unwanted side effects as resentment, hostility, and truancy. Several forms of mild punishment are often effective in reducing undesirable classroom behaviors:

- **Verbal reprimands (scolding).** Although some students seem to thrive on teacher scolding because of the attention it brings, most students find verbal reprimands to be unpleasant and punishing, especially if given only infrequently. In general, reprimands are more effective when they're immediate, brief, and unemotional, and they should be given in private, if at all possible. When scolded in front of peers, some students may relish the peer attention, and others may feel totally humiliated.[76]
- **Response cost.** **Response cost** involves the loss either of a previously earned reinforcer or of an opportunity to obtain reinforcement; in either case, it's a form of *removal punishment*. Response cost is especially effective when used in combination

[74] J. O. Cooper et al., 2007; Duckworth et al., 2014; Meltzer, 2007.
[75] Landrum & Kauffman, 2006.
[76] M. L. Fuller, 2001; Landrum & Kauffman, 2006; Pfiffner & O'Leary, 1993; Van Houten et al., 1982.

with reinforcement of appropriate behavior.[77] For example, when dealing with students who exhibit chronic behavior problems, teachers sometimes incorporate response cost into a point system or *token economy*, awarding points, plastic chips, or the like for good behavior (reinforcement) and taking away these things for inappropriate behavior (response cost). Students who accumulate a sufficient number of points or tokens can use them to "buy" objects, privileges, or enjoyable activities that are otherwise not available. (You may want to revisit the discussions of removal punishment and token economy in Chapter 4.)

- **Logical consequences.** A **logical consequence** is something that follows naturally or logically from a student's misbehavior; in other words, it's punishment that fits the crime. For example, if a student destroys a classmate's possession, a reasonable consequence is for the student to replace it or pay for a new one. If two close friends talk so much that they aren't completing assignments, a reasonable consequence is that they be separated.[78]
- **Time out.** A **time out** is a specified period of time in which a student has no opportunity to receive the kinds of reinforcement to which other students have access. In a mild form, it might involve asking students to put their heads down on their desks or to sit away from other students, where they must quietly watch an enjoyable activity in which classmates are participating. For more significant infractions, it might involve placing a student for a short time in a separate place that's dull and boring—perhaps a remote corner of the classroom or playground.[79] Keep in mind, however, that a time out is apt to be effective only if ongoing classroom activities are a source of pleasure and reinforcement for a student. If, instead, a time out allows a student to escape difficult tasks or an overwhelming amount of noise and stimulation, it might actually be reinforcing and therefore might *increase* undesirable behavior.[80]
- **In-school suspension.** Like a time out, **in-school suspension** involves removing a student from normal classroom activities. However, it often lasts one or more school days and involves close adult supervision in a separate room within the school building. Students receiving in-school suspension spend the day working on the same assignments that their nonsuspended peers do, enabling them to keep up with their schoolwork. But they have little or no opportunity for interaction with peers—an aspect of school that's reinforcing to most students. In-school suspension programs tend to be most effective when part of the suspension session is devoted to teaching appropriate behaviors and tutoring academic skills and when the supervising teacher acts as a supportive resource rather than a punisher.[81]

Several other forms of punishment are typically *not* recommended. *Physical punishment* can, of course, lead to physical harm, and even mild forms (e.g., slapping a hand with a ruler) can lead to considerable resentment of the teacher and to such undesirable behaviors as inattention to or avoidance of school tasks, lying, aggression, vandalism, and truancy.[82] Any consequence that seriously threatens a student's sense of self-worth—*psychological punishment*—can lead to some of the same side effects as physical punishment

[77] Conyers et al., 2004; J. M. Donaldson et al., 2014; Iwata & Bailey, 1974; Lentz, 1988.
[78] Dreikurs, 1998; Landrum & Kauffman, 2006; Nucci, 2001.
[79] Historically, many time outs involved putting students in a separate, isolated room designed specifically for time outs. This practice has largely fallen out of favor in public schools except in cases of significant behavior problems, such as physical aggression; see Alberto & Troutman, 2013.
[80] J. M. Donaldson & Vollmer, 2012; McClowry, 1998; Pfiffner et al., 2006; Rortvedt & Miltenberger, 1994; A. G. White & Bailey, 1990.
[81] Gootman, 1998; Pfiffner et al., 2006; Sheets, 1996; J. S. Sullivan, 1989.
[82] W. Doyle, 1990; Landrum & Kauffman, 2006; Nucci, 2006.

(e.g., resentment, inattention to school tasks, truancy) and may possibly inflict long-term psychological harm.[83] *Assigning extra classwork* beyond that required for other students is inappropriate if done simply to punish a student's wrongdoing, in that it communicates the message that "schoolwork is unpleasant."[84] Nor is *giving low grades* appropriate; as we emphasize in Chapter 10, class grades should be based on students' academic achievements, not on their classroom behavior.[85] Finally, *out-of-school suspension* is rarely an effective means of changing a student's behavior. For one thing, suspension from school may be exactly what a student wants, in which case inappropriate behaviors are being reinforced rather than punished. Furthermore, out-of-school suspension involves a loss of valuable instructional time and interferes with any psychological attachment to school, thereby reducing low-achieving students' chances for academic and social success—sometimes to the point where they have little interest in returning to school.[86]

Two additional forms of punishment get mixed reviews regarding effectiveness. In some situations, *missing recess* is a logical consequence for students who fail to complete their schoolwork during regular class time because of off-task behavior. Yet research indicates that, especially at the elementary level, students can more effectively concentrate on school tasks if they have frequent breaks and opportunities to release pent-up energy.[87] And although *after-school detentions* are common practice at many schools, some students simply can't stay after school hours, perhaps because they have transportation issues, must take care of younger siblings at home, or are justifiably afraid to walk through certain neighborhoods after dark.[88]

A frequent criticism of punishment is that it's inhumane, or somehow cruel and barbaric. Indeed, certain forms of punishment, such as physical abuse and public humiliation, do constitute inhumane treatment.[89] Furthermore, physical punishment at school is illegal in many states. Teachers must be *extremely careful* in their use of punishment in the classroom. But when administered judiciously—and especially when administered within the context of a warm, supportive teacher–student relationship—some forms of mild punishment can lead to a rapid reduction in misbehavior without causing physical or psychological harm.[90] The Classroom Strategies feature "Using Punishment Humanely and Effectively" offers several guidelines for administering punishment in ways that will yield more productive student behaviors over the long run. As you'll notice, it includes possible consequences for the milk-carton-throwing and bleachers-spray-painting scenarios presented earlier.

Confer with parents.

By and large, teachers' communications with parents should reflect the many positive, productive things going on in their classrooms. But sometimes teachers need to talk with students' parents or other primary caregivers about a serious or chronic behavior problem. Consider these situations:

> You give your students short homework assignments almost every night. Carolyn has turned in only about one-third of them. You're pretty sure she's capable of doing the work, and you know from previous parent–teacher conferences that her parents give her

[83] Brendgen et al., 2007; J. Ellis et al., 2010; Hyman et al., 2006.
[84] H. Cooper, 1989; Corno, 1996.
[85] In addition to a problem with the validity of the grades (see Chapter 10), giving low grades as punishment for misbehavior can actually *increase* students' behavior problems; see F. Zimmermann et al., 2013.
[86] American Psychological Association Zero Tolerance Task Force, 2008; Christenson & Thurlow, 2004; Gregory et al., 2010; Osher et al., 2010.
[87] Owen et al., 2016; Pellegrini & Bohn, 2005; Pellegrini et al., 1995.
[88] Nichols et al., 1999.
[89] For a good discussion of this point, see Hyman et al., 2004.
[90] Landrum & Kauffman, 2006; Nucci, 2001.

Classroom Strategies

Using Punishment Humanely and Effectively

- **Inform students ahead of time that certain behaviors are unacceptable and explain how those behaviors will be punished.**
  A third-grade teacher makes one rule for recess perfectly clear: *Students must not do anything that might hurt someone else.* The teacher gives the class several concrete examples, including throwing rocks, pulling hair, and pushing someone off the playground slide. "If you do anything that might hurt another child," he says, "you'll spend the next three recesses sitting on the bench just outside the classroom door—close enough that I can see you and make sure you're safe but far away from the other kids."
- **Help students understand why the punished behavior is unacceptable.**
  When several members of a high school football team are caught spray-painting obscenities on a rival school's stadium bleachers, three consequences are imposed: (1) The students will not be able to play in the upcoming game against the rival school, (2) they must visit the rival school's principal to make a formal apology and acknowledge that their actions showed poor sportsmanship and disregard for other people's property, and (3) they must repaint the affected areas of the bleachers, purchasing the paint with their own money.
- **Emphasize that it is the behavior—*not* the student—that is undesirable.**
  When a kindergartner angrily throws her carton of milk at a classmate, her teacher puts her in the "time-out corner" at the back of the room. "I like you a lot, Bonnie," the teacher tells her, "but I simply can't have you doing something that might hurt Susan. I like her just as much as I like you, and I want both of you to feel safe in my classroom."
- **Administer punishment privately, especially when other students are not aware of the transgression.**
  As a junior high school teacher walks down the hall, she overhears a student tell two friends a "knock-knock" joke that includes an insulting racial slur, and the friends laugh, clearly thinking that it's funny. The teacher pulls the three students aside and explains that she heard the joke and found it quite offensive. "Whether you told the joke or merely laughed at it," she says, "you were all showing disrespect for certain teachers and students at this school. Not only does your disrespect undermine our overall sense of school community, but it also violates school policy. The consequence of such behavior is one day of in-school suspension. I'll notify the principal's office that you'll be reporting for in-school suspension tomorrow. Be sure to bring your textbooks and class assignments so that you won't get behind in your schoolwork."
- **Simultaneously teach and reinforce desirable alternative behaviors.**
  In small-group discussions and cooperative learning activities, a middle school student often belittles other students' ideas. Her teacher takes her aside and reprimands her but also teaches her productive strategies for disagreeing with classmates. "One strategy," he suggests, "is to say something *good* about another person's idea but then to suggest an alternative that the group might consider. For example, you might say, 'I like how carefully you've thought about the problem, Jerry. Here's a different perspective I'd like the group to think about as well. . . .'" Later, when the teacher hears the student using the strategy during a small-group project, he catches her eye and gives her a "thumbs-up" sign.

Sources: Boyanton, 2010; Landrum & Kauffman, 2006; Lerman & Vorndran, 2002; Moles, 1990; Nucci, 2001; Parke, 1974; D. G. Perry & Perry, 1983; Ruef et al., 1998.

the time and support she needs to get assignments done. You've spoken with Carolyn several times about the problem, but she shrugs you off as if she doesn't really care whether she does well in your class.

Students have often found things missing from their desks or personal storage bins after Roger has been in the vicinity. A few students have told you that they've seen Roger taking things that belong to others, and many of the missing objects have later turned up in his possession. When you confront him about your suspicion that he's been stealing from classmates, he adamantly denies it. Roger says he has no idea how Cami's gloves or Marvin's new book ended up in his desk.

Conferring with parents is especially important when students' behavior problems show a pattern over time and have serious implications for students' long-term academic or social success. In some cases, a simple phone call may be sufficient. For example, Carolyn's parents may be unaware that she hasn't been doing her homework (she's been telling them she doesn't have any) and may be able to take the steps necessary to ensure that it gets done. In other instances, a school conference may be necessary. For example, a teacher might want to discuss Roger's suspected thefts with both Roger and his parent(s) together—something the teacher can do more effectively when everyone sits face to face in the same room.

Some ways of talking with parents are far more effective than others. Put yourself in a parent's shoes in the following exercise.

See For Yourself

Putting Yourself in a Parent's Shoes

Imagine you're the parent of a seventh-grader named Tommy and you get a phone call one evening from Tommy's teacher.

You: Hello?

Ms. J.: This is Ms. Johnson, Tommy's teacher. May I talk with you for a few minutes?

You: Of course. What can I do for you?

Ms. J.: Well, I'm afraid I've been having some trouble with your son, and I thought you should know about it.

You: Really? What's the problem?

Ms. J.: Tommy hardly ever gets to class on time. When he does arrive, he spends most of his time playing around with friends instead paying attention to lessons. It seems as if I have to speak to him three or four times every day about his behavior.

You: How long has all this been going on?

Ms. J.: For several weeks now. And the problem's getting worse rather than better. I'd really appreciate it if you'd talk with Tommy about the situation.

You: Thank you for letting me know about this, Ms. Johnson.

Ms. J.: You're most welcome. Good night.

You: Good night, Ms. Johnson.

Take a few minutes to jot down some of the things that, as a parent, you might be thinking after this conversation.

You may have had a variety of thoughts, possibly including these:

- Why isn't Tommy taking his schoolwork more seriously?
- Isn't Tommy doing anything *right*?
- Has Ms. Johnson tried anything besides reprimanding Tommy for his behavior? Or is she laying all of this on *my* shoulders?
- Tommy's a good kid. I should know, because I raised him. For some reason, Ms. Johnson doesn't like him and so is finding fault with anything he does.

Only the first of these four reactions is likely to lead to a productive response on your part.

Notice how Ms. Johnson focused solely on the negative aspects of Tommy's classroom performance. As a result, you (as Tommy's parent) may possibly have felt anger toward your son or guilt about your ineffective parenting skills. Alternatively, if you remained confident about your son's scholastic abilities and your own ability as a parent, you may have begun to wonder about Ms. Johnson's ability to teach and motivate her seventh-graders. Sadly, too many teachers reach out to parents only to talk about students' weaknesses, and never their strengths.

Ideally, a teacher–parent discussion about problem behaviors is initiated within the context of an ongoing relationship characterized by mutual trust and respect and a shared concern for students' learning and well-being. For instance, a phone call to parents is most likely to yield productive results if teacher and parents already have a good working relationship and if the teacher is confident that parents won't overreact with harsh, excessive punishment of their child. Furthermore, when communicating with parents, teachers' overall messages about students should be positive and optimistic. For instance, a teacher

might describe undesirable aspects of a student's classroom performance within the context of the many things the student does *well.* (Rather than starting out by complaining about Tommy's behavior, Ms. Johnson might have begun by saying that Tommy is a bright, capable young man with many friends and a good sense of humor.) And teachers must be clear about their commitment to working *together* with parents to help a student succeed in the classroom. (Tommy's teacher could've explained the behavior management strategies she had tried so far and asked you [as the parent] what strategies you would suggest that you could use together with her to help address Tommy's behavior problems.)

The Classroom Strategies box "Talking with Parents about Students' Misbehaviors" presents several strategies for effectively approaching parents about a challenging behavior problem.

When talking with parents, teachers must keep in mind that different cultures have different perspectives on how best to address behavior problems. The vast majority of parents want what's best for their children and recognize the value of a good education for children's long-term success.[91] Yet parents from different cultural and ethnic groups sometimes have radically different ideas about which kinds of behaviors are problematic and require discipline. As an example, let's return to the opening case study in Chapter 4,

Classroom Strategies

Talking with Parents about Students' Misbehaviors

- **Consult with parents if a collaborative effort might bring about a behavior change.**
  At a parent–teacher–student conference, a high school math teacher expresses concern that a student often falls asleep in class. Her father speculates that she's online late at night when she should be in bed. He looks at his daughter inquisitively, and her guilty facial expression confirms his suspicion. With the teacher's prompting, the father and the student identify an appropriate policy for being online at night.
- **Begin with a description of a student's strengths.**
  In a phone conversation with a student's mother, a teacher describes several areas in which the student has made considerable progress and then asks for advice about strategies for helping the student stay on task and be more conscientious about completing his work.
- **Describe the problem in terms of inappropriate behaviors, *not* in terms of undesirable personality characteristics.**
  When describing a student's poor record of turning in homework assignments, her teacher says, "Carolyn has turned in only about a third of the homework I've assigned this year. Her attendance record is excellent, so I know she's been healthy, and she's certainly capable of doing the work." At no point does the teacher suggest that Carolyn is lazy, unmotivated, or stubborn.
- **Don't place blame; instead, acknowledge that raising children is rarely easy.**
  When conferring with the mother of a middle school student, a teacher mentions that the student seems to be more interested in talking to her friends than in getting her schoolwork done. The mother describes a similar problem at home: "It's like pulling teeth just getting her off her phone to do her homework!" The teacher sympathetically responds, "Students seem to become especially concerned about social matters once they reach adolescence. How about if you, Marnie, and I meet some day after school to talk about the problem? Perhaps by putting our heads together the three of us can find a way to solve it."
- **Ask for information and express your desire to work together to address the problem.**
  When a teacher finds that a student has regularly been taking items from classmates' personal storage bins, she sets up an appointment to meet with the student and his grandmother (the student's primary caregiver). "I like Roger a lot," the teacher says. "He has a great sense of humor, and his smile often lights up my day. I can't understand why he might want to 'borrow' items from other children without asking first. His actions have cost him several friendships. Do you have any ideas about how we might tackle the problem? I'd like to do whatever I can to help Roger repair his reputation with his classmates."
- **Agree on a strategy.**
  At a parent–teacher conference, a teacher says, "Abram has a tendency to fiddle with things at his desk—he especially likes meticulously folding pieces of paper into little origami figures—when he should be getting his work done. As a result, he often doesn't complete his assignments." Abram's father replies, "I've noticed the same thing when he works on his homework." They talk more about the problem and agree that reinforcement for completed assignments might be helpful. Abram will earn points for high scores that will help him "buy" the new bicycle he's been asking his father for.

Sources: Christenson & Sheridan, 2001; C. Davis & Yang, 2005; Emmer & Evertson, 2009; Evertson & Emmer, 2009; A. Miller, 2006; Woolfolk Hoy et al., 2006.

[91] Dantas & Manyak, 2010; Gallimore & Goldenberg, 2001; Spera, 2005.

which depicts a small slice of Navajo culture in the southwestern United States. Jack, a seventh-grader, had been absent from school for an entire week. Not only were his parents seemingly unconcerned, but they didn't even go looking for him until they needed him at home to help with the family farm. Their attitudes and actions make sense only when we understand that they knew their son was probably safe with neighbors and believed that, as an adolescent, Jack was essentially an adult and responsible for his own decisions.[92] In contrast, many parents from Asian cultures expect children to immediately defer to and obey adult authority figures (e.g., parents and teachers) and think that Western teachers are much too lenient with students.[93]

Disciplinary strategies also differ from culture to culture. In mainstream Western culture, praise is widely used as a strategy for encouraging good behavior, and reprimands and denial of privileges (e.g., "grounding") are often the consequences for unacceptable behavior. But such practices are hardly universal. Children in some cultures may be unaccustomed to direct praise for appropriate behavior and personal successes, perhaps because appropriate behavior is a social obligation (and thus not praiseworthy) or perhaps because adults express approval in other ways—for instance, by telling other people how skillful a child is.[94] And some cultural and religious groups use ostracism in an effort to keep children in line: If a child's misbehaviors are seen as bringing shame on the family or community, the child is ignored—for instance, given the "silent treatment"—for an extended time period.[95]

It's important to note that some cultural groups believe physical punishment to be necessary for behavioral transgressions. When physical punishment is a common form of discipline in one's culture, children are more likely to accept *mild* physical punishment as appropriate and deserved. Even in such contexts, however, physical punishment is apt to have adverse effects on children's psychological well-being.[96] Accordingly, teachers should tactfully dissuade parents from using it, ideally by suggesting alternative consequences that can effectively reduce problem behaviors without causing harm.

Ultimately, teachers and parents must try to find common ground on which to develop strategies for helping children and adolescents thrive at school. At the same time, teachers must tactfully and sensitively help parents understand that certain consequences—for instance, severe physical and psychological punishment—are unlikely to be productive over the long run.

To address a chronic problem, plan and carry out a systematic intervention.

Sometimes problem behaviors are so disruptive and persistent that they require a systematic effort to change them. Consider these situations:

> Tucker finds many reasons to roam about the room—he "has to" sharpen a pencil, "has to" get his homework out of his backpack, "has to" get a drink of water, and so on. As a result, Tucker gets very little work done and often distracts other students with his perpetual motion.
>
> Janelle's verbal abusiveness is getting out of hand. She frequently offends both you and her peers with sexually explicit language. You've tried praising her on occasions when she's pleasant to others, and she seems to appreciate your doing so, yet her abusive remarks continue.

[92] Deyhle & LeCompte, 1999.
[93] Dien, 1998; Hidalgo et al., 1995; Kağitçibaşi, 2007; Tamis-Lemonda & McFadden, 2010.
[94] Greenfield et al., 2006; Kitayama et al., 2007; Rogoff, 2003.
[95] Pang, 1995; K. D. Williams, 2001.
[96] Bornstein & Lansford, 2010; Lansford et al., 2003, 2005.

Imagine that both Tucker and Janelle are in your class. You've already spoken with each of them about their unacceptable behavior, yet you've seen no improvement. You've suggested self-regulation techniques, but neither student seems interested in changing for the better. You've tried putting them in time out for their actions, but Janelle seems to enjoy the time away from her schoolwork, and Tucker sometimes has a valid reason for getting out of his seat. Although both students' parents are aware of and concerned about their children's classroom behaviors, their efforts at home haven't had an impact. And after all, these are largely *school* problems rather than home problems. So what do you do now?

When a serious misbehavior persists despite ongoing efforts to curtail it, a more intensive intervention is in order. Some interventions, known by such labels as **applied behavior analysis (ABA)**, *behavior therapy*, and *contingency management*, focus on changing stimulus conditions and response–consequence contingencies in a student's environment.[97] These approaches are based largely on these principles presented in Chapter 4:

- Some stimuli tend to elicit certain kinds of behaviors.
- Learners are more likely to acquire behaviors that lead to desired consequences.
- Learners tend to steer clear of behaviors that lead to unpleasant consequences.

With these principles in mind, effective teachers change the classroom environment to elicit more productive behaviors and establish more beneficial response–consequence contingencies. Thus, they use strategies such as the following:

- Identify problem behaviors and desired behaviors in explicit (and ideally measurable) terms. Often the desired behaviors chosen are incompatible with problem behaviors—that is, it's impossible for a student to execute both kinds of behaviors at the same time.
- Identify reinforcers, punishments, or both that are truly effective for the student.
- Develop a specific intervention plan, which may involve reinforcement of desired behaviors, shaping, extinction, punishment, or some combination of these.
- Modify the classroom environment to minimize conditions that might elicit inappropriate behaviors.
- Collect data on the frequency of problem behaviors and desired behaviors both before and during the intervention.
- Monitor the program's effectiveness by observing how various behaviors change over time and modify the program, if necessary.
- Take steps to promote transfer of newly acquired behaviors (e.g., by having the student practice the behaviors in various realistic situations).
- Gradually phase out the intervention (e.g., through intermittent reinforcement) after desired behaviors are occurring regularly.

Often these strategies are more effective when cognitive and motivational factors affecting students' behavior are also addressed—an approach known as *cognitive-behavioral therapy*. For example, teachers might also use one or more of the following strategies:

- Teach self-regulation skills.
- Teach effective social skills.
- Encourage better perspective taking and other aspects of social cognition.
- Make changes in the curriculum, instructional methods, or both to maximize the likelihood of academic success and high self-efficacy for school tasks.

[97] For examples of such strategies, see Alberto & Troutman, 2013; Bradshaw et al., 2009; Ormrod, 2016.

How might a teacher use some of the preceding strategies to improve Tucker's classroom behavior? One approach would be to identify one or more effective reinforcers—given Tucker's constant fidgeting, opportunities for physical activity might be reinforcing—and then gradually shape more sedentary behavior. In addition, because some out-of-seat behaviors are quite appropriate (e.g., getting a reference book from the bookshelf, delivering a completed assignment to the teacher's "In" basket), the teacher might give Tucker a reasonable allotment of out-of-seat "tickets" he can use during the day. Tucker can probably also benefit from instruction and scaffolding regarding general organizational skills—in particular, assembling necessary supplies (notebooks, sharpened pencils, completed homework, etc.) before lessons begin.

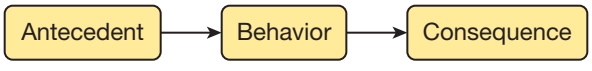
A systematic intervention may be helpful with Janelle as well. In this case, we might suspect that Janelle lacks the social skills she needs to interact effectively with others. Her teacher or a school counselor might therefore need to begin by teaching her such skills through modeling, role playing, and the like (see Chapter 7). Once Janelle has gained some competence in interpersonal skills, her teacher can begin to reinforce her for using those skills. Praise might be an effective reinforcer because she has responded positively to praise in the past. Meanwhile, the teacher should also punish any relapses into old, abusive behavior patterns. Time outs haven't previously worked with Janelle, but perhaps having her write apology notes to offended parties—a logical consequence—would help to drive home the message that some of her language is inappropriate.

Determine whether certain undesirable behaviors might serve particular purposes for students.

Sometimes a student's misbehaviors, although maladaptive from a teacher's perspective, in one way or another help the student preserve a sense of well-being. Consider this example:

> Nine-year-old Samantha has been identified as having a mild form of autism and moderate speech disabilities. She frequently runs out of her third-grade classroom, damaging school property and classmates' belongings in her flight. When an adult tries to intervene, she fights back by biting, hitting, kicking, or pulling hair. On such occasions school personnel often ask her parents to take her home.
>
> By systematically collecting data on Samantha's classroom performance, a team of teachers and specialists discover that her misbehaviors typically occur when she either has been given or is expecting a difficult assignment. Departures from the regular schedule or the absence of favorite teachers further increase the frequency of misbehaviors.
>
> The team hypothesizes that Samantha's undesirable behaviors serve two purposes: They (1) help her escape unpleasant academic tasks and (2) enable her to gain the attention of valued adults. The team suspects, too, that Samantha feels as if she has little or no control over classroom activities and that she yearns for more social interaction with others.[98]

In trying to determine why Samantha misbehaves as she does, the team is taking an approach known as **functional analysis** (you may also see the term *functional behavior assessment*). Functional analysis identifies the specific stimulus conditions that exist both before and after Samantha makes inappropriate responses—the antecedents and consequences of particular behaviors—like so:



[98] DeVault et al., 1996.

The team soon realizes that Samantha's behaviors are the result of *both* antecedent events (e.g., challenging tasks, changes in routine) and desirable consequences (e.g., getting attention, going home). In other words, Samantha's behaviors are serving certain *functions* for her: They get her attention from others (positive reinforcement) and enable her to escape things she doesn't want to do and places she doesn't want to be (escaping unpleasant things serves as negative reinforcement). Like Samantha, students with chronic behavior problems often misbehave when they're asked to do difficult or unpleasant tasks and when their misbehavior either helps them avoid these tasks or gains them the attention of others.[99]

Once a functional analysis has been completed, an approach known as **positive behavioral interventions and supports (PBIS)**[100] takes the process a step further. In particular, PBIS builds on knowledge about the functions of misbehaviors in order to encourage more productive behaviors. Following are typical strategies:[101]

- Teach behaviors that can serve the same purpose as—and can therefore replace—inappropriate behaviors.
- Modify the school environment to minimize conditions that might trigger inappropriate behaviors.
- Establish a predictable daily routine as a way of minimizing anxiety and making the student feel more comfortable and secure.
- Give the student opportunities to make choices; in this way, the student can often gain desired outcomes without having to resort to inappropriate behavior.
- Make changes in the curriculum, instruction, or both to maximize the likelihood of academic success (e.g., build on student interests, present material at a slower pace, or intersperse challenging tasks among easier and more enjoyable ones).
- Monitor the frequency of various behaviors to determine whether the intervention is working or, instead, requires modification.

For instance, after school faculty members have formed reasonable hypotheses regarding the roots of Samantha's inappropriate behaviors, they take several steps to help her acquire more productive ones:[102]

- Samantha is given a consistent and predictable daily schedule that includes frequent breaks from potentially challenging academic tasks and numerous opportunities to interact with others.
- Samantha is given "goal sheets" from which she can choose the academic tasks she'll work on, the length of time she'll work on them, and a reinforcer she'll receive for achieving each goal.
- Samantha is taught how to ask for help on challenging tasks.
- When Samantha feels she needs a break, she can ask to spend time in the "relaxation room," a quiet, private space where she can sit in a beanbag chair and listen to soothing audiotapes.
- If Samantha tries to leave the classroom, an adult immediately places her in the relaxation room, where she can calm down without a lot of adult attention.

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[99] Greer et al., 2013; Mueller et al., 2011; S. W. Payne & Dozier, 2013; Van Camp et al., 2000.

[100] Historically, this approach has been known as *positive behavior support (PBS)*, but educators are increasingly using the term *positive behavioral interventions and supports (PBIS)*, in part to avoid confusion with another "PBS"—the television network Public Broadcasting Service.

[101] For example, see Crone et al., 2015; Ruef et al., 1998; Scheuermann & Hall, 2016; Wheeler & Richey, 2014. You can find additional suggestions at www.pbis.org, a website created and maintained by the U.S. Department of Education's Office of Special Education Programs.

[102] DeVault et al., 1996.

- Samantha is given explicit instruction in how to interact appropriately with classmates. Initially, she earns points for appropriate social behaviors and can trade them for special treats (e.g., a family trip to get ice cream). Eventually, her new social skills lead to natural consequences—friendly interactions with peers—that make extrinsic reinforcers unnecessary.

Samantha's teachers and parents communicate regularly to coordinate their efforts. Her problem behaviors don't disappear overnight, but they show a dramatic decline over the next several months. By the time Samantha is 12 years old and in sixth grade, her grades consistently earn her a place on the honor roll, and she has a group of friends with whom she participates in several extracurricular activities.[103]

Let's return once again to Ms. Cornell's difficulties with Eli, Jake, and Vanessa in the opening case study. Here, too, a planned, systematic intervention, possibly including functional analysis and PBIS, might be in order. Reinforcing appropriate behaviors (if necessary, shaping such behaviors over a period of time) and punishing inappropriate behaviors are two obvious strategies. Furthermore, Ms. Cornell should make response–consequence contingencies clear, perhaps using contingency contracts (see Chapter 4). Ms. Cornell might also determine the purpose(s) that the students' misbehaviors serve (e.g., perhaps the three students crave attention, or perhaps they misbehave to avoid doing assignments for which they don't have adequate reading skills) and then either (1) identify more productive behaviors that can serve the same purpose(s) or (2) address academic or social problems that may be directly or indirectly contributing to the students' unproductive behaviors.

Use the simplest and least intrusive strategy possible to address student misbehaviors.

You may have noticed that as we presented the strategies for reducing unproductive behaviors in this section (Section 9.3), we began by suggesting relatively simple strategies (e.g., ignoring behaviors and cueing the student) and then progressed to providing more complex and intrusive strategies (e.g., conducting a systematic intervention). In general, it's best for teachers to use the simplest and least intrusive strategy that will address the behavior problems. Then, if needed, they can move on to more complex strategies. These strategies, ordered from simplest to most complex, are summarized in Table 9.2. The next section of this chapter examines strategies that can be used when behaviors become even more aggressive and violent.

9.4 Addressing Aggression and Violence at School

Big Idea 9.4 **Minimizing aggression and violence at school requires a three-tiered approach: (1) creating a respectful and supportive school environment, (2) intervening early for students at risk for social failure, and (3) providing intensive interventions for chronically aggressive students.**

In recent years the news media have focused considerable attention on violent school crime, and especially on school shootings, leading many people to believe that aggression in schools is on the rise. In reality, violent aggression involving serious injury or death is relatively rare on school grounds and, in the United States at least, has remained at about

[103] DeVault et al., 1996.

Table 9.2 Summary of Strategies for Addressing Undesirable Classroom Behaviors

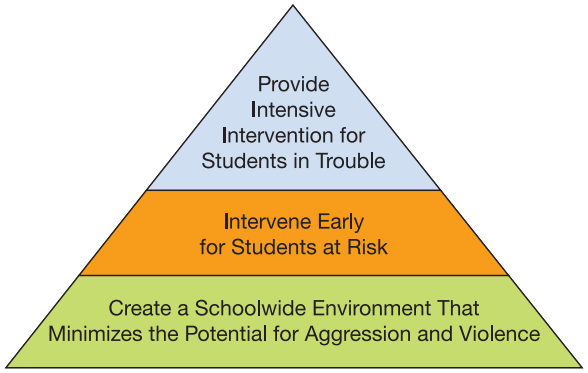
STRATEGY	SITUATIONS IN WHICH IT'S APPROPRIATE	EXAMPLES
Ignoring the behavior	• The misbehavior is unlikely to be repeated. • The misbehavior is unlikely to spread to other students. • Unusual circumstances have only temporarily elicited the misbehavior. • The misbehavior doesn't seriously interfere with learning.	• One student discreetly passes a note to another student just before the end of class. • A student accidentally drops her books, startling other students and temporarily distracting them from their work. • An entire class is hyperactive on the last afternoon before spring break.
Cueing the student	• The misbehavior is a minor infraction but definitely interferes with students' learning. • The behavior is likely to improve with a subtle reminder.	• A student forgets to close his notebook at the beginning of a quiz. • Members of a cooperative learning group are talking so loudly that they distract other groups. • Several students are exchanging jokes during an independent seatwork assignment.
Discussing the problem privately with the student	• Cueing has been ineffective in changing the behavior. • The reasons for the misbehavior, if made clear, might suggest possible strategies for addressing it.	• A student is frequently late to class. • A student refuses to do certain kinds of assignments. • A student shows a sudden drop in motivation for no apparent reason.
Promoting self-regulation	• The student has a strong desire to improve his or her behavior.	• A student doesn't realize how frequently she interrupts her classmates. • A student seeks help in learning to control his anger. • A student acknowledges that her inability to stay on task is preventing her from earning the good grades she wants to get.
Punishment	• A behavior significantly interferes with classroom learning or reflects a blatant disregard for others' rights and welfare. • The student has little or no understanding or concern that the behavior is unacceptable.	• A student punches a classmate who inadvertently brushes past him. • A student tells a joke that insults people of a particular ethnic group. • A student vandalizes other students' lockers.
Conferring with parents	• A chronic behavior problem is likely to interfere with the student's long-term academic or social success. • The source of the problem may possibly lie outside school walls. • Parents are likely to work collaboratively with school faculty members to bring about a behavior change.	• A student does well in class but rarely turns in required homework assignments. • A student falls asleep in class almost every day. • A student is caught stealing classmates' lunches.
Conducting a planned, systematic intervention (e.g., applied behavior analysis, positive behavioral interventions and supports)	• The misbehavior has continued over a period of time and significantly interferes with one or more students' learning and achievement. • Other, less intensive approaches (e.g., cueing, private conferences, mild punishment) have been ineffective. • The student seems unwilling or unable to use self-regulation techniques. • The misbehavior may in some way enable a student to achieve desired outcomes.	• A student has unusual difficulty sitting still for age-appropriate time periods. • A member of the soccer team displays bursts of anger and aggression that are potentially dangerous to other players. • A student engages in disruptive behavior every time a difficult task is assigned.

the same level over the past couple decades.[104] Most aggression at school involves minor physical injury, psychological harm (e.g., sexual or racial harassment), or destruction of property (e.g., vandalization of student lockers).[105]

If we consider *only* violent aggression that causes serious injury or death, then school is probably the safest place that young people can be.[106] But if we consider *all* forms of aggression—mild as well as severe, and psychological aggression as well as physical aggression—then aggression among children and adolescents occurs more frequently at

[104] Musu et al., 2019.
[105] Borum et al., 2010; Kupchik & Bracy, 2009; M. J. Mayer & Furlong, 2010; Musu et al., 2019.
[106] Musu et al., 2019.

Figure 9.8 A three-tiered approach to preventing aggression and violence in schools



Based on a figure in *Safeguarding Our Children: An Action Guide* (p. 3), by K. Dwyer and D. Osher, 2000, Washington, DC: U.S. Departments of Education and Justice, American Institutes for Research.

school than in any other location, probably for two reasons. First, children and adolescents spend a lot of time at school, more so than in any other place except home. Second, the sheer number of students attending even the smallest schools makes some interpersonal conflict almost inevitable.

The roots of school aggression and violence are many and diverse. As we discovered in Chapter 7, a variety of cognitive factors (e.g., lack of perspective taking, poor social problem-solving skills) predispose some students to aggressive behavior. Furthermore, some school- or neighborhood-specific cultures endorse the belief that defending one's reputation in the face of personal insults or indignities is a matter of "honor" that calls for aggressive action.[107] Developmental factors come into play as well. For example, many young children and a few adolescents have poor impulse control, and in early adolescence, the unsettling transition to middle school can lead some students to bully weaker agemates as a way of gaining social status with peers.[108] Finally, aggression is a common reaction to frustration, and some students are repeatedly frustrated in their efforts to be academically and socially successful at school.[109]

Regardless of the roots of the behavior, educators must not tolerate *any* form of aggression or violence on school grounds. Students can learn and achieve at optimal levels only if they know that they're both physically and psychologically safe at school. Furthermore, if they *don't* feel safe, they're at increased risk for dropping out before high school graduation.[110] To be truly effective in combating aggression and violence, teachers and other school faculty members must attack these challenges on three levels, or *tiers*, depicted graphically in Figure 9.8.[111] The first three of the following four recommendations reflect these three tiers; the final one specifically addresses aggression that can result from hostilities among rival gangs on school grounds.

Make the creation of a nonviolent school environment a long-term effort.

One-shot "antiviolence" campaigns have little lasting effect on school aggression and violence. Instead, the key seems to be establishing and maintaining an overall **school climate** in which students feel physically and psychologically safe and are jointly committed to accomplishing important academic and personal goals. Creating a peaceful and productive school environment must be a long-term effort that includes many strategies:[112]

- Make a schoolwide commitment to supporting *all* students' academic and social success.
- Provide a challenging and engaging curriculum.

[107] R. P. Brown et al., 2009; K. M. Williams, 2001.
[108] Bradshaw, 2015; Bronson, 2000; Espelage et al., 2003; Pellegrini, 2002.
[109] Bender, 2001; Casella, 2001; Miles & Stipek, 2006.
[110] Filax, 2007; Rumberger, 2011.
[111] Dwyer & Osher, 2000; Hyman et al., 2006; Ihlo & Nantais, 2010; Osher et al., 2010; H. M. Walker et al., 1996. For a classic discussion of the three tiers, we urge you to read *Safeguarding Our Children: An Action Guide* (Dwyer & Osher, 2000). You can download a copy from a variety of Internet websites, including www.ed.gov.
[112] Bradshaw, 2015; Burstyn & Stevens, 2001; Dwyer & Osher, 2000; L. M. Jones et al., 2015; Learning First Alliance, 2001; Meehan et al., 2003; G. M. Morrison et al., 2004; Osher et al., 2006; Pellegrini, 2002; S. W. Ross & Horner, 2009; Syvertsen et al., 2009; Thapa et al., 2013; Warren et al., 2006; Yeager & Dweck, 2012.

- Form caring, trusting faculty–student relationships.
- Insist on genuine and equal respect—among students and faculty alike—for people of diverse backgrounds, races, and ethnic groups.
- Help students understand that other people's behaviors are *not* the result of enduring personality traits (e.g., general "meanness") but, instead, the result of certain beliefs and feelings that can change for the better.[113]
- Emphasize prosocial behaviors (e.g., sharing, helping, cooperating).
- Establish schoolwide policies and practices that foster appropriate behavior (e.g., give clear guidelines for behavior, consistently apply consequences for infractions, provide instruction in effective social interaction and problem-solving skills).
- Teach specific skills that students can use to intervene when they witness bullying.
- Provide mechanisms through which students can communicate their concerns about aggression and victimization openly and without fear of reprisal.
- Involve students in school decision making.
- Establish close working relationships with community agencies and families.
- Openly discuss safety issues.

Most of these strategies should look familiar because they've surfaced at various places throughout this book. The final strategy on the list—openly discuss safety issues—encompasses a number of more specific strategies. For example, teachers should explain what bullying is and why it's unacceptable (see Chapter 7). Faculty members might also solicit students' input on potentially unsafe areas (perhaps an infrequently used restroom or back stairwell) that require more adult supervision. And a willingness to listen to students' concerns about troublesome and potentially dangerous classmates can provide important clues about which children and adolescents are most in need of assistance and intervention.

In recent years, many schools have successfully instituted **schoolwide positive behavioral interventions and supports (SWPBIS)** programs that encompass some of the same components previously described for ABA and PBIS. These programs typically implement most or all of the following strategies for *all* students:

- Explicitly defining and teaching appropriate behaviors, including productive ways of getting desired outcomes (e.g., teacher attention)
- Designing a curriculum and implementing instructional practices tailored to students' current needs and ability levels
- Giving students opportunities to make choices
- Regularly reinforcing students for behaving appropriately, almost always with praise but often also with token reinforcers that can be traded for special prizes and privileges
- Providing considerable guidance and support (sometimes including individualized interventions) for students who need them
- Continually monitoring the program's effectiveness by examining office referrals, disciplinary actions, and other relevant data

Such steps often lead to dramatic changes in students' behavior and are especially helpful in schools that have historically had many discipline problems. Furthermore, teachers gain optimism that they can truly make a difference in improving students' classroom behavior and academic achievement.[114]

[113] For an effective way of doing this (one in which students are taught about the malleability of the human brain), see Yeager & Dweck, 2012.

[114] Bradshaw et al., 2010; Ihlo & Nantais, 2010; T. J. Lewis et al., 2006; Osher et al., 2010; Warren et al., 2006.

Intervene early for students at risk.

Perhaps 10 to 15% of students need some sort of intervention to help them interact effectively with peers, establish good working relationships with teachers, and become bona fide members of the school community.[115] Such intervention can't be a one-size-fits-all approach but must instead be tailored to students' particular strengths and needs. For some students, it might involve instruction in effective social skills. For other students, it might mean getting them actively involved in school clubs or extracurricular activities. For still others, it may require a well-planned, systematic effort to encourage and reinforce productive behaviors, perhaps through functional analysis and PBIS. But regardless of their nature, interventions are most effective when they occur *early* in the game—before students go too far down the path of antisocial behavior—and when they're developed and implemented by a multidisciplinary team of teachers and other professionals who bring various areas of expertise to the planning table.[116]

Provide intensive intervention for students in trouble.

For a variety of reasons, minor interventions aren't sufficient for a small percentage of students who are predisposed to be aggressive and violent. For example, some students have serious mental illnesses that interfere with their ability to think rationally, cope appropriately with everyday frustrations, and control impulses. Typically schools must work closely and collaboratively with other community agencies—perhaps mental health clinics, police and probation departments, and social services—to help students at high risk for aggression and violence.[117] Teachers are a vital component of this collaborative effort, offering insights about students' strengths and limitations, communicating with students' families about available services, and working with specialists to develop appropriate intervention strategies.

Teachers' frequent interactions with students also put them in an ideal position to identify those children and adolescents most in need of intensive intervention to get them back on track for academic and social success. Especially after working with a particular age group for a period of time, teachers acquire a good sense of what characteristics are and aren't normal for that age level. Teachers should also be on the lookout for the early warning signs of violence presented in Figure 9.9.

Although teachers must be ever vigilant for signals that a student might be planning to cause harm to others, it's essential to keep several points in mind. First, as mentioned earlier, extreme violence is *very rare* in schools. Unreasonable paranoia about potential school violence will prevent teachers from working effectively with students. Second, the great majority of students who exhibit one or a few of the warning signs listed in Figure 9.9 *won't* become violent.[118] And most importantly, teachers must *never* use the warning signs as a reason to unfairly accuse, isolate, or punish a student.[119] These signs provide a means of getting students the help they may need, not of excluding them from the education that all children and adolescents deserve.

Take additional measures to address gang violence.

A frequent source of aggression at some schools is gang-related hostilities. On an optimistic note, gang activity in U.S. schools has been *decreasing* over the past couple of decades.[120] The three-tiered approach to combating school aggression and violence just described can

[115] Ihlo & Nantais, 2010; K. L. Lane et al., 2011; Osher et al., 2006.
[116] Crone et al., 2004; Dwyer & Osher, 2000; Osher et al., 2010.
[117] Greenberg et al., 2003; Hyman et al., 2006; Rappaport et al., 2003.
[118] U.S. Secret Service National Threat Assessment Center, 2000.
[119] Dwyer et al., 1998.
[120] Kodluboy, 2004; Musu et al., 2019.

Figure 9.9 Early warning signs of possible violent behavior

Experts have identified numerous warning signs that a student may possibly be contemplating violent actions against others. Any one of them alone is unlikely to signal a violent attack, but several of them *in combination* should lead a teacher to consult with school administrators and specially trained professionals about the student(s) of concern.

Social withdrawal. Over time, a student interacts less and less frequently with teachers and with all or most peers.

Excessive feelings of isolation, rejection, or persecution. A student may directly or indirectly express the belief that he or she is friendless, disliked, or unfairly picked on; such feelings are sometimes the result of long-term physical or psychological bullying by peers.

Rapid decline in academic performance. A student shows a dramatic change in academic performance and seems unconcerned about doing well. Cognitive and physical factors (e.g., learning disabilities, ineffective study skills, brain injury) have been ruled out as causes of the decline.

Poor coping skills. A student has little ability to deal effectively with frustration, takes the smallest affront personally, and has trouble bouncing back after minor disappointments.

Lack of anger control. A student frequently responds with uncontrolled anger to even the slightest injustice and may misdirect anger at innocent bystanders.

Apparent sense of superiority, self-centeredness, and lack of empathy. A student depicts him- or herself as smarter or in some other way better than peers, is preoccupied with his or her own needs, and has little regard for the needs of others. Underlying such characteristics may be low-esteem and depression.

Lengthy grudges. A student is unforgiving of others' transgressions, even after considerable time has elapsed.

Violent themes in drawings and written work. Violence predominates in a student's artwork, stories, or journal entries, and perhaps certain individuals (e.g., particular adults or peers) are regularly targeted in these fantasies. (Keep in mind that *occasional* violence in writing and art isn't unusual, especially for boys.)

Intolerance of individual and group differences. A student shows intense disdain and prejudice toward people of a certain race, ethnicity, gender, sexual orientation, religion, or disability.

History of violence, aggression, and other discipline problems. A student has a long record of seriously inappropriate behavior extending over several years.

Association with violent peers. A student associates regularly with a gang or other antisocial peer group.

Inappropriate role models. A student may speak with admiration about Satan, Adolf Hitler, or some other malevolent figure.

Excessive alcohol or drug use. A student who abuses alcohol or drugs may have reduced self-control. In some cases, substance abuse signals significant mental illness.

Inappropriate access to firearms. A student has easy access to guns and ammunition and may regularly practice using them.

Threats of violence. A student has openly expressed an intent to harm someone else, perhaps in explicit terms or perhaps through ambiguous references to "something spectacular" happening at school on a particular day. ***This warning sign alone requires immediate action.***

Sources: Dwyer et al., 1998; O'Toole, 2000; U.S. Secret Service National Threat Assessment Center, 2000; M. W. Watson et al., 2005.

go a long way toward suppressing violent gang activities, but school faculty members often need to take additional measures as well. Recommended strategies include the following:[121]

- Identify the specific nature and scope of gang activity in the student population.
- Develop, communicate, and enforce clear-cut policies regarding potential threats to other students' safety.
- Forbid clothing, jewelry, and behaviors that signify membership in a particular gang (e.g., bandanas, shoelaces in gang colors, certain hand signs).[122]
- Actively mediate between-gang and within-gang disputes.

A case study at one middle school[123] illustrates just how effective the last of these strategies—mediation—can sometimes be in addressing gang-related aggression. Many students belonged to one of several gangs that seemed to "rule the school." Fights among rival gangs were common, and nongang members were frequent victims of harassment.

[121] Kodluboy, 2004.

[122] A potential problem with this strategy is that it may violate students' civil liberties. For guidance on how to walk the line between ensuring students' safety and giving them reasonable freedom of expression, see Kodluboy, 2004; Rozalski & Yell, 2004.

[123] Sanchez & Anderson, 1990.

Dress codes, counseling, and suspensions of chronic troublemakers had little impact on students' behavior. In desperation, two school counselors suggested that the school implement a mediation program, beginning with three large gangs that were responsible for most of the trouble. Interpersonal problems involving two or more gangs would be brought to a mediation team composed of five school faculty members and three representatives from each of the three gangs. Team members had to abide by the following rules:

1. Really try to solve the problem.
2. No name-calling or put-downs.
3. No interrupting.
4. Be as honest as possible.
5. No weapons or acts of intimidation.
6. All sessions to be confidential until an agreement is reached or mediation is called off.[124]

To lay the groundwork for productive discussions, faculty members of the mediation team met separately with each of the three gangs to establish feelings of rapport and trust, explain how the mediation process would work, and gain students' cooperation with the plan.

In the first mediation session, common grievances were aired. Students agreed that they didn't like being insulted or intimidated, that they worried about their physical safety, and that they all wanted one another's respect. In several additional meetings during the next 2 weeks, the team reached an agreement that a number of behaviors would be unacceptable at school: There would be no put-downs, name calling, hateful stares, threats, shoving, or gang graffiti. After the final meeting, each gang was separately called into the conference room. Its representatives on the mediation team explained the agreement, and other members of the gang were asked to sign it. Despite some skepticism, most members of all three gangs signed it.

A month later, it was clear that the process had been successful. Members of rival gangs nodded pleasantly to one another or gave one another a high-five sign as they passed in the hall. Gang members no longer felt compelled to hang out in groups for safety's sake. Members of two of the gangs were seen playing soccer together one afternoon. And there had been no gang-related fights all month.

As should be apparent from our discussion in this chapter, helping growing children and adolescents develop into successful, productive adults can occasionally be quite a challenge. Yet discovering that you actually *can* make a difference in students' lives—including the lives of some who are at risk for academic or social failure—is perhaps the most rewarding aspect of being a teacher.

[124] Sanchez & Anderson, 1990, p. 54.

Summary

Effective classroom management involves both prevention and intervention, as reflected in the four Big Ideas presented at the beginning of the chapter.

9.1 Creating an Environment Conducive to Learning

Big Idea 9.1 Effective teachers create a caring, respectful classroom environment in which students are consistently focused on accomplishing instructional goals and objectives.

Good teachers create a setting in which students are regularly engaged in planned tasks and activities and in which few student behaviors interfere with those tasks and activities. The physical arrangement of the classroom makes a difference, but more important is a psychological environment (*classroom climate*) in which students feel safe and secure, make learning a high priority, and are willing to take risks and make mistakes. Central to such a climate are (1) teacher–student relationships that communicate genuine caring and concern for every student and (2) an overall sense of community in the classroom—a sense that teachers and students have shared goals, are mutually respectful and supportive of one another's efforts, and believe that everyone makes an important contribution to classroom learning. At the same time, teachers must take charge to some extent, establishing rules and planning age-appropriate activities to ensure that students are continually working toward instructional goals and objectives.

9.2 Expanding the Sense of Community Beyond the Classroom

Big Idea 9.2 Teachers are most effective when they coordinate their efforts with colleagues, outside agencies, and parents.

Effective teachers work cooperatively with other faculty members, other institutions, and families to promote students' learning, development, and achievement. It's especially important that teachers stay in regular contact with parents and other primary caregivers, sharing information in both directions about the progress that students are making and coordinating efforts at school with those at home. Teachers may need to make an extra effort to establish productive working relationships with those parents who, on the surface, seem reluctant to become involved in their children's education.

9.3 Reducing Unproductive Behaviors

Big Idea 9.3 Effective interventions for reducing unproductive school behaviors are tailored to the circumstances, with students' long-term development and well-being as the ultimate goals.

Despite teachers' best efforts, children and adolescents sometimes engage in behaviors that disrupt classroom learning, put one or more students' physical safety or psychological well-being in jeopardy, or violate basic moral and ethical standards. Some minor misbehaviors are usually best ignored, including those that probably won't be repeated, those that are unlikely to be imitated by other students, and those that occur only temporarily within the context of unusual circumstances. Other minor infractions can be dealt with simply and quickly by cueing students or by talking with them privately about their counterproductive behaviors. More serious and chronic behavior problems may require instruction in self-regulation strategies, punishment, consultation with parents, or intensive interventions that systematically combine a variety of strategies.

9.4 Addressing Aggression and Violence at School

Big Idea 9.4 Minimizing aggression and violence at school requires a three-tiered approach: (1) creating a respectful and supportive school environment, (2) intervening early for students at risk for social failure, and (3) providing intensive interventions for chronically aggressive students.

When certain students' behaviors seriously threaten others' sense of safety and well-being, and especially when aggression and violence are prevalent throughout the school building, a three-level approach may be necessary.

First, faculty members must coordinate their efforts in creating a schoolwide environment that makes aggression and violence unlikely—for example, by establishing trusting teacher–student relationships, fostering a sense of mutual respect and understanding among students from diverse backgrounds, and providing mechanisms through which students can communicate their concerns without fear of reprisal. Second, faculty members must intervene early for students who are at risk for academic or social failure, providing them with the cognitive and social skills they need to be successful at school. Third, school personnel must seek intensive intervention for students who are especially prone to violence, show signs of significant mental illness, or in some other way are seriously troubled. Additional measures are sometimes needed to address incidents of aggression associated with intergang hostilities.

Case Study Practice Exercises

The Good Buddy

Mr. Schulak has wanted to be a teacher for as long as he can remember. In his many volunteer activities over the years—coaching a girls' basketball team, assisting with a Scouting troop, teaching Sunday school—he's discovered how much he enjoys working with children. Children obviously enjoy working with him as well. Many occasionally call or stop by his home to shoot baskets, talk over old times, or just say hello. Some of them even call him by his first name.

Now that Mr. Schulak has completed his college degree and obtained his teaching certificate, he's a first-year teacher at his hometown's junior high school. He's delighted to find that he already knows many of his students, and he spends the first few days of class renewing his friendships with them. But by the end of the week, he realizes that his classes have accomplished little of an academic nature.

The following Monday Mr. Schulak vows to get down to business. He begins each of his five class sessions by describing his instructional goals for the weeks to come and then introduces his first lesson. Unfortunately, many of his students are resistant to settling down and getting to work. They move from one seat to another, talk with friends, toss wadded-up paper "basketballs" across the room, and in general do anything *except* the academic tasks Mr. Schulak has in mind. In his second week as a new teacher, Mr. Schulak has already lost control of his classroom.

1. **Constructed-response question**

   Mr. Schulak is having considerable difficulty bringing his classes to order.

   A. Identify two critical things that Mr. Schulak has *not* done to get the school year off to a good start.

   B. Describe two strategies that Mr. Schulak might now use to remedy the situation.

2. **Multiple-choice question**

   Mr. Schulak is undoubtedly aware that good teachers show that they care about and respect their students. Which one of the following statements describes the kind of teacher–student relationship that is most likely to foster students' learning and achievement?

   a. The teacher communicates optimism about a student's potential for success and offers the support necessary for that success.

   b. The teacher spends a lot of time engaging in recreational activities with students after school and on weekends.

   c. The teacher focuses almost exclusively on what students do well and ignores or downplays what students do poorly.

   d. The teacher listens empathetically to students' concerns but reminds them that the teacher must ultimately decide what transpires in the classroom.

Chapter 10
Assessment Strategies

Photo by Unsplash

Big Ideas to Master in this Chapter

10.1 Classroom assessments serve a variety of purposes, but in one way or another, they can all influence students' future learning and achievement.

10.2 Effective teachers strategically use assessments to enhance students' learning.

10.3 Ideally, classroom assessments have four RSVP characteristics—reliability, standardization, validity, and practicality—with validity being the most important.

10.4 Spontaneous, informal assessments and preplanned formal assessments both have important roles to play in enhancing students' learning and achievement.

10.5 Final class grades provide only global, quantitative information about students' achievement levels; whenever possible, they should be supplemented with qualitative information, perhaps through student-constructed portfolios.

10.6 Large-scale standardized tests can be helpful in estimating students' general achievement levels in particular domains, but educators should never use a single test score to make important decisions about individual students, nor should policymakers use average scores from a single test to evaluate teacher and school effectiveness.

Case Study: B in History

Twelve-year-old Ellie is the highest achiever in Ms. Davidson's sixth-grade class. She eagerly engages in class discussions and activities, and she's conscientious about completing in-class assignments and homework. As a result of her consistent engagement and diligence in her schoolwork, she has earned straight As on report cards in previous years.

At the end of the school day one Friday, Ms. Davidson says, "As you all know, our first-quarter grading period ended last week. I'm handing out report cards for you to take home to your parents. I'm especially proud of one student who always puts forth her best effort, and her grades are almost perfect." She smiles affectionately at Ellie and hands her a report card. "Here you are. Just one B, Ellie, in history. I'm sure you'll be able to bring it up to an A next quarter."

Despite the praise, Ellie is devastated. The B has blindsided her; she had no idea it was coming. Embarrassed beyond words, she successfully fights back tears but looks down at her desk while Ms. Davidson distributes the other report cards. When the final school bell rings, Ellie quickly gathers her backpack and heads out the door, forgoing the usual after-school good-byes to her friends.

Please answer these questions before you read further:

1. What conclusions has Ms. Davidson drawn about Ellie, and on what kinds of information has she probably based each conclusion?
2. Ellie's parents are unlikely to be concerned about her single B; they're more worried about her younger brother, who has shown significant delays in reading development. Why, then, might Ellie be so upset?
3. Was it appropriate for Ms. Davidson to announce Ellie's grades to the class? Why or why not?

Obviously, Ms. Davidson has drawn conclusions about Ellie's achievement levels in various content domains, presumably based on Ellie's performance on assignments and quizzes and perhaps also based on day-to-day observations of what Ellie has said and done during class activities. In addition, Ms. Davidson has drawn a conclusion about Ellie's work habits (she "always puts forth her best effort"), perhaps after observing Ellie's regular on-task behavior at school and her consistency in completing homework.

Although Ellie undoubtedly knows that she has occasionally made errors on history assessment tasks, she hasn't been aware of how those errors might add up to a B rather than an A because Ms. Davidson never provided students with feedback about their progress in history. And with her past straight-A record, she has set an extremely high standard for herself. Only perfection is good enough—an unrealistic standard held by some high-achieving sixth-graders—which is why she is so upset by receiving a B.[1]

[1] Parker, 1997.

Chapter Outline

Case Study: B in History

10.1 Using Assessments for Various Purposes
- Guiding Instructional Decision Making
- Diagnosing Learning and Performance Problems
- Promoting Learning and Motivation
- Determining What Students Have Learned at the End of Instruction
- Evaluating the Quality of Instruction

10.2 Enhancing Learning Through Classroom Assessment Practices

10.3 Important Qualities of Good Assessment

10.4 Informally and Formally Assessing Students' Progress and Achievements
- Conducting Informal Assessments
- Designing and Giving Formal Assessments
- Evaluating Students' Performance on Formal Assessments

10.5 Summarizing Students' Achievement with Grades and Portfolios

10.6 Assessing Students' Achievement and Abilities with Standardized Tests
- High-Stakes Tests and Accountability
- Using Standardized Achievement Tests Judiciously

Summary

Case Study Practice Exercises: Two Science Quizzes

In addition, Ms. Davidson has announced Ellie's imperfection to the entire class. As a young adolescent, Ellie isn't sure which is worse: that her peers know she has earned the highest grades in the class or that they know she's *not* perfect in history. Not only does Ms. Davidson's announcement make Ellie extremely uncomfortable, but it also violates Ellie's right to confidentiality. In fact, as we'll discover later in the chapter, making a student's grades public, as Ms. Davidson does, is illegal, at least in the United States.

In this chapter, we explore many different types of educational assessments, including those commonly referred to as tests, quizzes, examinations (exams), assignments, portfolios, and project products. The following definition sums up the major features of assessment:

> **Assessment** is a process of observing a sample of a student's behavior and drawing inferences about the student's knowledge, skills, and/or attitudes.

Several parts of this definition are important to note. First, assessment is an observation of students' *behavior*—including students' written or oral responses to tasks—because it's impossible to look inside students' heads and see what knowledge, skills, and attitudes are actually there. Second, an assessment typically involves just a *sample* of behavior. Teachers certainly can't observe and keep track of everything their students do during the school day. Finally, assessment involves drawing *inferences* from observed behaviors to make judgments about students' overall learning and achievement, or, in some cases, about their attitudes, motives, personality characteristics, work habits, or social skills. Such inference-drawing is a tricky business at best, and one that requires considerable thought about which behaviors can provide a reasonably accurate estimate of what students know, can do, and are likely to do.

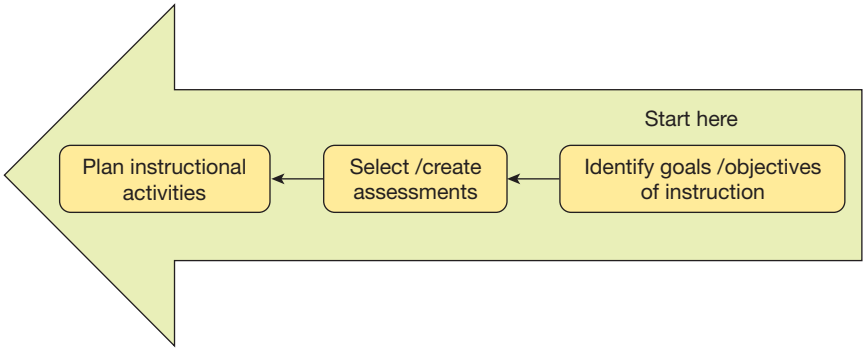
We focus primarily on *cognitive* and *behavioral* (performance) assessments in this chapter; that is, assessments that measure students' knowledge and skills. Remember that we discussed *affective* assessments in Chapter 5 and how teachers could measure students' attitudes and motivation-related perceptions in a class.

Some assessments involve **paper-and-pencil assessment**, whereby teachers present questions to answer, topics to address, or problems to solve, and students respond on paper or an electronic equivalent, such as a word processing document or an online form. But other examples (e.g., having students respond orally to questions or act out a story) reflect **performance assessment**, in which students show what they've learned by actively *doing* something rather than simply writing about it. As we'll discover later, paper-and-pencil and performance assessment tasks tend to be useful in different situations.

Another useful way to categorize assessments is to label them as informal or formal. **Informal assessments** involve spontaneous, day-to-day observations of what students say and do at school. In contrast, **formal assessments** are planned in advance and used for a specific purpose—perhaps to determine what students have learned from an instructional unit or whether students can apply what they've learned to real-world problems. A formal assessment is *formal* in the sense that a particular time is set aside for it, students can prepare for it ahead of time, and it's intended to yield information about particular instructional objectives or content-area standards.

Classroom assessment practices are intertwined with virtually every other aspect of classroom functioning (look once again at Figure 8.2 at the beginning of Chapter 8). Teachers' instructional goals should determine not only the content of classroom lessons but also the nature of assignments, tests, and other measures of students' achievement levels, as reflected in the **backward design** approach previously described in Chapter 8 and illustrated once again in Figure 10.1. In this approach, assessments are used as means for students to demonstrate the same types of knowledge and skills that are specified in the goals and objectives of the instruction. For example, if the objective is for students to demonstrate historical thinking by analyzing and interpreting artifacts and primary/secondary

Figure 10.1 The backward design approach involves teachers beginning with the goals and objectives of instruction and working "backward" by then selecting or creating assessments and planning their instructional activities



sources to understand U.S. history since World War II, then assessing students through a paper or project (in which students can demonstrate their analysis and interpretation) is more appropriate than a multiple-choice test that assesses only historical facts.

How students perform on ongoing assessments influences teachers' future planning, instructional methods, and classroom management strategies. Good classroom assessment practices also consider students' existing characteristics and behaviors, such as their attention spans, vocabulary levels, reading and writing skills, and so on. But above all else, good assessment practices *enhance students' learning* over both the short and the long run, which is something we examine more closely in the next section.

10.1 Using Assessments for Various Purposes

Big Idea 10.1 Classroom assessments serve a variety of purposes, but in one way or another, they can all influence students' future learning and achievement.

You can best think of classroom assessments as *tools* that can guide teachers' decisions about how to help students learn and achieve and, later, their decisions about how to sum up what students have ultimately accomplished. Classroom assessments are rarely *perfect* tools, as we'll see in an upcoming section, but a critical first step in choosing the right ones is to determine the specific purpose(s) for which particular assessments are being used.

Classroom assessments can be categorized as diagnostic, formative, or summative, depending on when and how they are used (see Figure 10.2). **Diagnostic assessment** involves determining what students know and can do *before* instruction, usually to identify students' existing strengths and interests, or to determine students' current knowledge and misconceptions about a topic. **Formative assessment** involves assessing what students know and can do *during* instruction, to ascertain students' progress partway through a unit or lesson. In contrast, **summative assessment** involves conducting an assessment *after* instruction, perhaps for the purpose of assigning final class grades or determining which students are ready for more advanced classes. Table 10.1 provides some characteristics and examples of these three types of assessments.

Figure 10.2 Three types of assessments

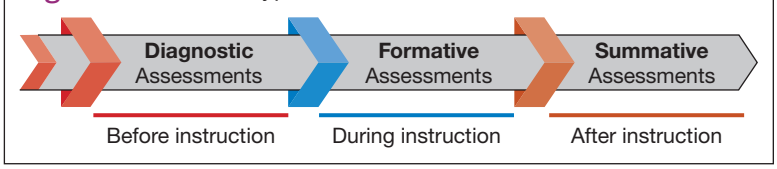


Table 10.1 Characteristics and Examples of Three Types of Assessments

	DIAGNOSTIC ASSESSMENT	FORMATIVE ASSESSMENT	SUMMATIVE ASSESSMENT
Short description	• Assessment *before* learning	• Assessment *for* learning	• Assessment *of* learning
Timing	• Used *before* instruction	• Used *during* instruction, possibly multiple times	• Used *after* instruction • Used at the end of an academic quarter or year
Purpose	• To identify students' existing knowledge and skills prior to instruction	• To ascertain students' progress during instruction	• To assess students' final achievement after instruction
Uses	• To design instruction that's appropriate for students • To determine when to begin an instructional unit	• To make instructional adjustments • To give students feedback about their progress • To monitor students' progress toward lesson goals	• To assign final grades • To make decisions about students (e.g., grade retention, preparedness for future classes) • To monitor students' progress toward lesson goals • To evaluate learning outcomes • To guide instructional planning for the future • To identify areas in need of instructional support • For program, school, and division improvement planning
Formal or informal	• Typically formal assessments	• Informal and formal assessments	• Formal assessments
Examples	• Quizzes, performance tasks, oral assessments	• Questioning during instruction, examples of students' work, quizzes (graded or ungraded), performance tasks, teacher observations	• Unit tests, standardized tests, projects, portfolios

With these three types of assessment in mind, we now examine the roles that educational assessments can play in (1) guiding instructional decision making, (2) diagnosing learning and performance problems, (3) promoting learning and motivation, (4) determining what students have learned at the end of instruction, and (5) evaluating the quality of instruction.

Guiding Instructional Decision Making

All three types of assessments (diagnostic, formative, and summative) can be used to guide instructional decision making. Diagnostic assessments can help teachers to identify students' existing knowledge and skills related to the instructional goals and to determine when students are ready to begin an instructional unit. Conducting formative assessments throughout a lesson or unit can provide ongoing information about the appropriateness of current instructional goals and the effectiveness of current instructional strategies. For example, after finding that almost all students are completing assignments quickly and easily, a teacher might set instructional goals a bit higher. Alternatively, if many students struggle with concepts presented only through verbal explanations, a teacher might try a different instructional approach—perhaps a more concrete, hands-on one.

Summative assessments can also have an impact on instructional decision making. For example, any annual districtwide, statewide, provincial, or (for some countries) national achievement tests should guide teachers somewhat as they prioritize topics and skills on which to focus. In some cases, then, teachers must consider the nature of future summative

assessments even *before* they conduct formative assessments (more about this issue in a later discussion of high-stakes tests).

Diagnosing Learning and Performance Problems

Why is Louis having trouble learning to read? Why does Gretel misbehave every time she faces a challenging assignment? Teachers ask such questions when they suspect that certain students might learn differently from their agemates and may possibly require special educational services. Some assessment instruments are specifically designed to identify students' unique academic and personal needs. Most of these instruments require explicit training in their use and so are typically administered and interpreted by specialists (e.g., school psychologists, speech-language pathologists). Yet, teachers' classroom assessments can provide considerable diagnostic information as well, especially when they reveal consistent error patterns and areas of difficulty (see Figure 10.3).

Many teachers make regular use of short, formative assessments to determine whether certain students might have exceptional instructional needs. In this approach, known as **response to intervention (RTI)**, a teacher frequently assesses students' progress, keeping a lookout for students who have unusual difficulty acquiring certain basic skills despite teachers' evidence-based practices in both whole-class instruction and follow-up small-group work. Note the importance of *evidence-based practices* here: The teacher must have used instructional strategies that research has shown to be effective for most students. The RTI approach has gained particular popularity as a means of identifying students who have learning disabilities, but it's potentially useful for other students as well.[2]

Promoting Learning and Motivation

When teachers conduct assessments, they can use the results to develop or modify lesson plans in ways that best help students achieve the instructional objectives. But assessments can also influence students' cognitive processes and motivation, as reflected in the following principles.

Figure 10.3 In these and other work samples, 7-year-old Casey shows consistent difficulty in making connections between the sounds he hears and the sounds he represents in his writing—a difficulty that in his case reflects a learning disability known as *dyslexia*

[2] T. A. Glover & Vaughn, 2010; Hoover, 2009; Mellard & Johnson, 2008.

Figure 10.4 Some of these items from a sixth-grade geology test could encourage students to memorize, rather than understand, information about rocks

A. Identify each of the four rocks shown at the front of the classroom as either sedimentary, igneous, or metamorphic rock (circle the correct answer for each rock):

Rock 1 is: sedimentary, igneous, metamorphic

Rock 2 is: sedimentary, igneous, metamorphic

Rock 3 is: sedimentary, igneous, metamorphic

Rock 4 is: sedimentary, igneous, metamorphic

B. The following are various stages of the rock cycle. Number them from 1 to 9 to indicate the order in which they occur.

_____ Heat and pressure

_____ Crystallization and cooling

_____ Igneous rock forms

_____ Magma

_____ Weathering and erosion into sediments

_____ Melting

_____ Sedimentary rock forms

_____ Pressure and cementing

_____ Metamorphic rock forms

C. Fill in the blanks in each sentence.

1. The process of breaking down rock by the action of water, ice, plants, animals, and chemical changes is called _____.
2. All rocks are made of _____.
3. The hardness of rocks can be determined by a _____.
4. Continued weathering of rock will eventually produce _____.
5. Every rock has a _____.

Assessments can influence students' cognitive processes as they study.

Students draw inferences about important instructional goals partly from the ways their learning is assessed. Thus, different assessment tasks can lead them to study and learn quite differently.[3] For example, students typically spend more time studying the things they think an assessment will address than the things they think the assessment won't cover. Furthermore, their expectations about the kinds of tasks they'll need to perform and the questions they'll need to answer influence whether they memorize isolated facts, on the one hand, or construct a meaningful, integrated body of knowledge, on the other.

As an example, look at the sixth-grade test about rocks shown in Figure 10.4. Part A (identifying rocks shown at the front of the classroom) may be assessing either basic knowledge or application (transfer). If they had seen those exact rock specimens before and were given the names of the rocks at that time, then Part A would assess their ability to *remember* what they were told previously. However, if they learned the definitions and characteristics of each of the types of rocks but did not see those exact rocks previously, then Part A would assess their ability to apply (transfer) their knowledge about rocks to those particular rocks. Teachers who want to assess students' knowledge of the definitions and characteristics would use rocks that students had never seen before to avoid the possibility that they had simply memorized the label for each particular rock.

Part B in Figure 10.4 could assess students' ability to simply memorize facts (the stages of the rock cycle). Alternatively, it could assess their conceptual knowledge of the various stages of the rock cycle as they think about what they know. For example, students who understand the rock cycle would know that when igneous rocks on the earth's surface are weathered, they turn into sediment that forms sedimentary rock through pressure. Then, through heat and pressure, metamorphic rock forms, and so forth. If teachers want to help students obtain this type of conceptual knowledge, they could also assess students by asking them to draw a picture of the cycle. Showing students pictures of the rock cycle and having them explain the cycle to someone else could also help them to form a conceptual understanding of the processes involved in it.

To answer the questions in Part C in Figure 10.4, students would need a good understanding of the concepts. Or, they could simply have memorized words that they learned on a class worksheet that was similar to these questions. The last item, "Every rock has a _____." (the answer is "story") requires students to memorize what they learned in class and would probably not be answered correctly even by an expert geologist who did not

[3] Carpenter, 2012; Corliss & Linn, 2011; N. Frederiksen, 1984; Haertel, 2013.

read the class worksheet. This type of item would likely encourage students to engage in rote learning as they study for future tests. As these examples show, the types of assessment items given can affect the types of cognitive processes students use as they study for the assessments.

Classroom assessments can also influence students' views about the nature of various academic disciplines; that is, they can influence the epistemic beliefs described in Chapter 3. For example, if a teacher routinely gives quizzes that assess knowledge of specific facts, students are apt to conclude that a discipline is just that: a collection of undisputed facts. If, instead, a teacher asks students to take a position on a controversial issue and justify their position with evidence and logic, students get a very different message: that the discipline involves an integrated set of understandings that must be supported with reasoning and are subject to change over time.

Assessment activities can be learning experiences in and of themselves.

In general, the very process of completing an assessment on classroom material helps students review the material during the assessment, which can help them to learn it better. Assessment tasks are especially valuable if they ask students to elaborate on or apply the material in a new way.[4] Therefore, assessment isn't just something that *accompanies* instruction. In a very real sense, assessment *is* instruction: It gives students clear messages about what things are most important to accomplish and how best to accomplish them.

Assessments can provide feedback about learning progress.

It isn't terribly helpful to know only one's final scores on tests and assignments. To facilitate students' learning and achievement—and also to enhance students' beliefs that they can master school subject matter—assessment feedback must include specific information about where students have succeeded, where they've had difficulty, and how they might improve.[5]

One simple yet effective feedback strategy is to insert short nongraded "mini-tests" into lessons. For example, when an instructional strategy involves mostly *presenting* information without a lot of two-way teacher–student interaction—as can sometimes be true in a traditional lecture—occasionally interspersing a few multiple-choice or short-answer questions throughout the lesson can help students monitor their current understandings of the material being presented.[6]

Assessments can motivate students to study and learn.

On average, students study class material more and learn it better when they're told that they'll be tested on it or in some other way held accountable for it, rather than when they're simply told to learn it.[7] Yet *how* students are assessed is as important as *whether* they're assessed. Assessments are especially effective as motivators when students are challenged to do their very best and their performance is judged on the basis of how well they've accomplished instructional goals.[8] And as you'll remember from Chapter 5, students are

[4] Corliss & Linn, 2011; Dunlosky et al., 2013; Foos & Fisher, 1988; C. I. Johnson & Mayer, 2009; Rohrer & Pashler, 2010.

[5] Andrade & Cizek, 2010; Fong et al., 2019; Hattie & Gan, 2011; Lee et al., 2020; Shute, 2008; Wiliam, 2010.

[6] Glass & Sinha, 2013; Szpunar et al., 2014; Wiliam, 2011.

[7] Dempster, 1991; N. Frederiksen, 1984; Rohrer & Pashler, 2010.

[8] Mac Iver et al., 1995; L. H. Meyer et al., 2008; Newstead, 2004.

more likely to be motivated when they believe that they can succeed on activities and assessments (if they exert reasonable effort and use appropriate strategies) and when they believe that what they're being assessed on is useful and relevant to their goals in life. In addition to success perceptions and the usefulness of class content, the MUSIC Model of Motivation (see Chapter 5) reminds us that students are more likely to be motivated when they feel cared for, when the class activities or assessments are interesting and enjoyable (e.g., creating a diorama showing the resources important to a particular culture, writing code to make a robot complete particular tasks), and when they are empowered to make choices (we discuss empowerment further in the next section).[9]

Assessments can encourage engagement and self-regulation *if* students play an active role in the assessment process.

Teachers can empower students and increase their sense of autonomy in order to motivate them to engage in class activities and assessments (see Chapter 5). Furthermore, if students are to become self-regulating learners, they must acquire skills in self-monitoring and self-evaluation (see Chapter 3). For such reasons, students should be regular and active participants in the assessment of their own learning and performance (more on this point shortly). Ultimately, teachers should think of assessment as something they do *with* students rather than *to* them.[10] Teachers can accomplish this by empowering students to help the teacher develop criteria for assessments, to help improve existing assessment criteria, and/or to assess themselves on the criteria.

Through both words and deeds, communicate that promoting learning and mastery—*not* passing judgment—is the ultimate goal.

Although regular classroom assessments can be highly motivating, they may direct students' attention to performance goals and undermine their motivation to engage in the activities for the rewards they receive while participating in the activities. Assessments are especially likely to encourage performance goals when students perceive them to be an evaluation of their performance rather than a mechanism for helping them master classroom subject matter.[11] Teachers can downplay the judgmental nature of assessments with strategies such as the following:[12]

- Describe the instructional goals and objectives being assessed in clear, understandable language.
- Assess students' progress frequently rather than infrequently, but *without* spending an inordinate time on assessment tasks that don't also enhance students' learning.
- When giving assessments, consistently convey a desire to enhance understanding and promote mastery, rather than to pass judgment.
- Help students recognize important (yet possibly subtle) differences between genuine mastery and more superficial knowledge.
- Engage students in constructive discussions of one another's work, with a focus on ideas for improvement.
- Give students opportunities to revise their work based on feedback they've received.

Such strategies can be especially important when working with students who are at risk for academic failure.[13]

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[9] Jones, 2009, 2018, 2020.

[10] Andrade, 2010; Panadero & Jonsson, 2013; Paris & Ayres, 1994; Reeve et al., 2004; Shepard et al., 2005.

[11] F. Danner, 2008; Grolnick & Ryan, 1987; Paris & Turner, 1994; Shernoff, 2013.

[12] Andrade & Cizek, 2010; Black & Wiliam, 1998; Chappuis, 2009; Hattie & Gan, 2011; Panadero & Jonsson, 2013; Rohrer & Pashler, 2010; Szpunar et al., 2014.

[13] G. B. Hughes, 2010; Wiliam, 2011.

Determining What Students Have Learned at the End of Instruction

In most instances, to determine whether students have achieved instructional goals or met certain content-area standards, teachers should use formal summative assessments rather than more casual, informal ones. Formal summative assessments of achievement are important in any mastery-learning approach to instruction, and they're essential for assigning final grades. School counselors and administrators, too, may use summative assessment results to make placement decisions, such as deciding which students are most likely to do well in advanced classes and which might need additional coursework in basic skills.

Evaluating the Quality of Instruction

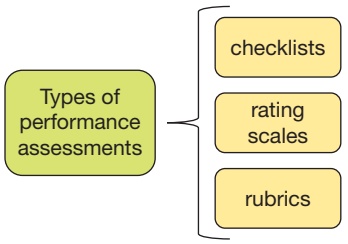
Summative assessment is also useful in evaluating how effective instruction has been. When most students perform poorly after an instructional unit, teachers should reflect not only on what students might have done differently, but also on what *they themselves* might have done differently. For example, perhaps a teacher moved too quickly through material or provided insufficient opportunities to practice essential skills. In any event, consistently low assessment results for many or all students indicate that some modification of instruction is in order.

10.2 Enhancing Learning Through Classroom Assessment Practices

Big Idea 10.2 **Effective teachers strategically use assessments to enhance students' learning.**

As we've just seen, certain characteristics of classroom assessments are likely to have a significant impact on students' learning and achievement. Ideally, teachers should *intentionally* use assessments with students' long-term learning and development in mind. Following are several general recommendations.

Figure 10.5 Types of performance assessments



Make assessment criteria explicit early in the instructional process.

Some assessment tasks yield clear-cut good and not-as-good responses; for example, assessments of typing speed (e.g., typing 42 words per minute) and math fact skills (e.g., 14 + 13 = 27) are usually pretty straightforward. But when a variety of behaviors and products might be equally good indicators of students' achievement levels related to a particular topic or skill—and especially when those behaviors and products can have varying degrees of quality—then explicit evaluation criteria are needed. Three types of performance assessments are most commonly used to make assessment criteria explicit: checklists, rating scales, and rubrics (see Figure 10.5).

When a behavior can be identified as present or not present, teachers can make the assessment criteria explicit by distributing a **checklist** that includes a list of characteristics that indicate good performance on an assessment task. Figure 10.6 shows an example checklist from a beginner swimming class. Note that most of these behaviors can be identified as present or not present and the instructor

Figure 10.6 An example checklist from a beginner swimming class

Beginner Swimmer Class
Springside Parks and Recreation Department

Students must demonstrate proficiency in each of the following:

_____ Jump into chest-deep water
_____ Hold breath under water for 8 seconds
_____ Float in prone position for 10 seconds
_____ Glide in prone position with flutter kick
_____ Float on back for 10 seconds
_____ Glide on back with flutter kick
_____ Demonstrate crawl stroke and rhythmic breathing while standing in chest-deep water
_____ Show knowledge of basic water safety rules

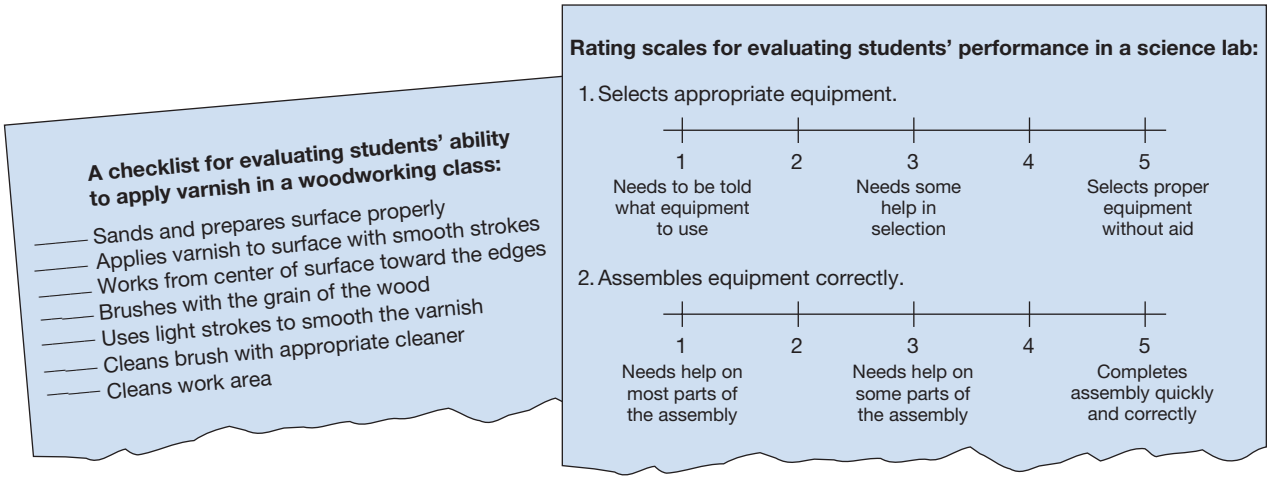
can simply check the behaviors that are present. The last item (Show knowledge of basic water safety rules) is not specific and should be rewritten to include each specific water safety rule so that it's clear to the rater and the swimmer exactly what rules are being assessed.

Another example of a checklist is provided on the left side of Figure 10.7. Although some of these criteria may be easily identified as present or not (e.g., Brushes with the grain of the wood), some of the criteria may vary along a continuum. For example, the item "Applies varnish to surface with smooth strokes" may be difficult to categorize as present or not if the student applies varnish with *fairly* smooth, but not *really* smooth strokes. In cases like this, it can be better to use a **rating scale**—a numerical scale used to evaluate a performance or product on one or more characteristics. In this example, the teacher could assess students' ability to apply varnish with smooth strokes by rating them either a 1 (not at all smooth strokes), 2, 3, or 4 (very smooth strokes). Teachers need to design the scales with the appropriate number of points along the scale. It is fairly common to use 4 points on a scale; however, teachers can use more or less than 4 points depending on how precisely the characteristic can be measured. In this example, it may be better to use a 3-point scale (1, 2, or 3) if it's difficult for the teacher to make distinctions of smoothness, or it may be better to include more points (5 points or more) if the instructor can identify many different levels of smoothness.

The right side of Figure 10.7 provides two examples of rating scales for evaluating students' performance in a science lab. Teachers should provide descriptions for the numbers at the end points of a rating scale; and preferably, they should also label some or all of the other points to make the criteria as explicit as possible. In the examples in Figure 10.7, the end points (1 and 5) and the mid-point (3) are labeled with brief descriptions (e.g., in the first item a value of 3 is described as "Needs some help in selection").

When the focus of instruction is a complex, multifaceted topic or skill, teachers can make the assessment criteria explicit by using a **rubric**—a two-dimensional table used to evaluate a multifaceted performance or product. On one dimension a rubric includes two or more characteristics and on the other dimension it includes a rating scale and specific criteria for rating the characteristics.

Figure 10.7 Examples of a checklist and rating scales



Sources: Checklist from *Measurement and Assessment in Teaching,* 9th edition, by Robert L. Linn and M. David Miller. Copyright © 2005 by Pearson Education, Inc. Printed and electronically reproduced by permission of Pearson Education, Inc. Upper Saddle River, New Jersey. Rating scales from *Writing Instructional Objectives for Teaching and Assessment,* 7th edition, by Norman E. Gronlund. Copyright © 2011 by Pearson Education, Inc. Printed and electronically reproduced by permission of Pearson Education, Inc. Upper Saddle River, New Jersey.

Figure 10.8 Partial rubric for evaluating writing

Characteristic	Proficient	In Progress	Beginning to Develop	Score
Complete sentences	**3 points** Writer uses almost all or all complete sentences throughout (except when using an incomplete sentence for stylistic purposes) with no run-on sentences.	**2 points** Writer uses a few incomplete sentences that have no obvious stylistic purpose, and/or writer occasionally includes a run-on sentence.	**1 point** Writer includes many incomplete sentences and/or run-on sentences; writer uses periods rarely or indiscriminately.	
Clear main idea	**6 points** Writer clearly states the main idea; sentences are all related to this idea and present a coherent message.	**4 points** Writer only implies the main idea; most sentences are related to this idea; a few sentences are unnecessary and off topic.	**2 points** Writer rambles, without a clear main idea; or writer frequently and unpredictably goes off topic.	
Specific word choice	**3 points** Writer uses very specific word choice and descriptive language.	**2 points** Writer uses limited word choice and descriptive language.	**1 point** Writer uses little or no specific word choice and descriptive language.	
Total score				

Figure 10.8 shows a partial rubric for evaluating writing. Notice that this example has many of the attributes of an effective rubric:[14]

- The left-hand column specifies the characteristics to be evaluated. This is only a partial rubric, a complete rubric would likely include more characteristics such as organization, details, style, and mechanics (e.g., capitalization, spelling, punctuation, formatting).
- The top row specifies the level of proficiency (i.e., Proficient, In Progress, or Beginning to Develop).
- The levels of proficiency are assigned a point value. Sometimes the point values are the same for each level of proficiency (e.g., Proficient = 3 points; In Progress = 2 points; and Beginning to Develop = 1 point). Other times, it may be appropriate to assign more points to some characteristics than others. In this example, the *clear main idea* characteristic is assigned twice as many points as the other criteria, which can indicate that it's more important than the other criteria or that the teacher wants to ensure that students focus on that characteristic.
- The focus of each characteristic is on only a few key attributes of skilled performance and these attributes are described in clear, concrete terms. The criteria aren't completely objective (e.g., what do the words *a few* and *many* mean exactly?), but they provide a general range of proficiency that could help teachers identify skills in which students still need to improve.
- Students can realistically acquire the highest proficiency in each characteristic with appropriate instruction, practice, and effort.
- The characteristics are applicable to many tasks within the content domain. In this example, which is in the domain of writing, the rubric would apply to some other writing tasks as well, not just this one particular assignment for which it was used.

[14] Arter & Chappuis, 2006; Popham, 2006, 2014.

Checklists, rating scales, and rubrics have at least three benefits. First, they give students clear targets toward which to aim. Second, when well constructed, they enable teachers to evaluate students' performance consistently and with reasonable objectivity (more about this point in an upcoming discussion of *reliability*). And third, they provide a means through which teachers can give students detailed feedback about the strengths and limitations of their performance—feedback that ideally can help students improve.

Ask students to evaluate their own performance.

Let's return to the opening case study, in which Ellie is blindsided by her B in history. Ms. Davidson has presumably been tracking Ellie's progress over time, but Ellie herself obviously hasn't been doing so. Students become more skillful in self-assessment as they grow older,[15] but even students in the elementary grades have some ability to evaluate their own performance. Here are several strategies for including students in the assessment process and helping them develop important self-monitoring and self-evaluation skills:[16]

- Solicit students' ideas about assessment criteria and the design of checklists, rating scales, and rubrics.
- Provide examples of good and not-as-good products—these should *not* come from current or recent students' work—and ask students to compare the examples on the basis of several criteria.
- Have students compare self-ratings of their performance with teacher ratings. For example, teachers could ask students to use checklists, rating scales, or rubrics to rate their own work before they see their teachers' ratings on these assessments.
- Ask students to write practice questions similar to those they might see on an upcoming multiple-choice or short-answer test.
- Have students keep ongoing records of their performance and chart their progress over time.
- Have students reflect on their work in daily or weekly journal entries, where they can keep track of knowledge and skills they have and haven't mastered, as well as learning strategies that have and haven't been effective for them.
- Have students compile portfolios of their work, including self-reflective explanations of what various items reveal about their learning and achievement (we discuss *portfolios* in Section 10.5).
- Ask students to lead parent–teacher conferences.

It's important, too, that teachers encourage productive attributions; for instance, students should genuinely believe they can overcome their existing shortcomings with reasonable effort and good strategies.[17] And teachers should ask students to develop a follow-up action plan—to explicitly address the question *What do I need to do now?* based on their assessment results. Such an action plan might include identifying answers to more specific questions such as these:

- What specific things do I need to do to improve?
- What resources and assistance do I need to help me improve?
- How will I know when I have reached my goal?[18]

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[15] van Kraayenoord & Paris, 1997.

[16] Andrade, 2010; A. L. Brown & Campione, 1996; Chappuis, 2009; McMillan, 2010; Paris & Ayres, 1994; Shepard, 2000; Stiggins & Chappuis, 2012.

[17] Andrade, 2010; Stupnisky et al., 2011.

[18] Questions based on Chappuis, 2009.

Assess students' ability to learn new things given varying levels of guidance and support.

One form of formative assessment is **dynamic assessment**, in which a teacher assesses a student's ability to learn something new, typically in a one-on-one situation, and also provides instruction, assistance, or some other form of scaffolding.[19] In other words, the teacher not only assesses the student but also provides some type of instruction. During the assessment, the teacher may ask the student a question and then follow up by asking questions such as "Why did you say that?", "How did you know that?", and "What would happen if . . .." These types of questions allow teachers to gain insight into students' knowledge and cognitive processes that may be undetectable using traditional means of assessment. If the student has misunderstandings, the teacher may provide the correct answer along with an explanation.

Such a dynamic approach reflects Vygotsky's *zone of proximal development* and can reveal what students might be able to accomplish with appropriate structure and guidance (such as questioning). Dynamic assessment can provide a wealth of qualitative information about children's abilities, cognitive strategies, and approaches to learning, such as:[20]

- Students' readiness for instruction in particular topics and skills
- Students' motivational and affective patterns (e.g., self-efficacy, achievement goals, attributions, anxiety)
- Students' work habits (e.g., impulsiveness, persistence, reactions to frustration and failure)
- Potential obstacles to students' learning (e.g., distractibility, poor reading comprehension skills, lack of effective self-monitoring and self-evaluation skills)

Thus, dynamic assessment can yield information that teachers are unlikely to get through more traditional assessment strategies.

Take advantage of technology-based formative assessment tools.

Several online resources provide short formative assessments through which teachers can regularly monitor students' progress in literacy, math, or science, such as Accelerated Reader (renaissance.com), AIMSweb (aimsweb.com), Diagnoser (diagnoser.com), and DIBELS (Dynamic Indicators of Basic Early Literacy Skills; dibels.uoregon.edu). Some of these resources provide means through which a teacher can immediately enter students' responses into a phone or tablet; others present short assessments that students themselves complete online. The programs keep track of students' performance over time and, at a teacher's request, can quickly generate reports and graphs regarding both individual students and an entire class. Thus, they're especially useful in *response-to-intervention* approaches to assessment (described earlier) and *curriculum-based measurement* (to be described a bit later in the section on validity).

Many computer and online programs can help students *self-assess* their work. For instance, most word processing programs provide grammar checkers and some websites are specifically designed to help students evaluate qualities of their written work by analyzing students' written essays, short stories, and other compositions (such as whether students have used plausible word combinations, appropriate grammatical structures, etc.). Using these types of programs for formative assessment purposes is one way to help students obtain feedback that can improve the quality of their writing.[21]

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[19] For example, see Feuerstein et al., 2010; Fuchs, Compton, et al., 2008; Haywood & Lidz, 2007; Seethaler et al., 2012; H. L. Swanson & Lussier, 2001.

[20] Feuerstein et al., 2010; Fuchs, Compton, et al., 2008; Hamers & Ruijssenaars, 1997; Haywood & Lidz, 2007; Tzuriel, 2000.

[21] Russell, 2010.

10.3 Important Qualities of Good Assessment

Big Idea 10.3 **Ideally, classroom assessments have four RSVP characteristics—reliability, standardization, validity, and practicality—with validity being the most important.**

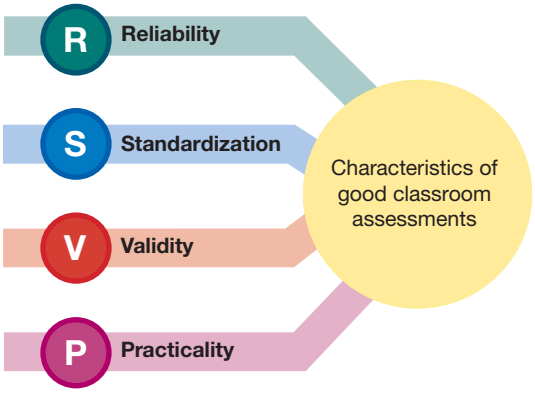
As a student, have you ever been assessed in a way you thought was unfair? If so, *why* was it unfair?

1. Did the teacher evaluate students' responses inconsistently?
2. Were some students assessed under more favorable conditions than others were?
3. Was the assessment a poor measure of what you had learned?
4. Was the assessment so time-consuming that eventually you no longer cared how well you performed?

In light of your experiences, what characteristics seem to be essential for good classroom assessment instruments and practices?

The four numbered questions just posed reflect, respectively, four *RSVP* characteristics of good classroom assessments: reliability, standardization, validity, and practicality (see Figure 10.9). These characteristics are important considerations for any assessment activity, but they're especially important when educators use summative assessments to make potentially life-changing decisions—for instance, decisions about final class grades, placements in advanced classes, and appropriate services for students with disabilities.

Figure 10.9 Qualities of good assessments



A good assessment is reliable.

The **reliability** of an assessment instrument or procedure is the extent to which it yields consistent information about the knowledge, skills, or characteristics being assessed. To get a sense of what reliability involves, try the following exercise.

See For Yourself

Fowl Play

Here is a sequence of events in the life of biology teacher Ms. Fowler:

- **Monday.** After completing a lesson on the bone structures of both birds and dinosaurs, Ms. Fowler asks students to write an essay explaining why many scientists believe that birds are descendants of dinosaurs. After school, she tosses the pile of essays on the back seat of her cluttered car.
- **Tuesday.** Ms. Fowler looks high and low for the essays both at home and in her classroom, but she can't find them anywhere.
- **Wednesday.** Because Ms. Fowler wants to use the students' essays to determine what they've learned, she asks the class to write the same essay a second time.
- **Thursday.** Ms. Fowler finally finds Monday's essays on the back seat of her car.
- **Friday.** Ms. Fowler grades both sets of essays. She is surprised to find little consistency between them: Students who wrote the best essays on Monday didn't necessarily do well on Wednesday, and some of Monday's poorest performers did quite well on Wednesday.

Which results should Ms. Fowler use, Monday's or Wednesday's?

When teachers assess learning and achievement, they must be confident that their assessment results will be essentially the same regardless of whether they give the assessment Monday or Wednesday, whether students complete it at 9:00 am or 2:00 pm, and whether they evaluate students' responses while in a good mood or a foul frame of mind.

Ms. Fowler's assessment task has poor reliability because the results it yields are completely different from one day to another. So which day's results should she use? We've asked you a trick question here because there's really no way to determine which set is more accurate.

Any single assessment task will rarely yield *exactly* the same results for the same student on two different occasions, even if the knowledge or ability being assessed remains the same. Many temporary conditions unrelated to the knowledge or ability being measured are apt to affect students' performance and almost inevitably lead to some fluctuation in assessment results. For instance, the inconsistencies in Ms. Fowler's two sets of student essays might have been due to one or more of the following temporary factors:

- **Day-to-day changes in students**—for example, changes in health, motivation, mood, and energy level

  In Ms. Fowler's class, Wednesday was the day before Thanksgiving—a holiday celebrated with the day off from school—and students were so excited about it that they had a hard time concentrating while writing their essays on Wednesday.
- **Variations in the physical environment**—for example, variations in room temperature, noise level, and outside distractions

  On Monday, students who sat by the window in Ms. Fowler's classroom enjoyed peace and quiet, but on Wednesday, they wrote their essays while noisy construction machinery was tearing up the pavement outside.
- **Variations in administration of the assessment**—for example, variations in instructions, timing, and the teacher's responses to students' questions

  On Monday, a few students wrote the essay during their lunch period because they had attended a rehearsal for the holiday band concert during their regular class time. Ms. Fowler explained the task more clearly for them than she had during the normal class time, and they had more time to complete it. On Wednesday, Ms. Fowler explained the task very hurriedly and collected the essays before some students had finished.
- **Characteristics of the assessment instrument**—for example, the length, clarity, and difficulty of tasks (e.g., ambiguous and very difficult tasks increase students' tendency to guess randomly)

  The essay topic, "Explain why many scientists believe that birds are descendants of dinosaurs," was an ambiguous one that students interpreted differently from one day to the next.
- **Subjectivity in scoring**—for example, judgments made on the basis of vague, imprecise criteria

  Ms. Fowler didn't have a rubric to grade the essays; instead, she made up the grading criteria in her head as she progressed through grading the Monday essays. After completing the Monday essays, she had a pretty good sense of the criteria she was using and, consequently, graded the Wednesday essays more strictly (which resulted in lower grades overall).

When drawing conclusions about students' learning and achievement, teachers must be confident that the information on which they're basing their conclusions hasn't been overly distorted by temporary, irrelevant factors. Several strategies can increase the likelihood that an assessment yields reliable results:

- Include a variety of tasks and look for consistency in students' performance on different tasks.
- Define each task clearly enough that students know exactly what they're being asked to do.
- Use a checklist, rating scale, or rubric that identifies specific, concrete criteria with which to evaluate students' performance.

- Try not to let expectations for students' performance influence judgments of *actual* performance.
- Avoid assessing students' achievement when they're unlikely to give their best performance—for instance, when they're sick.
- Administer the assessment in similar ways and under similar conditions for all students.

The last recommendation suggests that assessment procedures also be *standardized*, especially when—for whatever reason—students need to be compared to one another. We turn to this RSVP characteristic now.

A good assessment is standardized for most students.

The term **standardization** refers to the extent to which an assessment involves similar content and format and is administered and scored in the same way for everyone. In most situations, all students should get the same instructions, perform identical or similar tasks, have the same time limits, and work under the same constraints. Furthermore, all students' responses should be scored using the same criteria.

think about it
Is this description of how standardized tests are administered consistent with your own experiences taking such tests?

Many tests constructed and published by large-scale testing companies are called *standardized tests*. This label indicates that the tests have explicit procedures for administration and scoring that are consistently applied wherever the tests are used. Yet standardization is also important in teachers' own, self-constructed classroom assessments because it increases the probability that any single assessment task will yield consistent results on different occasions—something that Ms. Fowler's essay question doesn't do.

Equity is an additional consideration. Especially if a summative assessment is being conducted, it's only fair to ask all students to be evaluated under similar conditions. We find an exception in the assessment of students with special educational needs. In the United States, the Individuals with Disabilities Education Act (IDEA) mandates that schools make appropriate accommodations for students with physical, mental, social, or emotional disabilities. This mandate applies not only to instructional practices but to assessment practices as well. Specific modifications to assessment instruments and procedures must, of course, be tailored to students' particular disabilities. Following are examples:[22]

- Use technology to facilitate students' ability to perform reading and writing tasks—for instance, by presenting questions in an enlarged font (e.g., for students with impaired vision) or allowing the use of spell checkers (e.g., for students with learning disabilities).
- Read test questions to students with limited reading skills (e.g., to students with dyslexia).
- Divide a lengthy assessment task into several shorter tasks for students who have limited attention spans (e.g., for students with attention-deficit hyperactivity disorder [ADHD]).
- Administer an assessment in a quiet room with few distractions (e.g., for students with learning disabilities or ADHD).
- Give more time or frequent breaks during the assessment (e.g., for students who tire easily due to a chronic illness or traumatic brain injury).
- Construct individualized assessment instruments if some students are working toward instructional goals different from those of their classmates (e.g., as may often be the case for students with intellectual disabilities).

[22] American Educational Research Association et al., 1999; N. Gregg, 2009; Lovett, 2010.

A good assessment has validity for its purpose.

Earlier you learned about *reliability*. Let's see whether you can apply (transfer) your understanding of reliability in the following exercise.

See For Yourself

FTOI

We authors have developed a test called the FTOI: the Fathead Test of Intelligence. It consists of only a tape measure and a *table of norms* that shows how children and adults of various ages typically perform on the test. Administration of the FTOI is quick and easy. You simply measure a person's head circumference just above the eyebrows (firmly but not too tightly) and compare your measurement to the average head circumference for the person's age group. People with large heads (comparatively speaking) get high IQ scores. People with smaller heads get low scores.

Answer this question before you read further: Does the FTOI have high reliability?

No matter how often you measure a person's head, you're going to get similar scores from one time to the next. People with large heads will continue to be big-headed, and those with small heads will always have relatively small hat sizes. So the answer to our question is yes: The FTOI has high reliability because it yields consistent results. If you answered no, you were probably thinking that the FTOI doesn't really measure intelligence. But that's a problem with the FTOI's *validity*, not with its reliability.

The **validity** of an assessment is the extent to which it measures what it's intended to measure and allows us to draw appropriate inferences about the characteristic or ability in question. Validity must be considered when answering the following types of questions:

- Does the FTOI measure intelligence?
- Are scores on a standardized, multiple-choice achievement test a good indication of whether students have mastered basic skills in reading and writing?
- Does students' performance at a school concert reflect what they've achieved in their instrumental music class?

When assessments don't fulfill their intended purposes—when they're poor measures of students' knowledge and abilities—we have a validity problem. It's important to note that an assessment cannot be valid if it's not also reliable. For example, for the FTOI to be valid, it would have to both measure intelligence and be reliable.

As noted earlier, numerous irrelevant factors are apt to influence how well students perform in assessment situations. Some of these—such as students' health, classroom distractions, and inconsistencies in scoring—are temporary conditions that lead to fluctuation in assessment results from one time to the next and thereby lower reliability. But other irrelevant factors are more stable—as reading ability and chronic test anxiety might be—and so their effects on assessment results will be relatively constant. For example, if Joe has poor reading skills, he may get consistently low scores on multiple-choice achievement tests regardless of how much he has actually achieved in science, math, or social studies. When assessment results continue to be affected by the same irrelevant variables, the *validity* of the assessments is in doubt.

Psychologists distinguish among at least three different kinds of validity, with *content* validity being of primary importance to most classroom teachers:

- **Content validity**—the extent to which assessment questions and tasks adequately represent the overall body of knowledge and skills—the content domain—being assessed. For example, the extent to which the problems on a unit math test include only the types of problems covered in the unit.

- **Predictive validity**—the extent to which scores on an assessment instrument predict performance in some future activity. For example, how well IQ scores predict students' future school achievement levels.
- **Construct validity**—the extent to which an assessment instrument measures a particular human trait or characteristic. For example, the extent to which the FTOI test actually measures intelligence.

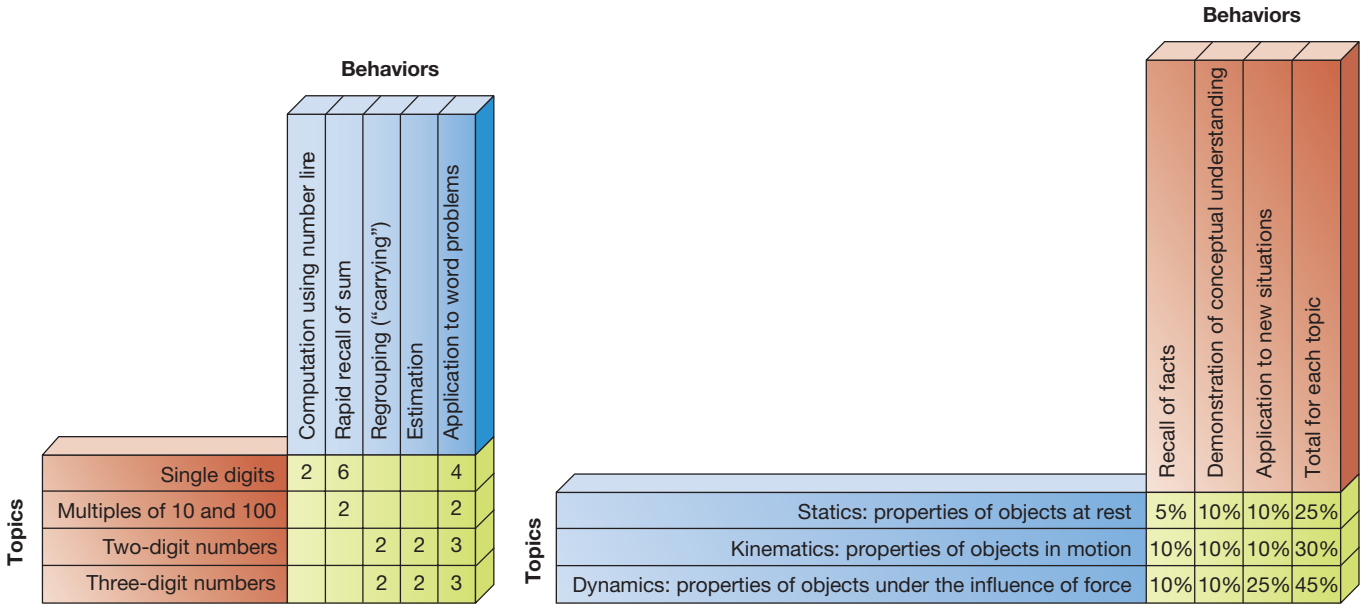
One strategy for ensuring content validity in *formative* assessments is **curriculum-based measurement (CBM)**, which is especially useful both in basic skills instruction and in a response-to-intervention approach to diagnosing persistent learning problems. In this approach teachers regularly administer assessments that each focus on a single, specific skill in the curriculum (e.g., word recognition in reading, addition of two-digit numbers in math) as a means of tracking individual students' progress. Each assessment is typically quite short (perhaps only 1 to 4 minutes long) and yet can help teachers identify students who might need additional instruction in a certain skill in order to move forward. Many of the technology-based formative assessment tools described earlier enable teachers to take a CBM approach. For example, we refer you once again to AIMSweb (aimsweb.com) and DIBELS (dibels.uoregon.edu).

High content validity is *essential* whenever teachers conduct *summative* assessments—that is, when teachers want to assess students' final achievement levels in an instructional unit or course of study. A teacher maximizes content validity when assessment tasks are as similar as possible to the things students should ultimately be able to do. In other words, any assessment used in summative assessment should reflect instructional goals and objectives.

When a summative assessment is intended to encompass multiple topics, concepts, and skills—and possibly also multiple instructional goals—teachers can't always address each and every one of these things in the assessment. But taken as a whole, the things teachers ask students to do in the assessment should comprise a *representative* sample of the content domain being assessed. In some ways, the ideas here are analogous to those used by pollsters who poll people before an election. Pollsters don't poll everyone; they poll people who are representative of those likely to vote. When they do their job well, their poll results are similar to the results of the upcoming election. Similarly, assessment scores should be similar to the scores that would be obtained if every possible knowledge and skill related to the instructional goals were assessed.

The most widely recommended strategy to obtain construct validity is to construct a blueprint that identifies the specific things a teacher wants to assess and the proportion of questions or tasks that should address each one. This blueprint frequently takes the form of a **table of specifications**, a two-way grid that indicates both what topics should be covered and what students should be able to *do* with each topic. Each cell of the grid indicates the relative importance of each topic–behavior combination, perhaps as a certain number or percentage of tasks or test items to be included in the overall assessment. Figure 10.10 shows two examples. The table on the left, constructed for a 30-item paper-and-pencil quiz on addition, assigns different weights (i.e., different numbers of test items) to different topic–behavior combinations, with some combinations intentionally not being assessed at all. The table on the right, constructed for a high school physics unit on classical mechanics, instead uses percentages to identify the relative weights assigned to different topic–behavior combinations; the three behaviors it includes are based loosely on the first three processes in Bloom's taxonomy (*remember*, *understand*, *apply*; see Chapter 8). Both tables in Figure 10.10 intentionally place greater emphasis on some topic–behavior combinations than on others, but in other situations, equal weightings across the board might be quite appropriate.

Figure 10.10 Two examples of a table of specifications



A good assessment is practical.

The final RSVP characteristic is **practicality**—the extent to which assessment instruments and procedures are easy to use. Practicality encompasses issues such as these:

- How much time will it take to develop the questions and/or tasks to be used?
- Can the assessment be administered to many students at once, or is one-on-one administration required?
- Are expensive materials involved?
- How much time will the assessment take away from instructional activities?
- How quickly and easily can students' performance be evaluated?

There's often a trade-off between practicality and such other characteristics as validity and reliability. For example, a true–false test for a unit on lacrosse should be easy to construct and administer, but a performance assessment in which students actually demonstrate their lacrosse skills—even though it takes more time and energy—would undoubtedly be a more valid measure of how well students can play during a real game.

The four RSVP characteristics are summarized in Table 10.2. Of these, *validity is the most important*. Teachers must use assessment techniques that validly assess students' accomplishment of instructional goals and objectives. Yet it's important to remember that *reliability is a necessary condition for validity*, especially when summative assessments are involved. Reliability doesn't guarantee validity, however, as our earlier Fathead Test of Intelligence exercise illustrated. Standardization is most relevant to summative assessments, especially those in which educators want to compare different students' performances (we identify reasons for occasionally doing so later in the chapter). Furthermore, standardization can enhance the reliability of assessment results and so can indirectly enhance their validity. Practicality should be a consideration only when validity isn't significantly jeopardized in the process.

Table 10.2 The RSVP Characteristics of Good Assessment

CHARACTERISTIC	DEFINITION	RELEVANT QUESTIONS TO CONSIDER
Reliability	The extent to which an assessment instrument or procedure yields consistent results for each student	• How much are students' scores affected by temporary conditions unrelated to the characteristic being assessed? • Do different people score students' performance similarly? • Do different parts of a single assessment instrument lead to similar conclusions about a student's achievement?
Standardization	The extent to which an assessment instrument or procedure is similar for all students	• Are all students assessed on identical or similar content? • Do all students have the same types of tasks to perform? • Is everyone given the same instructions? • Do all students have the same time limits? • Is everyone's performance evaluated using the same criteria?
Validity	The extent to which an assessment instrument or procedure measures what it is intended to measure and enables appropriate inferences to be made	• Does the assessment tap into a representative sample of the content domain being assessed (*content validity*)? • Do students' scores predict their later success in a domain (*predictive validity*)? • Does the instrument accurately measure a particular psychological or educational characteristic (*construct validity*)?
Practicality	The extent to which an assessment instrument or procedure is easy and inexpensive to use	• How much class time does the assessment take? • How quickly and easily can students' responses be scored? • Is special training required to administer or score the assessment? • Does the assessment require specialized materials that must be purchased?

10.4 Informally and Formally Assessing Students' Progress and Achievements

Big Idea 10.4 **Spontaneous, informal assessments and preplanned formal assessments both have important roles to play in enhancing students' learning and achievement.**

Now that we've examined desirable characteristics of any classroom assessment, we're in a good position to explore both informal and formal classroom assessment strategies. As we go along, we'll consider the goals and objectives for which various assessment strategies might be most appropriate and the RSVP characteristics of different approaches.

Conducting Informal Assessments

Teachers' spontaneous, unplanned assessments have several advantages. First and foremost, they provide continuing feedback about the effectiveness of ongoing instructional activities. Second, they can be easily adjusted at a moment's notice. For example, when students express misconceptions about a topic, a teacher's follow-up questions can probe their beliefs and reasoning processes. Third, informal assessments provide information that may either support or call into question the data obtained from more formal assessment tasks. Finally, regular observations of students' behaviors provide clues about social,

emotional, and motivational factors affecting classroom performance (see Chapter 5 for other types of affective assessments).

Here we offer general strategies that can enhance the usefulness of informal assessments.

Observe both verbal and nonverbal behaviors.

Teachers can learn a lot both from what students *say* and from what they *do* during the school day. Following are examples of informal assessment strategies:

- Ask questions during a lesson (e.g., see the Classroom Strategies box "Asking Questions to Promote and Assess Learning" in Chapter 8).
- Listen to what and how much students contribute to whole-class and small-group discussions; make note of the kinds of questions they ask.
- Observe how quickly and proficiently students perform various physical tasks.
- Identify the kinds of activities in which students engage voluntarily (e.g., see Figure 10.11).
- Watch for body language that might reflect students' feelings about particular classroom tasks.
- Look at the relative frequency of on-task and off-task behaviors; also look for patterns in *when* students are off task (e.g., see the discussion of functional analysis in Chapter 9).
- Observe students' interactions with peers in class, at lunch, and on the playground.

By observing both verbal and nonverbal behaviors, teachers can acquire a lot of information not only about students' knowledge and misconceptions but also about students' study strategies, self-regulation skills, interests and priorities; feelings about classroom subject matter; and attributions for success and failure. For example, in the opening case study, Ellie's active engagement in class discussions and diligent completion of assignments have led Ms. Davidson to conclude that Ellie "always puts forth her best effort."

Figure 10.11 As illustrated in this page from 8-year-old Peter's "Going Back in Time" book, he appears to have a strong interest in drawing and writing about science fiction—an interest that his teachers might build on as they assign reading, writing, and math tasks

Ask yourself whether your existing beliefs and expectations might be biasing your judgments.

Teachers' existing beliefs about particular students, as well as their expectations for students' performance, inevitably affect teachers' ongoing informal assessments of students' behaviors.[23] For example, their informal judgments of students' current achievement levels can easily be influenced by other things teachers know about students, such as how often particular students misbehave in class and what their past achievement levels have been.[24] Other common sources of bias in teachers'

[23] Hattie, 2009; Ritts et al., 1992; Stiggins & Chappuis, 2012.
[24] Carbonneau & Selig, 2011; Hoge & Coladarci, 1989; J. P. Robinson & Lubienski, 2011.

informal assessments of student performance are their existing beliefs about students of different ethnic groups, genders, and socioeconomic groups.[25] Therefore, as noted in Chapter 4, it's important for teachers to be aware of their cultural beliefs and to not pass judgment on students' cultural practices and beliefs that are different from their own.

Keep a written record of your observations.

Let's revisit another principle presented in Chapter 2: *Long-term memory isn't necessarily forever.* Teachers' memories of students' classroom behaviors can probably never be totally accurate, dependable records of what students have actually done and said. As normal human beings, teachers are apt to remember some student behaviors but not others. When teachers must depend heavily on informal in-class observations of students' performance—and this will often be the case when working with young children who have limited reading and writing skills—they should keep ongoing, written records of what they see students do and what they hear students say, especially for students whose behaviors or comments aren't typical for their age group.[26]

Don't take any single informal observation too seriously; instead, look for patterns over time.

The greatest strength of informal assessment is its practicality. It typically involves little or no teacher time either beforehand or after the fact (except for keeping written records of observations). Furthermore, it's flexible, in that teachers can adapt their assessment procedures on the spur of the moment, altering them as circumstances change.

Despite the practicality of informal assessment, its other RSVP characteristics are often questionable. For one thing, reliability can be a problem because children and adolescents can behave inconsistently from one day to the next, or even within a single day or class period. A teacher who asks Mohamed a question in class may happen to ask him the *only* question for which he doesn't know the answer. Furthermore, informal assessments are rarely, if ever, standardized for all students. Teachers ask different questions of different students, and they might observe one student in a context quite different from that of another student. Hence, such assessments will definitely *not* yield the same kinds of information for all students.

Validity can also be a problem because even when teachers see consistency in students' behavior over time, they don't always get accurate information about what students have learned. For example, Tom may intentionally answer questions incorrectly so that he doesn't come across as a know-it-all, and Margot may be reluctant to say anything because of a chronic stuttering problem. In general, when teachers use in-class questions to assess students' learning, they must be aware that some students—especially females and students from certain cultural groups—will be less eager to respond than others.[27]

When teachers use informal assessment to draw conclusions about what students know and can do, then they should base their conclusions on many observations over a long period. Furthermore, they should treat any conclusions only as *hypotheses* that they must either confirm or disconfirm through other means. In the end, most teachers rely more heavily on formal assessment techniques to determine whether students have achieved instructional goals and objectives.

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[25] Pellegrini, 2011; Ready & Wright, 2011; J. P. Robinson & Lubienski, 2011; van den Bergh et al., 2010.
[26] M. D. Miller et al., 2009; Stiggins & Chappuis, 2012.
[27] Castagno & Brayboy, 2008; Rogoff, 2003; Wentzel, 2009.

Designing and Giving Formal Assessments

Remember, formal classroom assessment tasks don't just *assess* students' learning, they also have an impact on students' learning. Furthermore, the conclusions teachers draw from assessment results—conclusions that affect final grades and decisions about promotion and graduation—can have a significant effect on students' future educational and career options. Accordingly, teachers must take their formal assessments very seriously, planning and designing them carefully, administering them under optimal conditions for student performance, and scoring them reliably and equitably.

Following are a number of recommendations that should increase the RSVP characteristics of formal classroom assessments.

Get as much information as possible within reasonable time limits.

On average, longer assessment instruments have greater validity and reliability. To see why this might be so, try the next exercise.

See For Yourself

Quick Quiz

The following multiple-choice quiz is designed to assess what you learned about human motivation in Chapter 5. No peeking at the answers until you've answered both questions!

1. Which one of the following alternatives best illustrates *situated motivation*?
   a. Alex has been interested in air travel and aerodynamics since he was a toddler, and he often sketches airplanes during his free time in class.
   b. When Youjin gets a lower grade on an assignment than she had anticipated, she says to her friends, "I deserved a much higher grade. Mr. Smith obviously doesn't like me very much."
   c. Colby is confident he'll do well on an upcoming history test because he has done well on other history tests throughout the semester.
   d. Although Mihaela has never been terribly interested in physical fitness, she eagerly learns an aerobic exercise routine her teacher has set to some of her favorite hip-hop music.

2. Which one of the following alternatives is the best example of *cognitive dissonance*?
   a. Alicia says to herself, "I don't really like math very much, but I'm taking it because it's important for me to get into a good college."
   b. Enrique is certain that metal always sinks, and so he's quite puzzled when he sees a large metal battleship floating in the harbor.
   c. Carly gets so anxious during an important test that she can hardly concentrate on the test items.
   d. Donovan gets really angry when he reads about the mass genocides the Nazis carried out during World War II.

Now score your quiz. The correct answers are *d* and *b* for Items 1 and 2, respectively. If you answered both questions correctly, you earned an A+ (100%) on the quiz. If you answered only one question correctly, you earned an F (50%). And, of course, two incorrect answers also mean an F.

Unfortunately, the length of the quiz is problematic. First, we assessed your knowledge of only two concepts (situated motivation and cognitive dissonance) out of the many concepts presented in Chapter 5. Two concepts are hardly a representative sample of what you've learned about motivation, and so the quiz has questionable content validity. Second, if you interpreted one of the items differently than intended, you might have answered an item incorrectly despite having the knowledge to answer it correctly. For example, in Item 2, if you assumed that Donovan had previously thought the Nazis were nice, tolerant people, you might reasonably have selected *d* as an example of cognitive dissonance. With this one slip-up, you would have gone from an A to an F. When a single misinterpretation

moves a student from a very good grade to a very poor one—a misinterpretation that might occur on one occasion but not on another—the reliability of the assessment is poor, and thus its validity is also questionable.

To some degree, then, longer is better when it comes to formal assessments. Ideally, a classroom assessment should include enough questions or tasks that (1) it adequately represents the content domain being assessed and (2) one or two errors due to irrelevant factors (such as misinterpretations of questions) don't seriously impact the final result. If assessments are too long, however, they can leave too little time for instruction and students can become tired near the end, which could unfairly affect their performance. Therefore, teachers often need to find a reasonable balance between the length of the assessment and the other RSVP characteristics of good assessments.

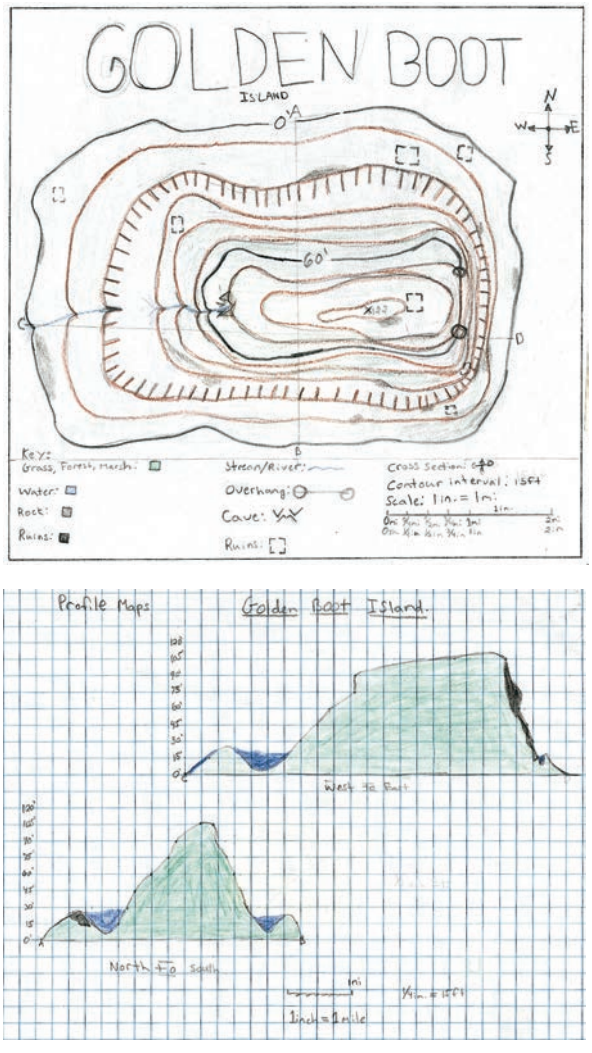


Figure 10.12 In his aerial and side-view drawings of "Golden Boot Island," 12-year-old Francisco demonstrates what he has learned about depicting elevation and topography

When practical, use authentic tasks.

Historically, most educational assessment instruments have focused on measuring basic knowledge and skills in relative isolation from tasks typically found in the outside world. Spelling quizzes, math word problems, and physical fitness tests are examples of such traditional assessments. Yet ultimately students must be able to transfer their knowledge and skills to complex activities outside the classroom. The notion of **authentic assessment**—assessing students' knowledge and skills in an authentic, similar-to-real-life context—is gaining increasing prominence in today's schools.[28]

In some situations, an authentic assessment can involve paper and pencil. For example, a teacher might ask students to write a letter to a friend or submit an article to a school newspaper. At other times it involves performance tasks. For example, a teacher might ask students to converse in a foreign language, design and build a bookshelf, or successfully maneuver a car into a parallel parking space.[29] Occasionally authentic tasks have both paper-and-pencil and performance components. For example, a teacher might ask students to create and post new entries for Wikipedia or to write lab reports describing what they have done and discovered in a computer-simulated science experiment.

Whether they be paper-and-pencil, performance based, or some combination of the two, assessment tasks can be authentic to varying degrees. For instance, they might involve having students apply new skills to imagined or hypothetical—rather than truly real-world—situations. As an illustration, one seventh-grade social studies teacher asked students to apply their mapping skills in depicting an island with certain topographical features (e.g., a stream running into the ocean on the west shore) and contours of certain heights. Figure 10.12 shows 12-year-old Francisco's response to the assignment.

[28] For example, see E. L. Baker, 2007; R. L. Johnson et al., 2009; Quellmalz et al., 2013; Wiggins & McTighe, 2007.

[29] Educators are not in complete agreement in their use of the terms *performance assessment* and *authentic assessment*, and many treat the terms more or less as synonyms. We authors find it useful to consider separately whether an assessment involves *performance* (rather than paper and pencil) and whether it involves a complex, real-world (*authentic*) task. In the discussion here, then, we do *not* use the two terms interchangeably.

Use paper-and-pencil assessment tasks when they are consistent with instructional goals.

In some situations—for instance, when the desired outcome is simple recall of facts—a teacher might ask students to respond to multiple-choice or short-answer questions on a paper-and-pencil test. In other situations—for instance, when a teacher wants students to critique a literary work or use scientific evidence to back up a conclusion—essay tasks are often more appropriate. *If* a teacher can truly assess knowledge of a domain by having students respond in writing, then a paper-and-pencil assessment is a good choice.

Paper-and-pencil assessment is typically easier and faster, and thus has greater practicality, than performance assessment. Usually a paper-and-pencil task can be administered to all students at the same time and under the same conditions, so it's easily standardized. To the extent that a paper-and-pencil assessment has a large number of items that can be objectively scored—as is true for true–false and multiple-choice tests—it's also likely to be fairly reliable.

The RSVP characteristic of most concern in a paper-and-pencil assessment is its validity. When teachers ask questions that require only short, simple responses (e.g., true–false, multiple-choice, and matching questions), they can representatively sample students' knowledge about many topics within a relatively short time period. In this sense, then, such questions can yield high content validity. Yet these types of items may not accurately reflect important instructional goals. To assess students' ability to apply what they've learned to new situations, solve complex real-world problems, critically analyze the logic and evidence presented in a persuasive essay, or engage in other complex cognitive processes, teachers may sometimes need to be satisfied with a few tasks requiring lengthy responses.[30]

Unfortunately, many paper-and-pencil assessment instruments—especially teacher-created tests—focus primarily on basic skills and knowledge of discrete facts.[31] But with a little ingenuity, teachers can develop paper-and-pencil assessment tasks that require conceptual understanding and complex cognitive processes. You've already seen an example in Figure 10.12, the drawings of *Golden Boot Island*. As another example, consider the following assessment given to students who live an hour's drive from Rocky Mountain National Park in Colorado, which has altitudes ranging from 1½ to more than 2 miles above sea level:

> A group of friends went hiking in Rocky Mountain National Park. They noticed that it was harder to breathe when hiking in the mountains than when hiking at the lower elevation of their hometown. During the hike, one girl opened a tube of sunscreen that she bought in her hometown. When she opened it, a small squirt of air and lotion shot out. Please answer the following two questions:
>
> 1. Why did the girls have a hard time breathing in the mountains?
> 2. Why did the air and lotion squirt out of the tube of sunscreen?

Teachers can also assess complex cognitive processes with carefully constructed multiple-choice questions. In the "Quick Quiz" exercise you did earlier, you saw two multiple-choice questions that required you to transfer what you've learned about motivation to new situations. The last two items in the Classroom Strategies box "Guidelines for Constructing Multiple-Choice Items" are additional examples.

For multiple-choice questions, teachers usually give students full credit (e.g., 1 point) for selecting the correct response and no credit (0 points) for any other response. However,

[30] Brookhart & Nitko, 2011; H.-S. Lee et al., 2011; Marzano & Kendall, 2007.
[31] Bransford et al., 2006; Corliss & Linn, 2011; Nickerson, 1989; Poole, 1994; Shepard et al., 2005.

Classroom Strategies

Guidelines for Constructing Multiple-Choice Items

- **Use simple vocabulary that can be understood by all students taking the test.**
  If some students know the answer to a question but are unable to understand the vocabulary, they may answer the question incorrectly. In this case, the item does not effectively assess students' knowledge of the content.

- **Avoid using negative wording—such as *not*—in the item stem.**
  Generally, it's best to avoid negatively worded stems because some students may read the item incorrectly. In this case, the item may not accurately assess students' knowledge. However, if it's necessary to use a negatively worded stem, be sure to use capital letters and boldface to emphasize the negative word (e.g., Which of the following is **NOT** a state capital in the United States?).

- **Order the response options in logical or numerical order.**
  A fourth-grade teacher should order the responses to this mathematics problem in increasing numerical order:

  How many wheels do 8 cars have?
  a. 16
  b. 24
  c. 32
  d. 64
  (The correct answer is c.)

- **In creating response options, use "none of the above" sparingly and avoid using "all of the above."**
  It can be appropriate to use the option "none of the above" if there are few plausible incorrect responses. However, "all of the above" should not be used because these items tend to have lower reliability.

- **Throughout a test, vary the position of the correct answers so that you use all of the response positions fairly equally.**
  For example, if you have four response options labeled as a, b, c, and d, don't primarily use options c and d to "hide" the correct answer. Instead, use each response option about 20 to 30% of the time (tests that use each of the four options exactly 25% of the time may provide unintended cues to students). Use the response options as randomly as possible, but also adhere to the other recommendations provided here, such as ordering the options in a logical order.

- **Make the content and structure of the response options similar.**
  Response options should be similar in length, complexity, formatting, and grammar. For example, when one or two of the response options are much shorter or longer than the other options, it can provide unintended clues that can help students to guess the correct answer even when they don't know it.

- **When assessing basic knowledge, rephrase ideas presented in class or in the textbook.**
  A middle school language arts teacher uses short multiple-choice quizzes to assess students' understanding of each week's new vocabulary words. The items never include the specific definitions students have been given. For instance, for the word *manacle*, students have been given this definition: "Device used to restrain a person's hands or wrists." But the item on the quiz is this one:

  Which one of the following words or phrases is closest in meaning to the word *manacle*?
  a. Insane
  b. Handcuffs
  c. Out of control
  d. Saltwater creature that clings to hard surfaces
  (The correct answer is b.)

- **Present incorrect alternatives that are clearly wrong to students who know the material but plausible to students who haven't mastered it.**
  After a unit on the seasons, a middle school science teacher asks this question:

  What is the *main* reason that it is colder in winter than in summer?
  a. Because Earth is in the part of its orbit farthest away from the sun
  b. Because wind is more likely to come from the north than from the south
  c. Because the sun's rays hit our part of Earth at more of an angle
  d. Because the snow on the ground reflects rather than absorbs the sun's heat
  (The correct answer is c.)

- **Consider using only three response options: one correct answer and two plausible distractor options.**
  Using only three response options for each item has been shown to be as effective as using four or five options in many cases. One reason that three options can be sufficient is that it's often difficult for teachers to create more than two plausible distractor options. Other potential advantages of using only three options are that it saves teachers time in creating more response options and it saves students time in answering the items. Consequently, teachers can use the saved time to provide more items, which could improve content coverage and content validity.

- **To assess complex cognitive processes, ask students to apply what they've learned to new situations.**
  A high school physics teacher includes the following question on a quiz designed to assess what students have learned about simple machines:

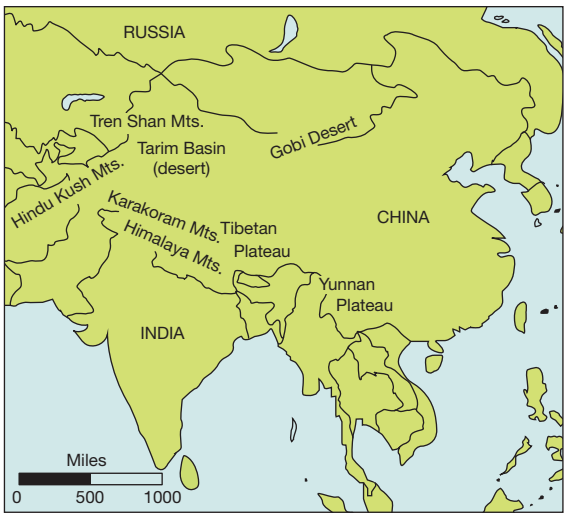
  An inventor has just designed a new device for cutting paper. Without knowing anything else about his invention, we can predict that it is probably which type of machine?
  a. A lever
  b. A movable pulley
  c. An inclined plane
  d. A wedge

  (The correct answer is d.)

- **Occasionally incorporate visual materials.**
  A high school geography teacher includes maps in some of his questions. Following is an example:

  Using the map to the right, choose the most logical explanation for why people living in the Middle East and people living in the Far East developed distinctly different languages.
  a. People in the Far East had little contact with those who lived in the Middle East.
  b. People who lived by the ocean had very different lifestyles from those who lived in the mountains.
  c. People who lived in southern climates had very different lifestyles from those of people who lived in northern climates.
  d. People in the two regions were constantly fighting over desirable farmland.

  (The correct answer is a.)



Sources: Gierl et al., 2017 (incorrect alternatives, number of distractors); Haladyna et al., 2002; Haladyna et al., 2019 (number of distractors); Kan et al., 2019 (using simple vocabulary); Popham, 2003.

it's possible to use partial credit grading schemes. For example, teachers can use *subset selection* by allowing students to select more than one response (even when there is only one correct response) and get partial credit if they select the correct answer as one of their responses (see Figure 10.13 for how to assign scores). Although it may seem unfair to give students 0.25 points for selecting all of the answers, this point value is the same as if students randomly guessed at four questions in a traditionally scored test with four response options (i.e., they have a 25% chance of answering one out of four questions correctly). Using partial credit may be easier to comprehend for older students (e.g., high school students) than younger students. In one study, first-year college students preferred these subset selection tests and found them less stressful than traditional multiple-choice tests.[32]

Figure 10.13 Multiple-choice items can be graded using partial credit.

Grading Multiple-Choice Items with Partial Credit

This example is for multiple-choice items with 4 response options that have only 1 correct option.

Tell students that they can select 1, 2, 3, or 4 of the response options. However, the more options they select, the fewer points they will receive if they select the correct answer. Here are the point values they will receive:

- 1 point = 1 option selected, and it is correct
- 0.5 points = 2 options selected, and one of them is correct
- 0.33 points = 3 options selected, and one of them is correct
- 0.25 points = 4 options selected
- 0 points = none of the selections were correct

Source: Otoyo, L., & Bush, M. (2018). Addressing the Shortcomings of Traditional Multiple-Choice Tests: Subset Selection Without Mark Deductions. Practical Assessment, Research, and Evaluation, 23(23), 1–9.

Use performance assessments when necessary to ensure validity.

In situations for which paper-and-pencil tasks are clearly *not* a good reflection of what students have learned, teachers may need to sacrifice practicality to gain the greater validity that a performance assessment provides (see Figure 10.14 for examples). Performance assessment lends itself especially well to the assessment of complex achievements, such as those that involve simultaneous use of multiple skills. It can also be quite helpful in assessing problem solving, creativity, and critical thinking. Furthermore, performance tasks are often more meaningful, thought provoking, and authentic for students—and so often more motivating—than paper-and-pencil tasks.[33]

Figure 10.14 Performance assessments can take many different forms

Examples of Performance Assessments

- Playing a music instrument
- Conversing in a foreign language
- Engaging in a debate about social issues
- Fixing a malfunctioning machine
- Role-playing a job interview
- Presenting research findings to a group of teachers, peers, and community members

[32] Otoyo & Bush, 2018.
[33] Darling-Hammond et al., 1995; DiMartino & Castaneda, 2007; R. L. Johnson et al., 2009; Khattri & Sweet, 1996; Paris & Paris, 2001.

think about it

Which topics and skills in the content domain(s) you will be teaching might be validly assessed with paper-and-pencil assessments? Which ones would require performance assessments?

Some performance assessments focus on tangible *products* that students create—perhaps a sculpture, scientific invention, or poster display. In situations with no tangible product, teachers must instead look at the specific *processes and behaviors* that students exhibit—perhaps how they give an oral presentation, throw a football, or play an instrumental solo. When teachers look at processes rather than products, they may in some instances probe students' *thinking processes*. For example, if a teacher who wants to determine whether students have acquired some of the concrete operational or formal operational abilities that Piaget described (e.g., conservation, separation and control of variables), the teacher might present tasks similar to those Piaget used and ask students to explain their reasoning (see Chapter 6). And a teacher can often determine how students reason about scientific phenomena by asking them to manipulate physical objects (e.g., chemicals in a chemistry lab, electrical circuit boards in a physics class), make predictions about what will happen under varying circumstances, and then explain their results.[34] The Classroom Strategies box "Guidelines for Developing Performance Assessments" offers several suggestions for using performance assessments for different age levels and content domains.

Classroom Strategies

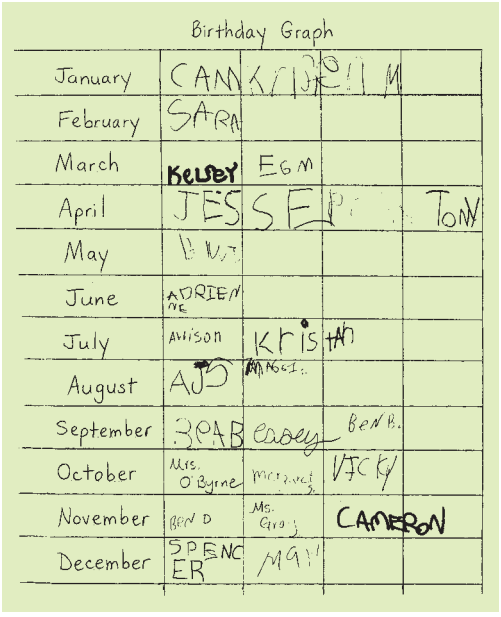
Guidelines for Developing Performance Assessments

- **Have students create products that reflect what they have learned.**
  A middle school science teacher asks students to make posters that summarize their projects for the school science fair. The teacher tells the students that the posters should include (1) a research question or hypothesis, (2) the method used to address the question or hypothesis, (3) results obtained, and (4) one or more conclusions.

- **When the assigned task doesn't yield a tangible product, observe students' behaviors and, if appropriate, probe their thinking processes.**
  After a unit on major and minor scales in an instrumental band class, a music teacher assesses students' understanding of minor scales by having them play three different ones on their instruments. If a student plays a scale incorrectly, the teacher asks the student to describe the structure of a minor scale (whole-step, half-step, whole-step, whole-step, half-step, whole-step, whole-step) and explain why the scale might not have sounded right.

- **Consider assigning complex, lengthy tasks as group projects.**
  In a high school marketing class, students work in groups of two or three to interview a local business owner, develop a social media marketing plan for the business, and work with the business owner to implement the plan. In evaluating students' performance, the teacher considers each group's overall accomplishments plus individual students' contributions to the group effort.

- **Consider incorporating the assessment into normal instructional activities.**
  To assess students' handwriting and understanding of simple graphs, a first-grade teacher distributes a table that lists the 12 months of the year. She asks the students to circulate around the room and gather students' signatures in a box beside their birthday month. This activity allows the teacher to assess students' handwriting and whether they understand that for the graph to be accurate, each person's name needs to fit within one box in the table (which is not the case for some students like Cameron).



Sources: Baxter et al., 1996; Boschee & Baron, 1993; DiMartino & Castaneda, 2007; Lester et al., 1997; Newmann, 1997; Shavelson & Baxter, 1992; Stiggins & Chappuis, 2012.

[34] De Corte et al., 1996; diSessa, 2007; Magnusson et al., 1994; Quellmalz & Hoskyn, 1997.

Although performance assessment tasks sometimes provide more valid indicators of students' accomplishments than paper-and-pencil tasks, students' responses to a *single* performance assessment task may be a poor indication of their overall achievement.[35] Content validity is at stake here. If time constraints allow students to perform only one or two complex tasks, those tasks may not be a representative sample of what students have learned and can do. In addition, teachers may have trouble standardizing assessment conditions for everyone and scoring students' performance consistently—problems that adversely affect reliability. And performance assessments are often less practical than more traditional paper-and-pencil assessments. Conducting a performance assessment can be quite time-consuming, especially when a teacher must observe students one by one or when a task requires students to spend considerable time in the outside community.

As you can see, then, informal assessment, formal paper-and-pencil assessment, and formal performance assessment all have their strengths and weaknesses. Table 10.3 summarizes their RSVP characteristics and offers relevant suggestions. In the end, teachers may find that they can best assess students' achievement with a combination of paper-and-pencil and performance tasks and supplement their findings with informal observations of students' typical classroom behaviors.

Table 10.3 Evaluating RSVP Characteristics of Different Kinds of Assessments

KIND OF ASSESSMENT	RELIABILITY	STANDARDIZATION	VALIDITY	PRACTICALITY
Informal assessment	A single, brief assessment is not a reliable indicator of achievement. Teachers must look for consistency in a student's performance across time and in different contexts.	Informal observations are rarely, if ever, standardized. Accordingly, teachers should not compare one student to another on the basis of informal assessments alone.	Students' public behaviors in the classroom aren't always valid indicators of their achievement (e.g., some students may try to hide high achievement from peers, others may come from cultures that encourage listening more than talking).	Informal assessment is definitely practical: It's flexible and can occur spontaneously during instruction.
Formal paper-and-pencil assessment	Objectively scorable items are highly reliable. Teachers can enhance the reliability of subjectively scorable items by specifying scoring criteria in concrete terms.	In most instances paper-and-pencil tasks are easily standardized for all students. Giving students choices (e.g., regarding topics to write about or questions to answer) may increase motivation but reduce standardization.	Numerous questions requiring short, simple responses can provide a more representative sample of the content domain. But tasks requiring lengthy responses may sometimes more closely match instructional goals.	Paper-and-pencil assessment is usually practical: All students can be assessed at once, and no special materials are required.
Formal performance assessment	Performance assessment tasks are often difficult to score reliably. Teachers can enhance reliability by specifying scoring criteria in concrete terms (e.g., with a checklist or rubric).	Some performance assessment tasks are easily standardized, whereas others are not.	Performance tasks may sometimes be more consistent with instructional goals than paper-and-pencil tasks. However, a single performance task may not provide a representative sample of the content domain; several tasks may be necessary to ensure content validity.	Performance assessment is typically less practical than other approaches: It may involve special materials, and it can take a fair amount of class time, especially if students must be assessed one by one.

[35] Crehan, 2001; R. L. Johnson et al., 2009; S. Klassen, 2006; Stiggins & Chappuis, 2012.

Define tasks clearly and give students some structure to guide their responses.

There's usually little to be gained from assigning ambiguous tasks to assess students' learning and achievement. Whether or not students know how to respond to assessment tasks, they should at least understand what they're being asked to do. As an illustration, consider this essay question in a history class:

> List the causes of the American Revolution.

One student might take the word *list* literally and simply write "Stamp Act, Boston Massacre, Quartering Act." But another student might write several pages describing Britain's increasing demands for revenue from the American colonies, the colonists' resentment of taxation without representation, and King George III's apparent lack of concern about the colonists' welfare. Responses to unstructured tasks may go in so many different directions that scoring them consistently and reliably is virtually impossible. Especially in situations for which a great deal of material is potentially relevant, students need guidance about the length and completeness of desired responses. For example, the previous essay task about the American Revolution might be rewritten like this:

> Identify three events or policies during the 1760s and/or 1770s that contributed to the outbreak of the American Revolution. For each one, explain in three to five sentences how it increased tension between England and the American colonies.

Performance assessment tasks, too, require a certain amount of structure, especially if they're used for summative (rather than formative) assessment. For instance, students should have detailed instructions about what they should accomplish, what materials and equipment they can use, and how much time they have to get the job done.[36] Such structure helps to standardize the assessment and so enables a teacher to evaluate students' performance more reliably. A *lot* of structure can decrease a performance task's validity, however. Especially when giving authentic assessments, assigned tasks should be similar to those in the outside world, and real-world tasks don't always have a lot of structure. Teachers must often seek a happy medium, providing enough structure to guide students in the right direction but not so much that students make few of their own decisions about how to proceed.

One obvious strategy for defining and structuring an assessment task is to give students a performance assessment, such as a checklist, rating scale, or rubric. You've previously seen examples of each of these in Figures 10.6, 10.7, and 10.8. Sometimes it's appropriate to provide criteria that are applicable to a general *category* of tasks, such as writing, as is the case for the writing rubric in Figure 10.8. Checklists, rating scales, and rubrics are most likely to impact students' long-term learning and development when they portray the desired qualities of virtually any product or performance in a particular domain—and especially when, through regular self-assessments, students begin to internalize and adopt those criteria as being important ones to meet time after time.[37] For example, the writing rubric in Figure 10.8 can help students to understand the importance of complete sentences, clear main ideas, and specific word choice in many different types of writing.

Yet sometimes more task-specific checklists and rubrics are helpful as well. For example, Figure 10.7 (shown previously) presents a checklist for evaluating students'

[36] Gronlund & Waugh, 2009; R. L. Johnson et al., 2009; Shepard et al., 2005.
[37] Arter & Chappuis, 2006; Popham, 2006.

varnishing work in a woodworking class and two rating scales for evaluating students' preparatory activities in a science lab. Such scoring guides not only guide students in their efforts to meet particular instructional objectives but also help teachers evaluate students' performance consistently and reliably—thereby enhancing the validity of the assessment results.

Carefully scrutinize items and tasks for characteristics that might put some groups at an unfair disadvantage.

Earlier in the chapter, we spoke of the potential for teacher bias in judging students' behaviors in informal assessments. But bias can creep into more formal assessments as well. In particular, an assessment has **assessment bias** if any of its items either unfairly penalize or offend members of a particular group—perhaps students of a particular gender, family background, or socioeconomic status.[38] Consider these hypothetical assessment items, one for a math test and the other for a test of writing skills:

1. As a member of his high school baseball team this year, Mark has hit the ball 17 times in the 36 times he's been at bat. Of the times he hit the ball, he reached a base safely only 12 times; the other 5 times he hit fly balls or bunted, which resulted in outs. And in three of Mark's at-bats, poor pitches enabled Mark to walk to first base. Based on this information, calculate Mark's batting average for the year so far.
2. Would you rather swim in an ocean, a lake, or a swimming pool? Write a two-page persuasive essay defending your choice.

Question 1 assumes a fair amount of knowledge about baseball—knowledge that some students are more likely to have than other students, such as students who watch or play baseball or softball. Question 2 would obviously be difficult for students who haven't swum in all three situations and would be even more difficult for those who have never gone swimming at all. Therefore, both of these items have assessment bias because some students will perform better than others because of differences in their background experiences, *not* because of differences in what they've learned in the classroom.

In considering possible sources of bias in classroom assessments, teachers must look not only at the content of their assessment tasks but also at how the tasks are being administered. For example, students who have recently immigrated and only begun to learn English—even those students with strong math skills—may do poorly on math word problems because most word problems require a good command of written English.[39] In such instances, a teacher might restate the problems in simpler English—or, if possible, in students' native language—and perhaps draw pictures to help students understand the problem-solving tasks. And let's return to a point made in Chapter 4: Children from some cultural groups (e.g., those from some Native American communities) prefer to practice a skill privately until they attain reasonable mastery.[40] In such cases, a teacher might let students practice new skills away from the limelight and demonstrate their progress in private, one-on-one sessions.

One well-known form of assessment bias is *cultural bias,* in which an assessment puts students from a particular cultural or ethnic group at a disadvantage for reasons that have nothing to do with the particular knowledge and skills being assessed. The next exercise provides an example.

[38] G. E. García & Pearson, 1994; R. L. Johnson et al., 2009; Popham, 2006.
[39] E. E. Garcia, 2005; J. P. Robinson, 2010; Solano-Flores, 2008.
[40] E. E. Garcia, 1994; Tyler et al., 2008.

See For Yourself

How Productive Will You Be?

Imagine that you're taking a test designed to estimate your general ability to make productive contributions to the society in which you live. Please answer these first three questions on the test:

1. When you enter a hogan, in which direction should you move around the fire?
2. Why is turquoise often attached to a baby's cradleboard?
3. If you need black wool for weaving a rug, which one of the following alternatives would give you the blackest color?
   a. Dye the wool with a mixture of sumac, ochre, and piñon gum.
   b. Dye the wool with a mixture of indigo, lichen, and mesquite.
   c. Use the undyed wool of specially bred black sheep.

Did you have trouble answering some or all of the questions? All three were written from the perspective of a particular culture—that of the Navajos. Unless you've had considerable exposure to this culture, you would probably perform poorly. The three answers are (1) clockwise, (2) to ward off evil, and (3) response option *a*.[41]

Is the test culturally biased? That depends. If the test is designed to assess your ability to succeed in a traditional Navajo community, the questions might be quite appropriate. But if it's designed to assess your ability to accomplish tasks for which knowledge of Navajo culture is irrelevant, the questions have cultural bias.

An assessment instrument isn't necessarily biased just because one group of students gets higher scores than another group. It's biased only if the groups' scores are different when the knowledge and skills a teacher is trying to assess *aren't* different. In some cases, different groups have different backgrounds that affect their classroom learning and achievement as well as their performance on assessments. For example, the fact that, on average, boys have more mathematically oriented toys and experiences than girls do may give them an advantage that affects both their ability to learn certain math concepts and processes *and* their ability to perform well on tasks assessing mastery of those concepts and processes.[42] Similarly, if students from low-income families have had few opportunities to venture beyond their immediate neighborhoods (fewer museum trips, less travel, etc.), their more limited exposure to diverse environments is likely to impact *both* their classroom achievement and their performance on assessments measuring that achievement.

It's important to remember that an assessment also has bias if it can potentially *offend* members of a particular group. For example, imagine a test question that implies that girls are more competent than boys, and imagine another question that includes a picture in which members of a particular ethnic-racial group are engaging in inappropriate behavior. Such questions exemplify assessment bias because some groups of students (boys in the first situation and members of the depicted group in the second) are likely to be offended by the questions and thus distracted from doing their best on the test.

When giving tests, encourage students to do their best, but don't arouse a lot of anxiety.

Most students get a little bit anxious about tests and other important assessments, and a small amount of anxiety can actually enhance performance, as we noted in Chapter 5. But some students with **test anxiety** become extremely anxious in test-taking situations to the point where their scores significantly underestimate what they've learned.[43] Such students

[41] Gilpin, 1968; Nez, 2011.
[42] Jacobs et al., 2005; Leaper & Friedman, 2007.
[43] Cassady, 2010; Hembree, 1988; E. Hong et al., 2005; Lang & Lang, 2010.

appear to be concerned primarily about the *evaluative* aspect of tests, worrying that someone will judge them as being "stupid" or in some other way inadequate. Excessive, debilitating test anxiety is especially common in girls, students from ethnic minority groups, and students with disabilities.[44]

Test anxiety interferes not only with retrieval and performance at the time of an assessment but also with encoding and storage when learners are preparing for the assessment.[45] Thus highly test-anxious students don't just *test* poorly, they also *learn* poorly. Table 10.4 distinguishes between classroom assessment practices that are likely to lead to facilitating anxiety and those that may elicit debilitating anxiety.

Minimize the potential negative effects of stereotype threat during testing.

In some cases, students study and learn the material that is to be tested but are unable to demonstrate their full knowledge because of negative societal stereotypes about a group with which they identify. This phenomenon, known as **stereotype threat**, is the threat that members of a stigmatized group can experience when they are in a situation in which they could confirm the negative stereotype of their group.[46] For example, African American students in the United States could experience stereotype threat while taking a statewide standardized test because of the societal stereotype that African American students score lower than White students on these tests (this difference in scores is known as the *achievement gap*).[47] Similarly, girls could perform worse on math tests because of the societal

Table 10.4 Keeping Students' Anxiety at a Facilitative Level During Classroom Assessments

WHAT TO DO	WHAT *NOT* TO DO
Point out the value of the assessment as a feedback mechanism to improve learning; minimize use of the word *test* in describing the assessment.	Don't stress the fact that students' competence is being evaluated.
Administer one or more practice assessments or pretests—perhaps just a few quick items here and there—that give students an idea of what the final assessment will be like.	Don't keep the nature of the assessment a secret until the day it's administered.
Encourage students to do their best but not necessarily to expect perfection; for instance, say, "We're here to learn, and you can't do that without making mistakes."	Don't say or imply to students that failing will have dire consequences.
Provide or allow the use of memory aids (e.g., a list of formulas or a single note card containing key facts) when instructional goals don't require students to commit information to memory.	Don't insist that students commit even trivial facts to memory.
Eliminate time limits unless speed is an important part of the skill being measured.	Don't give more questions or tasks than students can possibly respond to in the allotted time.
Continually survey the room, and be available to answer students' questions.	Don't hover over students, watching them closely as they complete the assessment.
Use unannounced ("pop") quizzes only for formative assessment (e.g., to determine an appropriate starting point for instruction).	Don't give occasional pop quizzes to motivate students to study regularly and to punish those who haven't kept up with assigned readings.
Use the results of numerous assessments to make important decisions (e.g., to assign grades).	Don't make important decisions on the basis of a single assessment.

Sources: Agarwal et al., 2014; Brophy, 1986; Brophy, 2004, p. 274 ("We're here to learn . . . " suggestion); Cassady, 2010; Cizek, 2003; Gaudry & Bradshaw, 1970; K. T. Hill, 1984; K. T. Hill & Wigfield, 1984; Sieber et al., 1970; Spaulding, 1992; Stipek, 2002b; Usher, 2009.

[44] R. Carter et al., 2008; Cassady, 2010; Putwain, 2007; J. L. Smith, 2004; Steele, 1997; Whitaker Sena et al., 2007.

[45] Cassady, 2010; Zeidner & Matthews, 2005.

[46] Shapiro et al., 2016; Steele, 1997; Steele & Aronson, 1995.

[47] Kellow & Jones, 2005.

stereotype that girls are not as good as boys at math. And Asian American girls could actually score higher than White girls on a math test because of the societal stereotype that Asian American students are better at math than White students. In this case, the effect is called *stereotype lift* because the positive stereotype lifts the performance of the positively stereotyped group (the Asian girls).[48]

Why do these negative effects related to stereotype threat happen? Well, when students are aware of the negative societal stereotype of their group and they're taking a test in which they could confirm that negative stereotype if they do poorly, then their heart rate and other physiological indicators of anxiety increase and their performance decreases.[49] This anxiety is believed to interfere with various cognitive processes; for example, it interferes by overloading their working memory and leaving less "space" in working memory to use during the test (recall from Chapter 2 that the size of working memory is relatively small). This process can happen without the person even knowing that it is happening to them.

Interestingly, even when students don't actually believe the negative societal stereotype is true, they can still be affected because during the test they're afraid they may confirm the negative societal stereotype. The negative effects of stereotype threat are more common when students interpret their performance on a task as an evaluation of their competence or overall self-worth.[50] Stereotype threat is also more likely to arise when students have an entity view of ability—a fixed mindset that ability is relatively fixed and permanent—rather than a growth mindset.[51]

To help students overcome the negative effects of stereotype threat, teachers can do several things as part of their regular instruction *prior* to testing:[52]

- Explicitly address untrue stereotypes, ideally by showing students evidence that the negative stereotypes are untrue.
- Teach students about stereotype threat.
- Promote a *growth mindset* by reinforcing the idea that students can change their intelligence through effort and effective strategies (see Chapter 5).
- Give students *value affirmation* exercises a few times a year before important tests. These exercises typically involve giving students a list of values (e.g., relationships with friends and family, religion, humor, athletic ability, art and literature, music, kindness, creativity), asking them to select the values that are most important to them, and then having students write a brief essay to elaborate on why the values they chose are important to them.[53]

Because stereotype threat can be triggered by stimuli that are in the testing environment (including the test itself) teachers can also do the following things *during* the testing session to help students avoid the negative effects of stereotype threat (the example following each strategy is based on the negative societal stereotype that girls perform worse than boys on math tests):[54]

- The person administering the test should be a member of the negatively stereotyped group. For example, a female teacher should administer a math test to avoid triggering stereotype threat for girls.

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[48] Ambady et al., 2001; Kellow & Jones, 2008; Walton & Cohen, 2003.
[49] Aronson et al., 1999; Aronson & Steele, 2005; McKown & Weinstein, 2003; Osborne, 2007; Ryan & Ryan, 2005; Smith, 2004.
[50] Davies & Spencer, 2005; Huguet & Régner, 2007; McKown & Weinstein, 2003; Walton & Spencer, 2009.
[51] Ben-Zeev et al., 2005; Dweck et al., 2004; C. Good et al., 2003.
[52] Ambady et al., 2004; Aronson et al., 2002; Johns et al., 2005.
[53] Cohen et al., 2006, 2009; Cohen & Sherman, 2014; Rapa et al., 2020.
[54] Marx & Roman, 2002; Sekaquaptewa & Thompson, 2003; Shih et al., 1999.

- Don't test students in groups in which there is only one or two negatively stereotyped students in the classroom. For example, a girl taking a math test in a classroom in which all or most of the other students are boys can trigger stereotype threat.
- Don't ask students to note their ethnicity or gender at the beginning of a test; these demographic questions can be asked at the end of a test, if needed. For example, asking students to note their gender at the beginning of a math test can trigger stereotype threat for girls. And some students have a negative reaction when they have to provide their race or ethnicity, as one Black high school student explained: "I do not feel completely Black and African American. It kind of throws me back on a test. . . . Overall I am Black and so I put the Black. . . . I just do not like being called, Black. I mean Black is whatever. But on a test for some reason I do not like to put that."[55]

These suggestions may be difficult or impossible to implement in a typical K–12 classroom without trying something different from what has been done previously. For example, teachers may need to cooperate and proctor tests in classes other than their own if doing so will allow the proctor to be a member of a negatively stereotyped group (e.g., a female teacher proctoring a math test in a class with girls). As another idea, students from different classes could be grouped together to avoid a classroom in which there was only a couple of negatively stereotyped students.

Establish conditions for the assessment that enable students to maximize their performance.

Administration procedures for an assessment can impact the validity of the results. For example, students are more likely to perform at their best when they complete an assessment in a comfortable environment with acceptable room temperature, adequate lighting, reasonable workspace, and minimal distractions. This comfort factor may be especially important for students who are easily distracted, unaccustomed to formal assessments, or uninterested in exerting much effort, for instance, students who are at risk for academic failure and dropping out of school.[56]

In addition, teachers should encourage students to ask questions whenever they're uncertain about what an assessment task is requiring them to do. Without such encouragement, some students—including many from ethnic minority groups—may be reluctant to ask questions during formal assessments.[57]

Take reasonable steps to discourage cheating.

When students cheat on assessments, their scores don't accurately reflect what they know and can do; hence, the scores have little or no validity. Furthermore, cheating can be habit forming if students discover that it enables them to get good grades with minimal effort.[58] The best approach is prevention—making sure students don't cheat in the first place—through strategies such as these.

In the weeks or days before the assessment:

- Focus students' attention on mastery goals rather than on performance goals.
- Make success without cheating a realistic possibility.
- Use assessment tasks with obvious validity for important instructional goals and objectives.

[55] Smith & Hope, 2020, p. 558.
[56] Popham, 2006; Shriner & Spicuzza, 1995.
[57] L. R. Cheng, 1987; C. A. Grant & Gomez, 2001; J. Li & Fischer, 2004.
[58] Cizek, 2003.

- Create two or more assessment instruments that are equivalent in form and content but have different answers (e.g., for a test, use one form in class and another for makeups, or use different forms for different class periods).
- Explain exactly what cheating is and why it's unacceptable (e.g., explain that cheating includes plagiarism, such as copying material word for word from the Internet without giving appropriate credit).[59]
- Explain what the consequence for cheating will be.

During the assessment (especially during a test or quiz):

- Insist that phones and other electronic devices be turned off and checked in at the classroom door to avoid students using devices to look up information or share answers with others during the assessment.
- Have teacher-assigned seats during any assessments that require individual work rather than small-group work.
- Seat students as far away from one another as possible.
- Remain attentive to what students are doing throughout the assessment session, but without hovering over particular students.

When assignments require independent research in an unsupervised setting (such as take-home tests), students might try to pass off documents obtained on the Internet as being their own work. As teachers ourselves, we authors have found two strategies to be helpful in minimizing Internet-based plagiarism. First, we've designed assessment tasks that are so specific—and so tied to particular instructional goals—that documents found on the Internet don't meet the task requirements. Second, we've been vigilant for clues that point to questionable authorship—for example, sophisticated knowledge, vocabulary, and sentence structures that we don't typically see in our students' work.

If cheating occurs and can be documented, teachers must administer whatever consequence they've previously described to students. The consequences should be severe enough to discourage a student from cheating again yet not so severe that the student's motivation and chances for academic success are significantly diminished over the long run. Having the student honestly redo the assessment task is one appropriate consequence; a teacher might also ask the student to write a paper about the moral implications and negative repercussions of academic dishonesty.[60] In general, teachers must remember that students' final grades should ultimately reflect *what they have learned*. For this reason, many assessment experts recommend that the consequence for cheating *not* be a failing final grade if a student has, in other assessments, demonstrated mastery of the subject matter.[61]

Evaluating Students' Performance on Formal Assessments

As teachers evaluate students' performance on an assessment task, they must continue to be concerned about the four RSVP characteristics: reliability, standardization, validity, and practicality. Furthermore, they must keep in mind that their most important role is not to evaluate performance, but rather to *help students learn.* And for both pedagogical and legal reasons, they must preserve students' general sense of well-being and right to privacy. Each of the following strategies is valuable in achieving one or more of these ends.

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[59] Many middle school students erroneously believe that copying material verbatim from the Internet is appropriate and acceptable; Nixon, 2005.

[60] K. O'Connor, 2011.

[61] K. O'Connor, 2011; Stiggins & Chappuis, 2012.

After students have completed an assessment, review evaluation criteria to be sure the criteria can adequately guide scoring.

Even the most experienced teachers can't always anticipate the many possible directions in which students might go in responding to classroom assessment tasks. As a general rule, teachers should use the criteria they've previously told students they would use. However, they may occasionally need to adjust (or perhaps add or eliminate) one or more criteria to accommodate unexpected responses and improve their ability to score the responses consistently, fairly, and reliably. Any adjustments should be made *before* a teacher begins scoring, rather than midway through the scoring process. For example, when grading written assessments, it's often helpful to skim a sample of students' papers first, looking for unusual responses and revising the criteria as needed.

Be as objective as possible.

A scoring checklist, rating scale, or rubric can certainly help teachers apply evaluation criteria objectively and consistently for all students, thereby increasing standardization, reliability, and validity. In addition, when assessments involve multiple tasks (e.g., several essay questions, or lab reports with several discrete sections), teachers can often evaluate students' responses more reliably by scoring everyone's response to the first task, then everyone's response to the second task, and so on. And covering students' names with small sticky notes can help minimize the extent to which prior expectations for particular students influence judgments of students' actual performance levels.

Make note of any significant aspects of a student's performance that predetermined scoring criteria don't address.

Whenever teachers break down students' performance on a complex task into discrete behaviors, they can lose valuable information in the process.[62] In using rubrics for scoring, then, teachers may occasionally want to jot down other noteworthy characteristics of students' performance. This aspect of the scoring process will be neither standardized nor reliable, but it can sometimes be useful in identifying students' unique strengths and needs and can therefore be helpful in future instructional planning.

When determining overall scores, don't compare students to one another unless there is a compelling reason to do so.

Scores on tests and other assessments typically take one of three general forms. When teachers construct their own assessment instruments, they most often use a **raw score**, which is based solely on the number or percentage of points earned or items answered correctly. For example, a student who correctly answers 15 items on a 20-item multiple-choice test would receive a score of 75% if all items were worth the same point value. A student who gets 3 points, 8 points, and 5 points on three essay questions, respectively, might get an overall score of 16. Raw scores are easy to calculate, and they appear to be easy to understand. But in fact, students sometimes have trouble knowing what raw scores really mean. Are scores of 75% and 16 good scores or bad ones? Without knowing what kinds of tasks an assessment includes, we have no easy way of interpreting a raw score.

A **criterion-referenced score** indicates what students have achieved in relation to specific instructional objectives or standards. Some criterion-referenced scores are either–or scores indicating that a student has passed or failed a unit, mastered or not mastered a skill, or met or not met an objective. This approach was used in the checklist shown previously in Figure 10.6 with respect to a beginning swimming class. Other criterion-referenced scores indicate different levels of competence or achievement, as is the case with rating

[62] Delandshere & Petrosky, 1998.

scales and rubrics. For example, when using the rubric in Figure 10.8 to evaluate various characteristics of students' writing, a teacher would assign a "3" to a *proficient* performance in "complete sentences," a "2" if it was an *in-progress* performance, and a "1" if it was *beginning to develop*.

Adding various criterion-specific scores to get a single overall score isn't always an exact science, however. For example, when using the writing rubric in Figure 10.8, it may not be true that *proficient* should be worth exactly three times as much as *beginning to develop* or that *in progress* is exactly midway in quality between the other two levels; the numbers assigned to each level of performance are somewhat arbitrary. For these reasons, it may not always make sense to use rubrics to obtain a single criterion-referenced score.[63]

Both raw scores and criterion-referenced scores are determined solely by looking at an individual student's performance. In contrast, a **norm-referenced score** is determined by comparing a student's performance with the performance of others—perhaps that of classmates or perhaps that of students in a nationwide *norm group*. A norm-referenced score tells us little about what a student specifically knows and can do. Instead, it tells us whether a student's performance is typical or unusual for the age or grade level.

Norm-referenced scores—those that result from "grading on the curve"—are often used in standardized tests (more about this point later). They're far less common in teacher-constructed classroom assessments; however, they are necessary when identifying who the "first chair" is in a band or choosing the best students for a regional science fair. Teachers may also need to resort to a norm-referenced approach when assessing complex skills (e.g., poetry writing, advanced athletic skills, critical analysis of literature) that are difficult to describe as "mastered." Teachers should probably *not* use norm-referenced scores on a regular basis, however. Such scores create a competitive situation in which students do well only if their performance surpasses that of their classmates. Thus, norm-referenced scores can focus students' attention on performance goals rather than on mastery goals, and they may possibly encourage students to cheat on assessment tasks.[64] Furthermore, the competitive atmosphere that norm-referenced scores create is inconsistent with the sense of community discussed in Chapter 9.

Criterion-referenced scores communicate what teachers and students alike most need to know: whether instructional goals and objectives are being achieved. In doing so, they focus attention on mastery goals and, by showing improvement over time, can enhance students' self-efficacy for learning classroom subject matter. When criterion-referenced scores are hard to determine—perhaps because an assessment simultaneously addresses many instructional goals and objectives (something we authors don't generally recommend)—raw scores are usually the second best choice for teacher-constructed assessment tasks. But teachers must remember an important point about raw scores: They may provide very little information about the specific things students have and haven't learned.

Accompany any test scores with specific, constructive feedback.

We can't stress this point enough: The most important reason to assess students' current achievement levels is to help them learn and achieve *more.* Accordingly, teachers should provide detailed comments that tell students what they did well, where their weaknesses lie, and how they can improve.[65]

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[63] Also see Humphry & Heldsinger, 2014; Reddy & Andrade, 2010.

[64] E. M. Anderman et al., 1998; Mac Iver et al., 1995; Wentzel et al., 2012.

[65] Fong et al., 2019.

Make allowances for risk taking and the occasional "bad day."

Students should feel comfortable enough about classroom assessments that they're willing to take risks and make mistakes. Only under these circumstances will they tackle the challenging tasks that can maximize their learning and cognitive development. Teachers encourage risk taking—and also decrease debilitating anxiety—not only when they communicate that mistakes are a normal part of learning but also when classroom assessment practices give students some leeway to be wrong without penalty.[66]

One strategy for encouraging risk taking is to *give frequent short assessments* rather than only a few very long ones that might each take an entire class period. Students who are assessed frequently are more likely to take occasional risks—and they have less test anxiety—because they know that no single assessment means "sudden death" if they get a low score. Frequent assessment has other benefits as well. It provides ongoing information to students and teachers alike about students' progress and about areas of weakness that need attention. It motivates students to study regularly, and with the pressure off to perform well on every single assignment and exam, students are less likely to cheat in order to get good grades. The bottom line is that students who are frequently assessed learn and achieve at higher levels than students who are assessed only after lengthy intervals.[67]

Another strategy is to *give students a chance to correct errors.* Especially when an assessment includes most or all of the content domain in question, students may learn as much—possibly even more—by correcting their errors on an assessment task. For example, in an approach known as *mastery reform*, some math teachers have students correct their errors as follows:

1. **Identification of the error.** Students describe in a short paragraph exactly what they don't yet know how to do.
2. **Statement of the process.** Using words rather than mathematical symbols, students explain the steps involved in the procedure they're trying to master.
3. **Practice.** Students demonstrate their mastery of the procedure with three new problems similar to the problem(s) they previously solved incorrectly.
4. **Statement of mastery.** Students state in a sentence or two that they have now mastered the procedure.

By completing these steps, students can replace a score on a previous assessment with the new, higher one. One high school math teacher has told one of us authors that this approach has a more general, long-term benefit as well: Many of his students eventually incorporate the four steps into their regular, internalized learning strategies.

Still another strategy is to *give retakes* when students perform poorly the first time around. However, students who are allowed to redo the *same* test or assignment may work on the specific things the assessment covers without studying equally important but nonassessed material. (Remember, many classroom assessments can represent only small samples of the content in question.) Thus, a teacher might construct two assessment instruments for the same content domain, using one as the initial assessment and the other for retakes.

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[66] Clifford, 1990; N. E. Perry & Winne, 2004; Shepard et al., 2005.

[67] Crooks, 1988; E. D. Evans & Craig, 1990; McDaniel et al., 2011; Rohrer & Pashler, 2010.

Respect students' right to privacy.

How would you feel if one of your instructors did the following?

- Told the class that he was returning the test papers in the order of students' test scores, so that those with the highest scores would be handed out first, and you received yours *last.*
- Told your other instructors how poorly you had done on a test and wondered if you were smart enough to be in his class.

You'd probably be outraged that an instructor would do these things. Students' performance on assessment instruments should be somewhat confidential. But exactly *how* confidential? When should people know the results of students' assessments, and who should know them?

In the United States, teachers and other school faculty get legal guidance on these questions from the **Family Educational Rights and Privacy Act (FERPA)**, passed by the U.S. Congress in 1974. This legislation limits normal school testing practices primarily to the assessment of achievement and scholastic aptitude—two things that are clearly within the school's domain. Furthermore, it restricts access to students' assessment results to the few people who really need to know them: the students who earn them, their parents, and school personnel directly involved with students' education and well-being. Assessment results can be shared with other individuals (e.g., a family doctor or psychologist in private practice) *only* if the student (if at least 18 years old) or a parent gives written permission. Following are three implications of this legislative mandate for teachers' classroom practices:

- A teacher cannot ask students to reveal their political affiliation, sexual behavior or attitudes, illegal behaviors, potentially embarrassing psychological problems, or family income. (An exception: Questions about income are allowed if they're used only to ascertain eligibility for financial assistance—for example, to determine whether students qualify for a free-lunch program.)
- A teacher cannot post test scores in ways that allow students to learn one another's scores. For example, teachers can't post scores in alphabetical order of students' names or according to birth dates or Social Security numbers.
- A teacher cannot distribute papers in any way that allows students to observe one another's scores. For example, teachers can't let students search through a stack of scored papers to find their own.

In the opening case study, the teacher announces Ellie's grades to the entire class. The teacher's remarks violate FERPA, which applies to final grades as well as to individual assessment scores. Furthermore, making Ellie's grades public isn't in Ellie's best interest. Rather than motivate her to work harder (she's already highly motivated), it distresses her to the point that she no longer feels comfortable in that classroom.

Many educators initially interpreted FERPA as forbidding teachers to have students grade one another's test papers. In 2002, however, the U.S. Supreme Court ruled that this practice doesn't violate FERPA because the test scores obtained aren't yet a part of students' permanent school records.[68] Nevertheless, having students grade one another's classroom assessments—and thereby revealing some students' exceptionally high or low performance—can have adverse effects on students' sense of psychological well-being in the classroom. For this reason, we strongly urge teachers *not* to have students swap and grade one another's papers. However, it is appropriate and effective for students to give each other feedback on each other's work.[69]

think about it
Reflecting on your own experiences as a student, can you recall situations in which FERPA was violated?

[68] *Owasso Independent School District v. Falvo*, 534 U.S. 426.
[69] Double et al., 2020.

10.5 Summarizing Students' Achievement with Grades and Portfolios

Big Idea 10.5 **Final class grades provide only global, quantitative information about students' achievement levels; whenever possible, they should be supplemented with qualitative information, perhaps through student-constructed portfolios.**

Teachers summarize students' achievement in a variety of ways. Some preschool and early elementary teachers use checklists to indicate specific accomplishments, and others write one- to two-page summaries describing students' strengths and areas needing improvement. Our focus here is on the two most commonly used methods of summarizing achievement: grades and portfolios. Following are recommendations for using them.

Base final grades largely on final achievement levels and hard data.

By and large, teachers should use hard data—such as the results of formal paper-and-pencil and performance assessments—when arriving at final conclusions about what students have achieved. Tempting as it might be to reward well-behaved, cooperative students with good grades and to punish chronic misbehavers with Ds or Fs, grades should ultimately reflect *how much students have learned.* Awarding good grades simply for good behavior or exceptional effort may lead students and their parents to overestimate the extent to which students have mastered classroom subject matter. And awarding low grades as punishment for disruptive or other undesirable behaviors can lead students to conclude (perhaps with good reason) that their teacher's grading system is arbitrary and meaningless—and in some cases can actually lead to an *increase* in student behavior problems.[70]

Also, assessment experts have made two good arguments against basing final grades on amount of improvement rather than on actual achievement levels. First, students who already show accomplishment of some of the year's instructional goals will have less room for improvement than their classmates. Second, when improvement is used as a criterion for grading, students trying to "beat the system" may quickly realize that they can achieve high grades simply by performing as poorly as possible when the school year begins.[71]

Use many assessments to determine final grades, but don't count everything.

In the earlier discussion of risk taking, we identified several advantages of assessing students' learning and achievement frequently. In addition, using multiple assessments to determine final grades can help compensate for the imperfect reliability and validity of any single assessment. However, teachers probably don't want to consider *everything* students do. For instance, they may not want to include students' early efforts at new tasks, which are likely to involve considerable trial and error. And many assessments may be more appropriately used for formative assessment purposes—to guide instruction and help students learn—than for summative assessment.[72]

Share grading criteria with students, and keep students continually apprised of their progress.

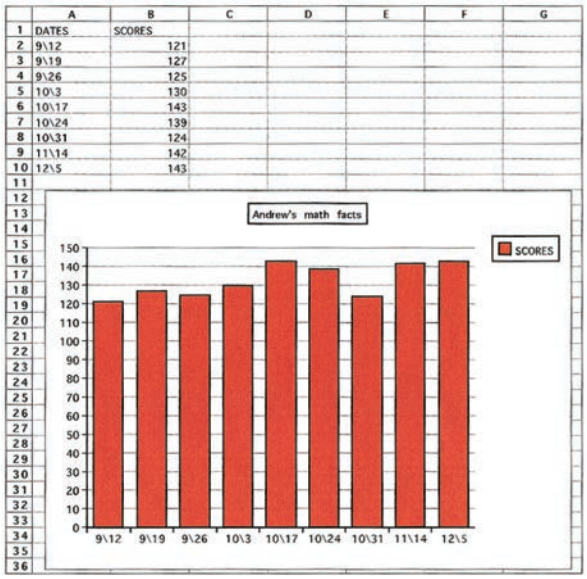
To give students a sense that they have some control over their grades and other summaries of achievement (recall the discussion of internal attributions and growth mindset in Chapter 5), their teachers must tell them early in the semester or school year what

[70] Brookhart, 2004; Cizek, 2003; Poorthuis et al., 2015; F. Zimmermann et al., 2013.

[71] Airasian, 1994; M. D. Miller et al., 2009; Sax, 2010.

[72] Andrade & Cizek, 2010; Brookhart, 2004; K. O'Connor, 2011; Shepard et al., 2005.

Figure 10.15 Electronic spreadsheets and gradebook software can help teachers and students keep track of students' performance on classroom assessments. Here we see a simple spreadsheet-based summary of 10-year-old Andrew's performance on math quizzes. Each quiz has been worth 150 points.



the grading criteria will be. In addition, by providing concrete information about how grades will be assigned, teachers avoid unpleasant surprises when students actually receive their grades (recall Ellie's sense of devastation in the opening case study). If at some point teachers discover that initial grading criteria are overly stringent, they might need to revise it in some way, perhaps by adjusting cutoffs or allowing retakes of critical assessments. But they must never change criteria midstream in a way that unfairly penalizes some students or imposes additional, unanticipated requirements.

Keep in mind that many students—younger ones especially—have limited self-monitoring skills and may not remember their assessment scores over a period of several weeks or months. Thus, it's often helpful to provide ongoing progress reports (e.g., see Figure 10.15) or teach students how to keep their own records. Electronic gradebooks—typically connected to a class website or class management system—provide an easy means by which teachers and students alike can track students' progress.

Accompany grades with descriptions of what the grades reflect.

As a general rule, final grades should reflect mastery of classroom subject matter and instructional goals—in other words, they should be criterion referenced as much as possible.[73] When setting up a criterion-referenced grading system, teachers should determine as concretely as possible what they want each grade to communicate about students' achievement. For example, when assigning traditional letter grades, a teacher might use general descriptors such as the following:

Grade	Criteria
A	The student has a firm command of both basic and advanced knowledge and skills in the content domain. The student is well prepared for future learning tasks.
B	The student has mastered all basic knowledge and skills. Mastery at a more advanced level is evident in some but not all areas. In most respects, the student is ready for future learning tasks.
C	The student has mastered basic knowledge and skills but has difficulty with more advanced aspects of the subject matter. The student lacks a few prerequisites critical for future learning tasks.
D	The student has mastered some but not all of the basics in the content domain. The student lacks many prerequisites for future learning tasks.
F	The student shows little or no mastery of instructional objectives and cannot demonstrate the most elementary knowledge and skills. The student lacks most of the prerequisites essential for success in future learning tasks.[74]

[73] For example, see K. O'Connor, 2011; Pattison et al., 2013; Stiggins & Chappuis, 2012. Over the past several decades, teachers have gradually moved from norm-referenced grading (i.e., grading on a curve) to criterion-referenced grading. This focus on mastery of instructional goals and objectives, rather than on comparing students with one another, partly accounts for the increasing grade point averages ("grade inflation") about which some public figures complain.

[74] Based on criteria described by Frisbie & Waltman, 1992.

It's especially important to specify grading criteria when different students in the same classroom are working toward different instructional goals. For example, in the United States, the IDEA legislation stipulates that teachers and other school personnel identify appropriate instructional goals for individual children and adolescents who have special educational needs. Final evaluations of achievement, including final grades, should be based on students' accomplishment of those goals.[75]

Also accompany grades with qualitative information about students' performance.

Even when final grades are accompanied by descriptions of what they reflect, they are, at best, only general indicators of some *quantity* of what students have learned. Thus, it's often helpful to accompany grades with *qualitative* information—for instance, information about students' particular academic strengths, work habits, attitudes, social skills, and unique contributions to the classroom community. Students and parents alike often find such qualitative feedback quite informative and helpful. Comments should be fairly explicit, however. Feedback such as "a pleasure to have in class" communicates little or no new information.[76]

Use portfolios to show complex skills or improvements over time.

A **portfolio** is a collection of a student's work systematically collected over a lengthy time period. It might include writing samples, student-constructed objects (e.g., sculptures, inventions), photographs, audiotapes, video recordings, technology-based creations (e.g., PowerPoint presentations, student-created video games), or any combination of these. In most cases, *students* are the primary authors of their portfolios, albeit with developmentally appropriate teacher scaffolding. When students actively work to document their accomplishments in portfolios, they can gain a strong sense of ownership and autonomy regarding both their achievement levels and the evaluation process.

The samples of student work included in a portfolio are typically called *artifacts*. Most school portfolios also include student-written documentation that describes each artifact and a rationale for including it. For example, in Figure 10.16, 14-year-old Kurt describes and evaluates the writing samples he has included in a portfolio for his eighth-grade language arts class. As is true in Kurt's portfolio, many portfolios include two or more successive versions of a single item.

Portfolios take a variety of forms. Following are four types commonly used in school settings:[77]

- **Working portfolio**—Shows competencies up to the present time; is dynamic in content, with new artifacts that show increasing proficiency gradually replacing older, less skillful ones.
- **Developmental portfolio**—Includes several artifacts related to a particular set of skills; shows how a student has improved over time.
- **Course portfolio**—Includes assignments and reflections for a single course; typically also includes a summarizing reflection in which the student identifies his or her general accomplishments in the course.
- **Best-work portfolio**—Includes artifacts intended to showcase the student's particular achievements and unique talents.

[75] For example, see Mastropieri & Scruggs, 2010; Venn, 2007.
[76] Brookhart, 2004, p. 183.
[77] R. S. Johnson et al., 2006; Spandel, 1997.

Figure 10.16 In this self-reflection, 14-year-old Kurt explains why he has chosen certain pieces to include in his eighth-grade language arts portfolio

SELF-EVALUATION

The three pieces of writing in my portfolio that best represent who I am are: (1) "Author Ben Hoff," which is a story in the language of Ben Hoff; (2) "Quotes from *The Tao of Pooh*"; and (3) "Discrimination."

What "Author Ben Hoff" shows about me as a learner or a writer is that I am able to analyze and absorb the types and styles of an author and then transfer what I learn onto paper in a good final understandable piece of writing. This piece has good description, a good plot line, gets the point across, has a basic setting, and is understandable. I did not change too much of this piece from one draft to the next except punctuation, grammar, and spelling. I did, however, add a quote from *The Tao of Pooh.*

"Quotes from *The Tao of Pooh*" shows that I am able to pull out good and significant quotes from a book, understand them, and put them into my own words. Then I can make them understandable to other people. This piece gets the point across well and is easy to understand. I really only corrected spelling and punctuation from one draft to the next.

"Discrimination" shows me that I am learning more about discrimination and how it might feel (even though I have never experienced really bad discrimination). I found I can get my ideas across through realistic writing. This piece has good description and was well written for the assignment. Besides correcting some punctuation and spelling, I changed some wording to make the story a little more clear.

For all three pieces, the mechanics of my writing tend to be fairly poor on my first draft, but that is because I am writing as thoughts come into my mind rather than focusing on details of grammar. Then my final drafts get better as I get comments and can turn my attention to details of writing.

The four most important things that I'm able to do as a writer are to: (1) get thoughts pulled into a story; (2) have that story understandable and the reader get something from it; (3) have the reader remember it was a good piece of writing; and (4) like the piece myself.

These categories aren't necessarily mutually exclusive. For example, a course portfolio might have a developmental component, showing how a student has improved in one or more skills over the school year. And a best-work portfolio may be a work-in-progress for quite some time, thereby having the dynamic nature of a working portfolio.

The various kinds of portfolios are apt to be more or less suitable for different purposes. For example, developmental portfolios can show whether students are making reasonable progress toward long-term instructional goals; thus, they lend themselves well to formative assessment. Best-work portfolios are better suited for summative assessment; for instance, they might be used to communicate students' final accomplishments to parents, school administrators, college admissions officers, or potential employers. But regardless of whether they're used for formative or summative assessment, portfolios can, in general, have several benefits:[78]

- They capture the multifaceted nature of students' achievements, with a particular emphasis on complex skills.
- They can demonstrate students' performance on real-world, authentic assessment tasks (e.g., science experiments, service-learning projects).
- They provide practice in self-monitoring and self-evaluation, thereby enhancing students' self-regulation skills.
- They give students a sense of accomplishment and self-efficacy about areas that have been mastered, while possibly also alerting students to areas needing improvement.
- They provide a mechanism through which teachers can easily intertwine assessment with instruction: Students often include products that their teachers have assigned primarily for instructional purposes.
- Because the focus of portfolios is usually on complex skills, teachers are more likely to *teach* those skills.

[78] Banta, 2003; Darling-Hammond et al., 1995; DiMartino & Castaneda, 2007; R. S. Johnson et al., 2006; Paulson et al., 1991; Popham, 2014; Spandel, 1997.

RSVP characteristics can be a source of concern for portfolios, however, especially if they're used to evaluate—rather than simply communicate—students' learning and achievement.[79] When portfolios must be scored in some way, scoring is often unreliable, with different teachers rating them differently. In addition, there's an obvious standardization problem because their contents can vary considerably from one student to another. Content validity may or may not be an issue: Some portfolios may include enough artifacts to adequately represent what students have accomplished relative to instructional goals, but others may be unrepresentative. And because portfolios are likely to take a great deal of teacher time, they're less practical than other methods of summarizing achievement. All this is *not* to say that teachers should shy away from having students create portfolios, but they should be sure the potential benefits outweigh the disadvantages. And when using portfolios as summative assessments of what students have accomplished, teachers must identify explicit criteria for evaluating them.[80]

Creating a portfolio is typically a lengthy process that stretches out over several weeks or months; some best-work portfolios evolve over several years. So as not to overwhelm students by such a complex undertaking, it's often helpful to break the portfolio-construction process into a series of steps, scaffolding students' efforts at each step:[81]

1. **Planning:** Decide on the purpose(s) the portfolio will serve (e.g., which instructional goals and/or content-area standards it will address and whether it will be used primarily for formative or summative assessment); identify a preliminary plan of attack for creating the portfolio.
2. **Collection:** Save artifacts that demonstrate progress toward or achievement of particular goals and standards.
3. **Selection:** Review the saved artifacts, and choose those that best reflect achievement of the specified goals and standards.
4. **Reflection:** Write explanations and self-evaluations of each artifact; describe how the artifacts show current competencies and growth over time; relate achievements to previously identified goals and standards.
5. **Projection:** Identify new goals toward which to strive.
6. **Presentation:** Share the portfolio with an appropriate audience (e.g., classmates, parents, college admissions personnel).

The Classroom Strategies box "Summarizing Students' Achievements with Portfolios" offers several suggestions for scaffolding students' efforts in creating portfolios.

Keep parents in the loop.

Certainly, parents don't need to be apprised of every score their child gets on a classroom assessment, but they have a right to know how their children are progressing. In fact, in the United States, an additional provision of FERPA is that parents have the right to review all of their children's test scores and other official school records. Furthermore, school personnel must present and interpret this information in a way that parents can understand. In Chapter 9 we identified several strategies for keeping the lines of communication open with parents, and some of them—for instance, parent–teacher conferences and occasional notes or checklists sent home—are obviously useful for keeping parents in the loop about students' academic progress.

[79] Arter & Spandel, 1992; Banta, 2003; R. S. Johnson et al., 2006; Popham, 2014.
[80] See Darling-Hammond et al., 1995, for examples of criteria that schools have successfully used.
[81] Six steps based on R. S. Johnson et al., 2006.

Classroom Strategies

Summarizing Students' Achievements with Portfolios

- **Identify in advance the specific purpose(s) for which a portfolio will be used.**
  A third-grade teacher and her students agree to create portfolios that will show parents and other family members how much their writing skills improve over the school year. Throughout the year, students save their fiction and nonfiction, and eventually they choose pieces that best demonstrate mastery of some writing skills and progress on others. The children proudly present their portfolios at parent–teacher–student conferences at the end of the year.

- **Align portfolio contents with important instructional goals and/or content-area standards.**
  At a high school in Ohio, 12th-graders complete graduation portfolios with three components, each of which reflects one or more of the school's instructional goals for all graduates:
  - A *lifelong-learning skills* section shows mastery of a student's key skills in writing, math, science, and at least one other content domain.
  - A *democratic citizenship* section provides specific examples of how a student has been actively engaged in issues related to the local community or larger society (e.g., by contributing to a public service activity).
  - A *career-readiness* section contains a resumé, letters of recommendation from teachers or other adults, and other documents that show preparedness for postsecondary education or the workplace.

- **Ask students to select the contents of their portfolios; provide the scaffolding they need to make wise choices.**
  A teacher meets one-on-one with each of his students to help them choose artifacts that best reflect their achievements for the year. To give students ideas, he shows them several portfolios that students have created in prior years (he obtained permission to do so from the previous students and parents).

- **Identify specific criteria that should guide students' selections; possibly include students in the criteria identification process.**
  A geography teacher leads the class in a discussion of criteria that students might use to identify artifacts for a course portfolio. After reviewing the instructional goals for the course, the class agrees that each portfolio should include at least one artifact demonstrating each of the following:
  - Map interpretation skills
  - Map construction skills
  - Understanding of interrelationships between physical environments and socioeconomic practices
  - Knowledge of cultural differences within the nation
  - Recognition that all cultures have many positive qualities

- **Have students include reflections on the products they include.**
  A ninth-grade journalism teacher tells students that they will be creating portfolios that show progress in journalistic writing during the semester. She asks them to save all of their drafts—"Even simple notes and outlines," she says. Later in the semester, she asks them to look at their various drafts of each artifact and to describe how the progression from one draft to the next shows their gradual mastery of journalism skills. She assigns these reflections as homework over time so that students don't leave everything until the last minute.

- **Give students a general organizational scheme to follow.**
  When a high school requires students to complete portfolios as one of their graduation requirements, their homeroom teachers provide guidance along with a handout describing the elements to include: title page, table of contents, introduction to the portfolio's contents and criteria guiding artifact selection, distinct sections for each content domain included, and final reflection that summarizes achievements.

- **Determine whether a physical format or electronic format is more suitable for the circumstances.**
  At a high school that places particular emphasis on visual and performing arts, students create electronic portfolios that showcase their talents in art, drama, dance, and/or instrumental music. They digitally photograph, videotape, or audiotape their projects and performances, and they create word processing documents that describe and evaluate each one. They then divide their electronic documents into several logical categories, each of which they put in a separate electronic folder on a password-protected website.

- **When using portfolios for summative assessments, develop a rubric to guide evaluation.**
  At a high school in New York City, a key instructional goal is for students to acquire certain dispositions and thinking processes—which the school collectively calls *habits of mind*—in their academic work. One of these habits of mind is the use of credible, convincing evidence to support statements and positions. The school develops a four-point rating scale to evaluate students' work on this criterion. A score of 4 is given to work that reflects "Generalizations and ideas supported by specific relevant and accurate information, which is developed in appropriate depth." At the other end of the scale, a score of 1 is given to work that reflects "Mostly general statements; little specific evidence relating to the topic."

Sources: Banta, 2003; Darling-Hammond et al., 1995, p. 39 (New York City high school example); DiMartino & Castaneda, 2007 (Ohio high school example); R. L. Johnson et al., 2009; R. S. Johnson et al., 2006; Paulson et al., 1991; Popham, 2014; Spandel, 1997; Stiggins & Chappuis, 2012.

10.6 Assessing Students' Achievement and Abilities with Standardized Tests

Big Idea 10.6 **Large-scale standardized tests can be helpful in estimating students' general achievement levels in particular domains, but educators should never use a single test score to make important decisions about individual students, nor should policymakers use average scores from a single test to evaluate teacher and school effectiveness.**

Final grades and portfolios are derived directly from things students do in the classroom. A different approach to summarizing what students know and can do is the **standardized test**, developed by test construction experts and published for use in many different schools and classrooms. The test is *standardized* in several ways: All students are given the same instructions and time limits, respond to the same (or very similar) questions or tasks, and have their responses evaluated relative to the same criteria. A test manual describes the instructions to give students, the time limits to impose, and the specific scoring criteria to use. Often the manual also provides information about test reliability for different populations and age groups, as well as information from which teachers and school administrators can draw inferences about test validity for their own situation and purposes.

Some standardized tests are administered one-on-one. Such tests enable the examiner to observe a student's attention span, motivation, and other factors that may affect test performance. For this reason, individually administered tests are typically used when identifying cognitive disabilities and other special educational needs.

When circumstances call for giving *all* students a standardized test, testing them as a group is usually the only practical approach. Fortunately, technology can be helpful in two distinct ways. For one thing, computers are routinely used to electronically score a group paper-and-pencil test and generate reports about each student's performance. In addition, some tests come in computer-based or online versions rather than paper-and-pencil form. Computer-based or online standardized testing can provide several options that are either impractical or impossible with paper-and-pencil tests:

- They allow **adaptive assessment**, which adjusts the difficulty level of items as students proceed through a test and can thereby focus in on students' specific strengths and weaknesses fairly quickly.
- They can include animations, simulations, videos, and audiotaped messages—all of which can expand the kinds of knowledge and skills that test items assess.
- They enable assessment of how students approach specific problems and how quickly they accomplish specific tasks.
- They can provide on-the-spot scoring and analyses of students' performance.

Computer-based and online standardized tests tend to have reliability and validity levels similar to those of traditional paper-and-pencil tests. Their use should, of course, be limited to students who are familiar and comfortable with using the technology and have adequate keyboarding skills.

Table 10.5 describes four kinds of standardized tests that school districts use frequently: achievement tests, general scholastic aptitude and intelligence tests, specific aptitude and ability tests, and school readiness tests. Many of these tests yield norm-referenced scores. For example, if you look once again at the explanation of IQ scores in Chapter 6, you'll realize that IQ scores indicate *only* how children stack up against one another and so are norm-referenced. Norm-referenced scores take a variety of forms, and the computer-generated test results that schools and parents eventually receive can be quite detailed, sometimes to the point of being too much information. Appendix B, "Understanding and Interpreting

Table 10.5 Commonly Used Standardized Tests

KIND OF TEST	PURPOSE	GENERAL DESCRIPTION	SPECIAL CONSIDERATIONS
Achievement tests	To assess how much students have learned from what they have presumably been specifically taught	Test items are written to reflect the curriculum common to many schools. Test scores indicate achievement only in a broad and (often) norm-referenced sense: They estimate a student's general level of knowledge and skills in a particular domain relative to other students across the country.	• Most of these tests are more appropriate for measuring general levels of achievement than for determining specific information and skills that students have and have not acquired.
General scholastic aptitude and intelligence tests	To assess students' general capability to learn; to predict their general academic success over the short run	Test items typically focus on what and how much students have learned and deduced from their general, everyday experiences. For example, the tests may include items that ask students to define words, draw logical deductions, recognize analogies between seemingly unrelated topics, analyze geometric figures, or solve problems.	• Test scores should not be construed as an indication of learning potential over the long run. • Individually administered tests (in which the tester works one-on-one with a particular student) are preferable when students' verbal skills are limited or when exceptional giftedness or a significant disability is suspected.
Specific aptitude and ability tests	To predict how easily students are likely to learn in a specific content domain	Test items are similar to those in general scholastic aptitude tests, except that they focus on a specific domain (e.g., verbal skills, mathematical reasoning). Some aptitude tests, called *multiple-aptitude batteries*, yield subscores for a variety of domains simultaneously.	• Test scores should not be construed as an indication of learning potential over the long run. • Tests tend to have only limited ability to predict students' success in a particular domain and so should be used only in combination with other information about students.
School readiness tests	To determine whether young children have the prerequisite skills to be successful in a typical kindergarten or first-grade curriculum	Test items focus on basic knowledge and skills—for instance, recognition of colors and shapes, knowledge of numbers and letters, and ability to remember and follow directions.	• Test scores should be interpreted cautiously. Young children have shorter attention spans and less motivation to perform testlike tasks than older children do, leading to lower reliability and validity of test scores. • Tests should be used primarily for instructional planning purposes, *not* for deciding whether students are ready to begin formal schooling.*

*School readiness tests have become increasingly controversial, in part because the scores they yield typically correlate only moderately with children's academic performance even a year or so later. For various perspectives on these tests, see G. J. Duncan et al., 2007; Forget-Dubois et al., 2007; La Paro & Pianta, 2000; Pellegrini, 1998; C. E. Sanders, 1997; Stipek, 2002a.

Standardized Test Results," can help you make some sense of norm-referenced scores and computer-generated test reports.

Consistent with our emphasis on assessing students' learning and achievement in this chapter, our focus in the upcoming pages is on standardized *achievement* tests. Such tests are useful in at least two ways. First, they enable teachers and school administrators to compare their own students' general achievement levels with the achievement of students elsewhere—information that may indirectly provide information about the effectiveness of the local curriculum and instructional practices. Second, standardized achievement tests provide a means of tracking students' general progress over time and raising red flags about potential trouble spots. For example, imagine that Lucas has been getting average test scores year after year but then suddenly performs well below average in eighth grade, even though the test and comparative norm group are the same as in previous years. At this point, his teacher would want to ascertain whether the low performance was a temporary fluke (e.g., was Lucas sick on the test day?) or, instead, due to other, longer-term issues that require attention.

High-Stakes Tests and Accountability

In U.S. public elementary and secondary schools, federal legislation has mandated both **high-stakes testing**—making major decisions on the basis of single assessments—and **accountability**—a mandated obligation of teachers, administrators, and other school personnel to accept responsibility for students' performance on those assessments. The **Every Student Succeeds Act (ESSA)** was passed in 2015 and mandates frequent assessments of students' progress in language arts, math, and science. Under this legislation, schools must assess students' progress in language arts and math at least once each year in grades 3 through 8 and then at least one time during grades 9 through 12; schools must also assess students' achievement levels in science at least three times over the course of grades 3 through 12. However, schools can use other assessment tools to supplement standardized test scores as indicators of the quality of students' achievement levels and progress. For example, schools might consider performance assessments, portfolios, and indicators of such things as "student engagement . . . completion of advanced coursework . . . [and] postsecondary readiness."

In addition to teacher and school accountability, sometimes individual students are held accountable for their performance on statewide or schoolwide assessments. Some school districts have used students' performance on tests or other assessments as a basis for promotion to the next grade level or for awarding high school diplomas.[82] Typically, school personnel begin by identifying certain content-area standards (they sometimes use the word *competencies*) that students' final achievement should reflect. They then assess students' performance levels (sometimes known as *outcomes*) at the end of instruction, and only those students whose performance meets the predetermined standards and competencies move forward. Such a practice clearly calls for criterion-referenced rather than norm-referenced scores.

Systematic efforts to monitor schools' instructional effectiveness and students' academic progress are certainly well intentioned. Ideally, they can help schools determine whether instructional methods need revision and whether teachers need retooling. They can also help teachers identify students who aren't acquiring essential basic skills. However, current emphases on boosting students' test scores are fraught with difficulties in implementation. For example, teachers often spend a great deal of time teaching to the tests—a serious problem if the tests reflect only a few of the many instructional goals toward which students should be striving. And recall the teacher's dilemma in the opening case study ("Taking Over") in Chapter 3. In order to "cover" all the material on the eighth-grade math competency exam, Ms. Gaunt eventually abandons her efforts to help students master basic concepts and procedures, essentially throwing the *less-is-more* principle out the window.[83]

Using Standardized Achievement Tests Judiciously

In our final set of recommendations, we offer several suggestions for using standardized and high-stakes achievement tests in ways that maximize their usefulness.

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[82] Such approaches go by a variety of names; *outcomes-based education* and *minimum competency testing* are two common ones.

[83] For various perspectives on the problems associated with high-stakes testing and No Child Left Behind, see W. Au, 2007; E. L. Baker, 2007; A. B. Brown & Clift, 2010; Duckworth et al., 2012; A. S. Finn et al., 2014; Finnigan & Gross, 2007; Forte, 2010; B. Fuller et al., 2007; M. G. Jones et al., 2003; Polikoff et al., 2011; Solórzano, 2008.

When you have a choice in the test you use, choose one that has high validity for your curriculum and students.

Content validity is just as much a concern for standardized achievement tests as it is for teacher-constructed classroom assessments. Teachers and school administrators can best determine the content validity of a standardized achievement test by comparing a table of specifications for the test to their own curriculum.[84] School faculty members should also scrutinize the actual test items to see whether they predominantly address only basic knowledge and skills (as some tests do) or, instead, also address conceptual understanding and complex cognitive processes.[85] A test has high content validity for a particular school and classroom only if the topics and thinking skills emphasized in test items match local instructional goals and content-area standards.

Teach to the test if—but only if—it reflects important instructional goals.

When teachers are held accountable for their students' performance on a particular test, many of them understandably devote many class hours to the knowledge and skills the test assesses, and students may focus their studying efforts accordingly. The result is often that students perform at higher levels on a high-stakes test *without* improving their achievement and abilities more generally. If a test truly measures the things that are most important for students to learn—including such complex cognitive processes as transfer, problem solving, and critical thinking—then focusing on those things is quite appropriate. If the test primarily assesses rote knowledge and basic skills, however, then such emphasis may undermine the improvements everyone wants to see in students' achievement.[86]

When preparing students for an upcoming standardized test, tell them what the test will be like and teach them good test-taking skills.

Teachers should typically prepare students ahead of time for a standardized test—for instance, by doing the following:

- Explain the general nature of the test and the tasks it involves (e.g., if applicable, mention that students aren't expected to know all the answers and that many students won't have enough time to respond to every item).
- Encourage students to do their best, but without describing the test as a life-or-death matter.
- Give students practice with the test's format and item types (e.g., demonstrate how to answer multiple-choice questions and fill in electronically scored answer sheets).
- Encourage students to get a full night's sleep and eat a good breakfast before taking the test.

To some degree, teachers can also help students prepare for standardized achievement tests by teaching them useful test-taking strategies, such as temporarily skipping difficult items, double-checking to be sure answers are marked in the correct spots, and the like. Teachers should keep in mind, however, that having effective test-taking skills—**testwiseness**—typically makes only a small difference in students' test scores.

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[84] Test publishers typically construct a table of specifications and either include it in the test manual or make it available upon request. If a table isn't available, school personnel can construct one by tallying the number of items that tap into various topics and thinking skills.

[85] M. G. Jones et al., 2003; Mintrop & Sunderman, 2009; Polikoff et al., 2011.

[86] W. Au, 2007; E. L. Baker, 2007; M. G. Jones et al., 2003; Mintrop & Sunderman, 2009; Shepard et al., 2005; R. M. Thomas, 2005.

Furthermore, test-taking skills and student achievement are positively correlated: Students with many test-taking strategies tend to be higher achievers than students with few strategies. In other words, very few students get low test scores *only* because they're poor test takers. In most cases teachers better serve their students by teaching them the knowledge and skills that tests are designed to assess rather than spending an inordinate amount of time teaching them how to take tests.[87]

When administering the test, follow the directions closely and report any unusual circumstances.

Once the testing session begins, teachers should follow the test administration procedures to the letter, asking students to complete any practice items provided, keeping time faithfully, and responding to students' questions in the prescribed manner. Remember, students in the test's norm group have taken the test under certain standardized conditions, and teachers must replicate those conditions as closely as possible. Occasionally teachers and students will face circumstances beyond their control (e.g., an unexpected power failure or exceptional outside noise). When such events significantly alter the conditions under which students are taking the test, they jeopardize the validity of the test results and must be reported. Teachers should also make note of any individual students who are behaving in ways unlikely to lead to maximum performance—for instance, students who appear exceptionally nervous, stare out the window for long periods, or seem to be marking answers haphazardly.[88]

Make appropriate accommodations for English learners.

Without question, students' experience and facility with the English language affects their performance on English-based achievement tests, including high-stakes tests.[89] For instance, when children come to school after growing up in a non-English-speaking environment, it typically takes them considerable time—perhaps 5 to 7 years—to gain sufficient proficiency in English to perform at their best in English-speaking classrooms.[90] Yet many school districts require these students to take high-stakes tests in English long before they achieve this proficiency, leading to test scores that significantly underestimate students' achievement levels.[91] Following are several recommended practices, provided that public policies and school district administrators allow for them (in the United States, ESSA allows some but not all of these practices):[92]

- Translate a test into a student's native language.
- Administer a test one-on-one, perhaps eliminating time limits, presenting questions orally, and allowing students to respond in their native language. (This practice reduces the second RSVP characteristic—standardization—but may be the only way to ensure the third RSVP characteristic—validity of the results.)
- Use alternative assessment methods (e.g., dynamic assessment, portfolios) to document achievement.
- Exclude English learners' test scores when computing averages that reflect the overall achievement of a school or a particular subgroup within the school.

[87] J. R. Frederiksen & Collins, 1989; Geiger, 1997; Scruggs & Lifson, 1985; Shepard et al., 2005.
[88] M. D. Miller et al., 2009.
[89] Carhill et al., 2008; Solórzano, 2008.
[90] Carhill et al., 2008; Cummins, 1984, 2008; Padilla, 2006.
[91] Solórzano, 2008; W. E. Wright, 2006.
[92] Haywood & Lidz, 2007; R. S. Johnson et al., 2006; Solórzano, 2008; W. E. Wright, 2006.

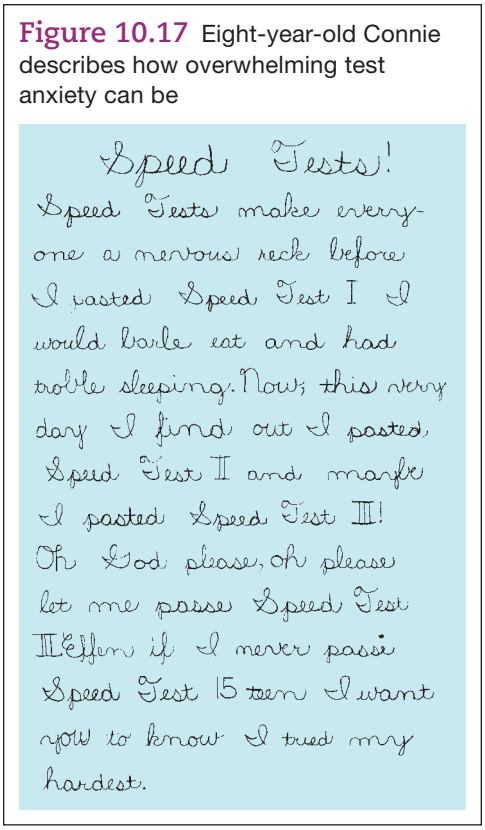


Figure 10.17 Eight-year-old Connie describes how overwhelming test anxiety can be

When interpreting test results, take students' ages and developmental levels into account.

Virtually any test score will be influenced by a variety of irrelevant factors that diminish the score's reliability and validity, including literacy skills, motivation, mood, energy level, and general health. Such factors are especially likely to influence the test results of young children, many of whom may have limited verbal skills, short attention spans, little motivation to do their best, and low tolerance for frustration. Furthermore, young children's erratic behaviors can make it difficult to maintain standardized testing conditions.[93]

In adolescence, other variables can affect the validity of scores on standardized tests. Although students may get a bit nervous about tests in the elementary grades (e.g., see Figure 10.17), test anxiety increases in the middle school and high school grades, sometimes to the point that it significantly interferes with students' concentration during a test. Furthermore, especially in high school, some students become quite cynical about the validity and usefulness of standardized tests. If students see little point to taking a test, they may read test items superficially, if at all, and a few may complete answer sheets simply by following a certain pattern (e.g., alternating between A and B) or filling in bubbles to make pictures or designs.[94] At *any* grade level, then, educators must be careful not to place too much stock in the specific scores that tests yield.

If tests are being used to measure teacher or school effectiveness, advocate for a focus on students' improvement over time rather than on age-group averages.

Assessing the degree to which each student makes progress during the school year may not be the best approach to assigning final grades (recall our earlier concerns about basing grades on improvement), but it is probably a reasonable approach to evaluating the effectiveness of teachers and schools. You may sometimes see the term **value-added assessment** used in reference to progress-based evaluation of teachers and schools.[95]

Unfortunately, assessing students' improvement over a single school year isn't as easy as it might seem, especially when using standardized achievement test scores. We can't just find the difference between beginning-of-year and end-of-year test scores and say, "Hey, Mr. Black's students showed bigger gains than Ms. Brown's students did, so Mr. Black must be the better teacher." For one thing, if we calculate the mathematical difference between two test scores with imperfect reliability and validity, the result will be a number with even *less* reliability and validity. Also, students can differ considerably in the *rates* at which they improve, with students from low-income families improving more slowly (on average) than their more economically advantaged peers. Furthermore, the particular school at which a teacher is working can have a major influence; for example, Mr. Black might be teaching at a newly built facility with many resources and a highly motivated student body, whereas Ms. Brown might be teaching in a dilapidated old school building with inadequate supplies and little or no sense of school community among students and faculty.

[93] Bracken & Walker, 1997; Carver, 2006; Fleege et al., 1992; Messick, 1983; Stipek, 2002a; Wodtke et al., 1989.

[94] Paris et al., 1991; W. E. Wright, 2006.

[95] Evans & Lee, 2018.

Statisticians have developed a variety of mathematical methods for taking such factors into account in calculating improvement scores, but none of them has yet emerged as a truly valid, dependable approach to measuring teacher or school effectiveness.[96] And statistical methods don't take into account an additional problem with improvement-based approaches to evaluating teacher and school effectiveness: Teachers may encourage students *not* to do well on assessments at the beginning of the school year so that students can maximize their so-called "improvement" during that year. As an illustration, when one sixth-grader came home from school not too long ago, she explained to her parents that "My teachers told me not to try too hard on the first test. Otherwise, I wouldn't be able to improve as much when I took the test the next time."

So where does all of this leave us with respect to teacher accountability? Ideally, decision makers should identify concrete, realistic instructional goals for students in a single school year—perhaps tailoring those goals to local students' strengths and needs and breaking them down into more specific and manageable short-term goals—and create reasonable criterion-referenced tasks to assess goal accomplishment.[97]

Never use a single test score to make important decisions about students.

What we authors have seen and heard in popular news media leads us to think that many politicians and other policymakers overestimate how much high-stakes and other standardized achievement tests can tell us: They assume that such instruments are highly accurate, comprehensive measures of students' academic achievement. It's true that these tests are often developed by experts with considerable training in test construction, but no test is completely reliable, and its validity will vary considerably depending on the context in which it's being used. Every test is fallible, and students do poorly on tests for a variety of reasons. Thus, teachers, school administrators, parents, and others should never—and we do mean ***never***—use a single assessment instrument or single test score to make important decisions about individual students. Nor should they use the results of a single test to make important decisions about large groups of students or about the teachers who teach them. It behooves everyone who has a personal or professional stake in children's education to be aware of the limitations of standardized tests and enlighten their fellow citizens accordingly.

Regardless of how students' learning and achievement are assessed, we must all continually keep one point in mind: *Tests and other educational assessments are useful but imperfect tools.* Standardized tests, teacher quizzes, classroom assignments, performance tasks, portfolios—all of these can tell us something about what students know and can do and what students still need to learn and master. The usefulness of any assessment strategy depends on how well matched it is to the situation in which it will be used and how reliable and valid it is for that situation. As a general rule, we should think of any educational assessment as a tool that, in combination with the other tools at teachers' disposal, can help improve classroom instruction and maximize students' learning and achievement over the long run.

[96] For example, see American Educational Research Association, 2015; American Statistical Association, 2014; E. M. Anderman et al., 2015; Ballou et al., 2004.

[97] American Educational Research Association, 2015; E. M. Anderman et al., 2015.

Summary

Regular assessments of students' learning and achievement are an essential component of effective classroom instruction. The Big Ideas presented at the beginning of the chapter can help us summarize key concepts and principles related to productive assessment practices.

10.1 Using Assessments for Various Purposes

Big Idea 10.1 Classroom assessments serve a variety of purposes, but in one way or another, they can all influence students' future learning and achievement.

Assessment is a process of observing a sample of a student's behavior and drawing inferences about the student's knowledge, skills, and/or attitudes. Classroom assessments can be used to determine what students know and can do before instruction (diagnostic assessment), during instruction (formative assessment), and after instruction (summative assessments). These types of assessments can serve a variety of purposes, including (1) guiding instructional decision making, (2) diagnosing learning and performance problems, (3) promoting learning and motivation, (4) determining what students have learned at the end of instruction, and (5) evaluating the quality of instruction. But regardless of a teacher's primary purposes in assessing students, the nature of the teacher's assessment instruments and practices gives students messages about what things are most important to learn and about how students should study and think about classroom subject matter.

10.2 Enhancing Learning Through Classroom Assessment Practices

Big Idea 10.2 Effective teachers strategically use assessments to enhance students' learning.

Not only is assessment closely interconnected with instruction, then, but in a very real sense, it *is* instruction. Teachers can—and *should*—regularly and purposefully use classroom assessments to enhance students' ongoing progress and ultimate achievement levels. For example, they can (1) create checklists, rating scales, or rubrics that specify important qualities of good performance; (2) provide the scaffolding students need to evaluate their *own* performance; and (3) make use of technology-based formative assessment tools.

10.3 Important Qualities of Good Assessment

Big Idea 10.3 Ideally, classroom assessments have four RSVP characteristics—reliability, standardization, validity, and practicality—with validity being the most important.

Teachers should keep four characteristics in mind when identifying assessment strategies and developing assessment instruments, especially those that will be used for summative evaluations of students' accomplishments. First, an assessment should be *reliable*, yielding consistent results regardless of the specific circumstances in which it is administered and scored. Second, it should be *standardized*, in that it has similar content and is administered and evaluated in a similar manner for everyone (some students with disabilities excepted). Third, it should be *valid*, being an accurate reflection of the knowledge and skills the teacher is trying to assess. Finally, it should be *practical*, staying within reasonable costs and time constraints.

10.4 Informally and Formally Assessing Students' Progress and Achievements

Big Idea 10.4 Spontaneous, informal assessments and preplanned formal assessments both have important roles to play in enhancing students' learning and achievement.

Teachers can sometimes assess students' characteristics and abilities informally, perhaps by simply observing what students do and listening to what they say in everyday activities. Informal assessment is flexible and practical and requires little or no advance planning. Unfortunately, it usually doesn't provide a representative sample of what students know and can do, and teachers' judgments are often biased by their beliefs and expectations regarding particular students.

When drawing firm conclusions about what students have and have not achieved—for example, when assigning final grades—teachers should base their conclusions largely on preplanned, formal assessments. Paper-and-pencil assessment tasks are usually the most practical ones, and so they're often preferable *if* they truly reflect instructional goals. Performance assessment tasks are often more appropriate for assessing complex achievements that require the integration of numerous skills, and accomplishment of some instructional objectives can be assessed *only* through direct observation of what students can do. Paper-and-pencil and performance assessments alike usually yield more useful information when tasks have some structure and when explicit, concrete scoring criteria are identified ahead of time.

Classroom assessment practices should allow leeway for students to take the risks so essential for the pursuit of

challenging tasks—no single failure should seriously impact a student's long-term academic success. Furthermore, for both legal and educational reasons, teachers must keep students' assessment results confidential, communicating students' test scores, grades, and other information only to the students themselves, to their parents, and to school personnel directly involved in the students' education and well-being. And ultimately, teachers must remember that the ultimate purpose of *any* assessment is not to pass judgment but rather to help students learn and achieve more effectively.

10.5 Summarizing Students' Achievement with Grades and Portfolios

Big Idea 10.5 Final class grades provide only global, quantitative information about students' achievement levels; whenever possible, they should be supplemented with qualitative information, perhaps through student-constructed portfolios.

Most teachers eventually need to boil down the results of classroom assessments into concise, general indicators of what students have learned. The most common procedure is to assign final grades that summarize what students have achieved during an academic term or school year. In most cases, final grades should reflect actual achievement levels and be based on hard data. The main problem with grades is that, by themselves, they communicate very little about what a student specifically has learned and can do. Student portfolios, which can represent the multifaceted, complex nature of students' achievements, can often be an effective alternative or supplement to final class grades.

10.6 Assessing Students' Achievement and Abilities With Standardized Tests

Big Idea 10.6 Large-scale standardized tests can be helpful in estimating students' general achievement levels in particular domains, but educators should never use a single test score to make important decisions about individual students, nor should policymakers use average scores from a single test to evaluate teacher and school effectiveness.

Standardized achievement tests provide a means of tracking students' general progress over time and getting a rough idea of how students at a particular school compare to their peers elsewhere. In recent years standardized achievement tests have often been used to make important decisions about students and to hold school personnel accountable for students' achievement levels. Such *high-stakes testing* doesn't always promote higher student achievement levels—for example, it can lead some teachers to simply "teach to the test" and thereby give short shrift to important but nontested instructional goals.

Standardized tests will undoubtedly continue to be used as important indicators of both (1) students' progress and (2) teacher and school quality, at least for the foreseeable future. Thus, teachers must become vocal advocates for reasonable and valid approaches to assessing students' overall achievement levels. For example, any high-stakes tests should be closely matched to important instructional goals, and students' ages, developmental levels, and proficiency in English must be accommodated in test design, administration, and interpretation. Also, influential policymakers must be made aware of the significant limitations of using students' achievement test scores as the sole indicators of teachers' and schools' overall effectiveness.

Case Study Practice Exercises

Two Science Quizzes

Knowing that frequent paper-and-pencil quizzes will encourage students to study and review class material regularly, Mr. Bloskas tells his ninth-grade science students that they'll have a quiz every Friday. As a first-year teacher, he has had little experience developing test questions, so he decides to use the questions in the test-item manual that accompanies the class textbook. The night before the first quiz, Mr. Bloskas types 30 multiple-choice and true–false items from the manual, making sure they cover the specific topics that he has addressed in class.

Mr. Bloskas's students complain that the questions are "picky." As he looks carefully at his quiz, he realizes that the students are right: The quiz measures nothing more than memorization of trivial details. So when he prepares the second quiz, he casts the test-item manual aside and writes two essay questions asking students to apply scientific principles they've studied to new, real-life situations.

The following Friday, students complain even more loudly about the second quiz: "This is too hard!" "We never studied this stuff!" "I liked the first quiz better!" Later, as

Mr. Bloskas grades the essays, he is appalled to discover how poorly his students have performed.

1. **Constructed-response question**

   When identifying classroom assessment tasks, teachers must be sure that the tasks have validity, especially *content validity*.

   A. Compare Mr. Bloskas's two quizzes with respect to their content validity.

   B. Describe a reasonable approach Mr. Bloskas might use to create quizzes that have good content validity for his classes.

2. **Multiple-choice question**

   The following alternatives present four possible explanations for the students' negative reactions to the second quiz. Drawing on contemporary theories of learning and motivation, choose the most likely explanation.

   a. Multiple-choice and true–false items are more likely than essay questions to enhance students' sense of autonomy.

   b. Learners are most likely to behave and study in ways that they expect will lead to reinforcement.

   c. Multiple-choice and true–false items are apt to foster mastery goals, whereas essay questions are more likely to foster performance goals.

   d. Multiple-choice and true–false items assess information in working (short-term) memory, whereas essay questions usually assess information in long-term memory.

Appendix A

Describing Associations with Correlation Coefficients

- Do students with high self-esteem perform better in school than students with low self-esteem?
- As students move through the grade levels, do they become more intrinsically motivated to learn classroom subject matter or, instead, *less* intrinsically motivated to learn it?
- When students are given two different tests of general cognitive ability in the same week, how similar are their scores on the two tests likely to be?
- Are children's emotional reactions to distressing circumstances related to their willingness to help the people in distress?

Each of these questions asks about an association between two variables—whether it be an association between self-esteem and school achievement, between grade level and intrinsic motivation, between two tests of general cognitive ability, or between emotional reactions and prosocial behavior. The nature of such associations is sometimes summarized by a statistic known as a **correlation coefficient**.

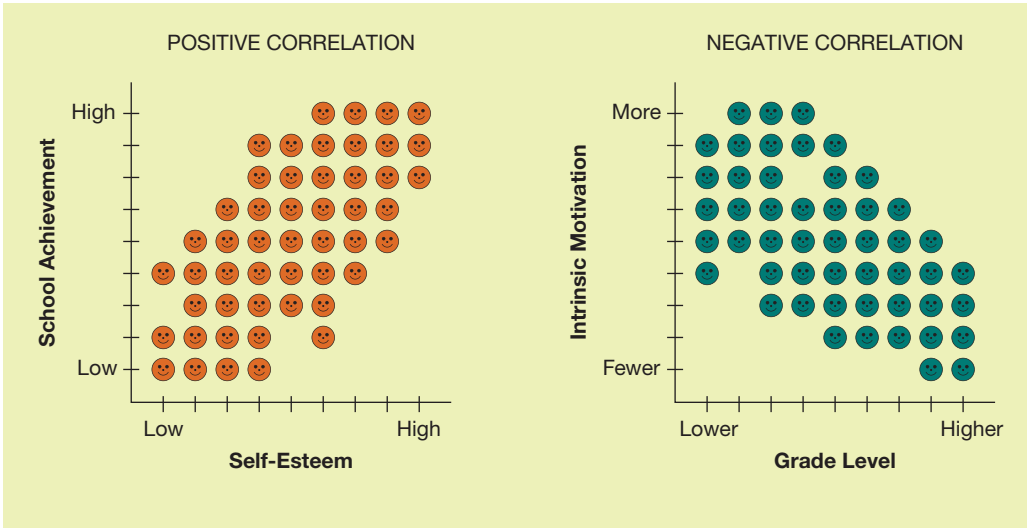
A correlation coefficient is a number between –1 and +1; most correlation coefficients are decimals (either positive or negative) somewhere between these two extremes. A correlation coefficient for two variables tells us about both the direction and the strength of the association between the variables.

Direction. The direction of the association is indicated by the *sign* of the coefficient—in other words, by whether the number is positive or negative. A positive number indicates a *positive correlation*: As one variable increases, the other variable also increases. For example, there's a positive correlation between self-esteem and school achievement: Students with higher self-esteem achieve at higher levels.[1] In contrast, a negative number indicates a *negative correlation*: As one variable increases, the other variable decreases instead. For example, there's a negative correlation between grade level and intrinsic motivation: On average, students in the upper grades (e.g., in middle school and high school) have less intrinsic motivation to master classroom subject matter than younger students do.[2] Figure A.1 graphically depicts the two correlations just described.

Strength. The strength of the association is indicated by the *size* of the coefficient. A number close to either +1 or –1 (e.g., +.89 or –.76) indicates a *strong* correlation: The two variables are closely related, so knowing the level of one variable allows us to predict the level of the other variable with considerable accuracy. For example, we often find a strong correlation between two tests of general cognitive ability given within a short time period: Students tend to get similar scores on both tests, especially if the tests cover similar kinds of content.[3] In contrast, a number close to 0 (e.g., +.08 or –.21) indicates a *weak* correlation: Knowing the level of one variable allows us to predict the level of the other variable but without much accuracy. For example, there's a weak association between young children's feelings of sadness and their prosocial behavior: On average, children who feel quite sad about a peer who needs help are more likely to provide the help than are less-sad children,

[1] For example, see Marsh et al., 2007.
[2] For example, see Gottfried et al., 2001.
[3] For example, see McGrew et al., 1997.

Figure A.1 Each face in these two graphs represents one student in a group of 50 students. The location of the face indicates the extent to which a student is high or low on the two characteristics indicated. There is a *positive correlation* between self-esteem and school achievement: Students with higher self-esteem tend to achieve at higher levels. There is a *negative correlation* between grade level and intrinsic motivation: Students in higher grades tend to have less intrinsic motivation to learn school subject matter than students in lower grades.



but with many exceptions to this general rule (e.g., some sad children don't help at all).[4] Correlations in the middle range (e.g., those in the .40s and .50s, either positive or negative) indicate a *moderate* correlation.

You may often encounter correlation coefficients in research articles in professional books and journals. For instance, you might read that students' visual-spatial thinking ability is positively correlated with their success in a math class or that there's a negative correlation between class size and students' achievement test scores. Whenever you see such evidence of correlation, you must remember one very important point: *Correlation does not necessarily indicate causation.* For example, based on correlations alone, we can't say that visual-spatial thinking ability specifically *leads to* greater mathematical ability, nor can we say that a large class size specifically *interferes with* classroom achievement. Each of these italicized phrases implies a causal relationship that doesn't necessarily exist. Only carefully designed experimental studies enable us to draw conclusions about the extent to which one thing causes or influences another.

Many calculators are now programmed to compute correlation coefficients. Alternatively, with an Internet browser such as Google or Bing, you can easily find websites that enable you to calculate correlations and other simple statistics. Computing a correlation coefficient by hand is complicated but certainly possible; you can find the formula through an Internet search or in most introductory statistics textbooks.

[4] For example, see P. A. Miller et al., 1996.

Appendix B

Understanding and Interpreting Standardized Test Results

Students' performance on standardized tests is often reported in terms of one or more *norm-referenced scores*—more specifically, as scores that show a student's performance relative to others in a nationwide *norm group*. In some cases, the scores are derived by comparing a student's performance with the performance of students at a variety of grade or age levels; such comparisons yield grade- or age-equivalent scores. In other cases, the scores are based on comparisons only with students of the *same* age or grade; these comparisons yield either percentile ranks or standard scores.

Regardless of the form a norm-referenced score takes, educators must keep in mind that *any test score reflects only a student's performance on a single test*. No test has perfect reliability, nor can any test score fully capture a student's achievement or abilities in a given content domain.

Grade-Equivalent and Age-Equivalent Scores

Imagine that Shawn takes a standardized test, the Reading Achievement Test (RAT). He gets 46 of the 60 test items correct; thus, 46 is his raw score. We turn to the norms reported in the test manual and find the average raw scores for students at different grade and age levels, shown in Figure B.1. Shawn's raw score of 46 is the same as the average score of 11th-graders in the norm group, so he has a **grade-equivalent score** of 11. His score is halfway between the average score of 16-year-old and 17-year-old students, so he has an **age-equivalent score** of approximately 16½. Shawn is 13 years old and in eighth grade, so he has obviously done well on the RAT.

In general, grade- and age-equivalent scores are determined by matching a student's raw score to a particular grade or age level in the norm group. A student who performs as well as the average second grader on a reading test will get a grade-equivalent score of 2, regardless of the student's actual grade level. A student who gets the same raw score as the average 10-year-old on a physical fitness test will get an age-equivalent score of 10, regardless of whether that student is 5, 10, or 15 years old.

Figure B.1 Hypothetical norm-group data for the Reading Achievement Test (RAT)

Norms for Grade Levels		Norms for Age Levels	
Grade	Average Raw Score	Age	Average Raw Score
5	19	10	18
6	25	11	24
7	30	12	28
8	34	13	33
9	39	14	37
10	43	15	41
11	46	16	44
12	50	17	48

On the surface, grade- and age-equivalent scores seem so simple and straightforward. But they have a serious drawback: They give us no idea of the typical *range* of performance for students at a particular grade or age level. For example, a raw score of 34 on the RAT gives us a grade-equivalent score of 8, but obviously not all eighth-graders will get raw scores of exactly 34. It's possible, and in fact quite likely, that many eighth-graders will get raw scores several points above or below 34, thus getting grade-equivalent scores of 9 or 7 (perhaps even 10 or higher, or 6 or lower).

In previous decades, grade-equivalent scores were widely used to summarize students' performance on standardized achievement tests. Their use has declined in recent years because they are too often misinterpreted. For one thing, well-meaning policymakers have sometimes proposed that grade-equivalent scores should be a standard for performance—that *all* students should perform at grade level on an achievement test. Given the normal variability within most classrooms, this goal is unrealistic: It's mathematically impossible for everyone to be average or above average. A second common misinterpretation is to conclude that grade-equivalent scores indicate the appropriate grade placement for a student—for example, concluding that a third-grader who gets grade-equivalent scores of 5 or 6 in all subject areas should be immediately moved to fifth grade. Remember, a norm-referenced score reflects nothing more than a student's performance on a particular test at a particular time; it *doesn't* necessarily reflect a student's ability to handle the curriculum at a higher grade level. Furthermore, although advanced placements are occasionally quite appropriate, most students are more socially and emotionally comfortable with classmates of the same age. And, of course, good teachers tailor their instructional strategies to students' differing achievement levels.

Percentile Ranks

A **percentile rank** (sometimes simply called a **percentile**) is the percentage of people at the *same* age or grade level getting a raw score less than or equal to the student's raw score. To illustrate, let's once again consider Shawn's performance on the RAT. Because Shawn is in eighth grade, we would turn to the eighth-grade norms in the RAT test manual. If we discover that a raw score of 46 is at the 98th percentile for eighth-graders, we know that Shawn has done as well as or better than 98% of eighth-graders in the norm group. Similarly, a student getting a percentile rank of 25 has performed as well as or better than 25% of the norm group, and a student getting a score at the 60th percentile has done as well as or better than 60%. It's important to note that a percentile rank refers to a percentage of *people*, not to the percentage of correct items—a common misconception among teacher education students.

Percentile ranks are relatively simple to understand and therefore used frequently in reporting test results. But they too, have a significant drawback: They distort actual differences among students. As an illustration, consider the RAT percentile ranks of these four boys:

STUDENT	PERCENTILE RANK
Ernest	45
Frank	55
Giorgio	89
Wayne	99

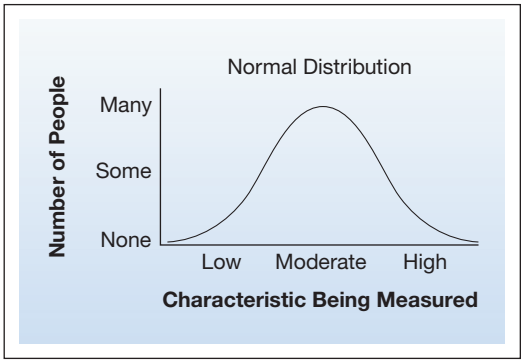
In *actual achievement level* (as measured by the RAT), Ernest and Frank are probably very similar even though their percentile ranks are 10 points apart. However, a 10-point difference at the upper end of the scale probably reflects a substantial difference in achievement: Giorgio's percentile rank of 89 tells us that he knows quite a bit, but Wayne's

percentile rank of 99 tells us that he knows an exceptional amount. In general, percentiles tend to *over*estimate differences in the middle range of the characteristic being measured: Scores a few points apart reflect similar achievement or ability levels. Meanwhile, percentiles *under*estimate differences at the upper and lower extremes: Scores only a few points apart often reflect substantial differences in achievement or ability. We avoid this problem when we use standard scores.

Standard Scores

The school nurse measures the heights of the 25 students in Ms. Oppenheimer's third-grade class, as shown on the left side of Figure B.2. The nurse then creates a graph of the children's heights, shown on the right side of Figure B.2. Notice that the graph is high in the middle and low on both ends. This shape tells us that most of Ms. Oppenheimer's students are more or less average in height, with only a few very short students (e.g., Pat, Amy, and Wil) and only a few very tall ones (e.g., Hal, Roy, and Jan).

Many psychologists believe that educational and psychological characteristics typically follow the same pattern we see for height: Most people are close to average, with fewer and fewer people being counted as we move farther from the average. This theoretical pattern of educational and psychological characteristics, known as the **normal distribution (or normal curve)**, is shown in the margin. Standard scores reflect this normal distribution: Many students get scores in the middle range, and only a few get very high or very low scores.



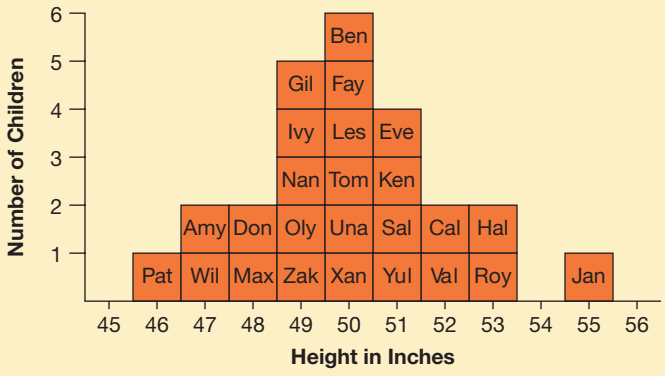
Before we examine standard scores in detail, we need to understand two numbers used to derive them: the mean and standard deviation. The **mean (M)** is the average of a set of scores: We add all the scores together and divide by the total number of scores (or people). For example, if we add the heights of all 25 students in Ms. Oppenheimer's class and then divide by 25, we get a mean height of 50 inches (see the calculation at the bottom of Figure B.2).

The **standard deviation (SD)** indicates the *variability* of a set of scores. A small number tells us that, generally speaking, the scores are close together, and a large number tells us that they're spread far apart. For example, third-graders tend to be more similar in height than eighth-graders (some eighth-graders are less than 5 feet tall; others may be almost

Figure B.2 Heights of children in Ms. Oppenheimer's third-grade class

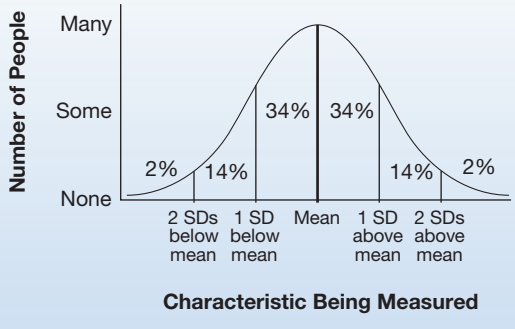
Heights (in inches)

Amy	47	Nan	49
Ben	50	Oly	49
Cal	52	Pat	46
Don	48	Roy	53
Eve	51	Sal	51
Fay	50	Tom	50
Gil	49	Una	50
Hal	53	Val	52
Ivy	49	Wil	47
Jan	55	Xan	50
Ken	51	Yul	51
Les	50	Zak	49
Max	48		



Mean height = $\frac{\text{Sum of all children's heights}}{\text{Number of children}} = \frac{1250}{25} = \mathbf{50}$

Figure B.3 Normal distribution divided by the mean and standard deviation



6 feet tall). The standard deviation for the heights of third-graders is therefore smaller than the standard deviation for the heights of eighth-graders. The formula for computing a standard deviation is fairly complex; fortunately, we don't need to know it in order to understand the role that a standard deviation plays in standard scores. Furthermore, the standard deviation for any published test is typically provided in the test manual. (If you're curious, you can find information about how to calculate standard deviations on Wikipedia and many other Internet websites.)

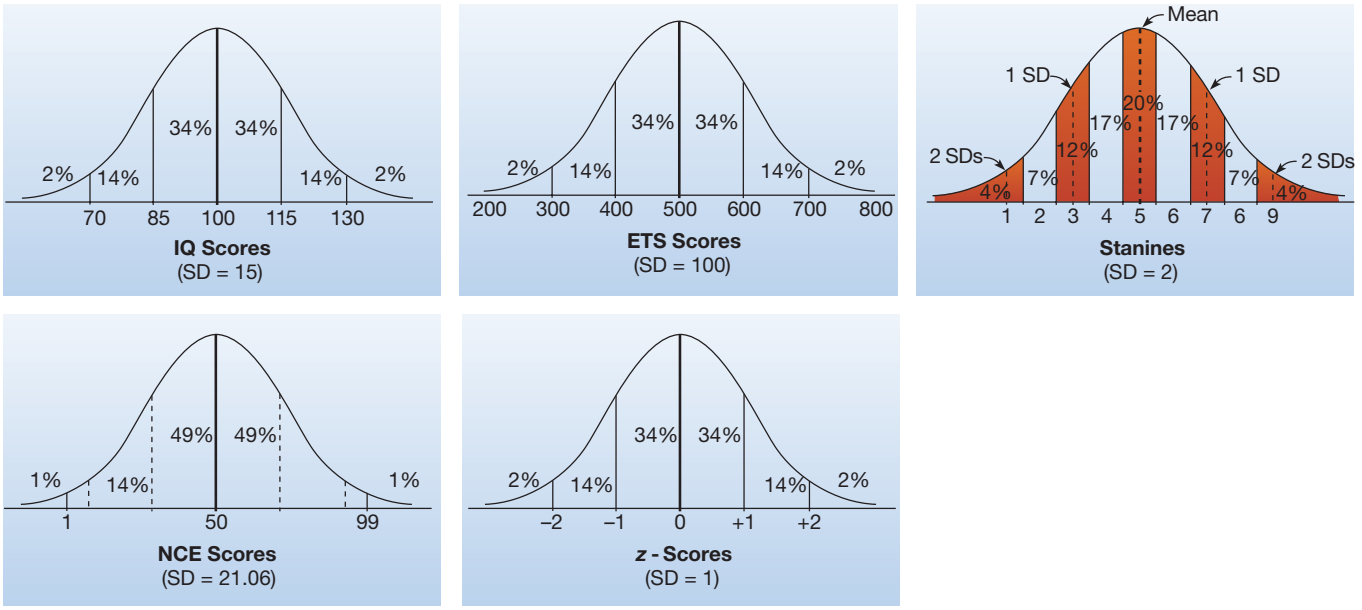
The mean and standard deviation can be used to divide the normal distribution into several parts, as shown in Figure B.3. The vertical line at the middle of the curve shows the mean; for a normal distribution, it's both the mid-point and the highest point of the curve. The thinner lines to either side reflect the standard deviation: We count out one standard deviation higher and lower than the mean and mark those two spots with vertical lines, and then we count another standard deviation to either side and draw two more lines. When we divide a normal distribution in this way, the percentages of students getting scores in each part are always the same. Approximately two-thirds (68%) get scores within one standard deviation of the mean (34% in each direction). As we go farther away from the mean, we find fewer and fewer students, with 28% lying between one and two standard deviations away (14% on each side) and only about 4% being more than two standard deviations away (2% at each end).

Now that we better understand the normal distribution and two statistics that describe it, let's return to standard scores. A **standard score** reflects a student's position in the normal distribution: It tells us how far the student's performance is from the mean in terms of standard deviation units. Unfortunately, not all standard scores use the same scale: Scores used for various tests have different means and standard deviations. Five commonly used standard scores, depicted graphically in Figure B.4, are the following:

- **IQ scores** are frequently used to report students' performance on intelligence tests. They have a *mean of 100* and, for most tests, a *standard deviation of 15*. (If you look back at Figure 6.10 in Chapter 6, you'll see that we've broken up that curve by thirds of a standard deviation unit. The lines for 85 and 115 reflect one standard deviation from the mean score of 100. The lines for 70 and 130 reflect two SDs from the mean.)
- **ETS scores** are used on the SAT Reasoning Test, published by the Educational Testing Service (ETS). They have a *mean of 500* and a *standard deviation of 100*. However, no scores fall below 200 or above 800.
- **Stanines** (short for *standard nines*) are often used in reporting standardized achievement test results. They have a *mean of 5* and a *standard deviation of 2*. Because they're always reported as whole numbers, each score reflects a *range* of test performance, indicated by the shaded and nonshaded portions of the upper-right-hand curve in Figure B.4.
- **NCE scores** (short for *normal-curve-equivalent scores*) are increasingly being used in reporting standardized achievement test results. They have a *mean of 50* and a *standard deviation of 21.06*. However, it isn't possible to get a score of zero or below, nor is it possible to get a score of 100 or above.
- **z-scores** are the standard scores that statisticians most often use. They have a *mean of 0* and a *standard deviation of 1*.

The odd standard deviation for NCE scores (21.06) requires an explanation. It turns out that with this particular standard deviation, an NCE score of 1 is equivalent to a percentile score of 1 and, likewise, an NCE score of 99 is equivalent to a percentile score of 99.

Figure B.4 Distributions of five types of standard scores



And, of course, an NCE score of 50 (being the mean and mid-point of the curve) is also a percentile score of 50. Thus, NCE scores have the same general range as percentile ranks.[1]

Interpreting Computer-Generated Test Results: Two Examples

As test-analysis software programs have become more and more sophisticated, test publishers have been generating increasingly complex reports for teachers and parents. Some of these reports can be quite overwhelming. To help you make sense of them, we're starting with a report generated back in the "old days"—that is, in 1990. Although it's certainly outdated by today's standards, its simplicity makes it relatively easy to understand. Figure B.5 presents a computer printout of 12-year-old Ingrid's scores on various subtests of a national achievement test. Ingrid's percentile ranks and stanines have been computed by comparing her raw scores with those of a national norm group. On the basis of her test scores, Ingrid appears to have achieved at average to below-average levels in spelling and math computation, an average to above-average level in math concepts, and above-average to well-above-average levels in reading comprehension, science, and social studies.

The "national percentile bands" in Figure B.5 (i.e., the rows of Xs) are **confidence intervals** that reflect the amount of error (due to imperfect reliability) that's likely to be in Ingrid's percentile scores. The confidence intervals for spelling and math overlap, so even though Ingrid has gotten somewhat higher scores in math concepts than in spelling or math computation, the scores aren't different *enough* to say that she's better at math concepts than in the other two areas. The confidence intervals for reading comprehension, science, and social studies overlap as well, so Ingrid has performed similarly in these three areas. The confidence intervals for her three highest scores *don't* overlap with those for

[1] Some educators find it helpful to calculate average test scores for a particular group of students (e.g., a particular class), and NCE scores allow us to do that. In contrast, percentile ranks don't allow calculation of averages: As noted earlier, they distort actual differences between students, making even the simplest mathematical calculations with them meaningless.

Figure B.5 Computer printout showing 12-year-old Ingrid's performance on a standardized achievement test

NATIONAL PERCENTILE BANDS

			BELOW AVERAGE			AVERAGE			ABOVE AVERAGE				
	STANINE	PERCENTILE	1	5	10	20	30	40	50	60	70	80	90	95	99
READING COMPREHENSION	8	92											XXXXXXXXXXXXX		
SPELLING	4	39					XXXXXXXXXXX								
MATH COMPUTATION	4	37					XXXXXXXXXX								
MATH CONCEPTS	5	57							XXXXXXXXXXXX						
SCIENCE	8	90											XXXXXXXXXXXXXX		
SOCIAL STUDIES	7	84										XXXXXXXX			
			1	5	10	20	30	40	50	60	70	80	90	95	99

her lowest three scores. We can say, then, that Ingrid's relative strengths are in reading comprehension, science, and social studies and that she has achieved at lower levels in spelling and math.

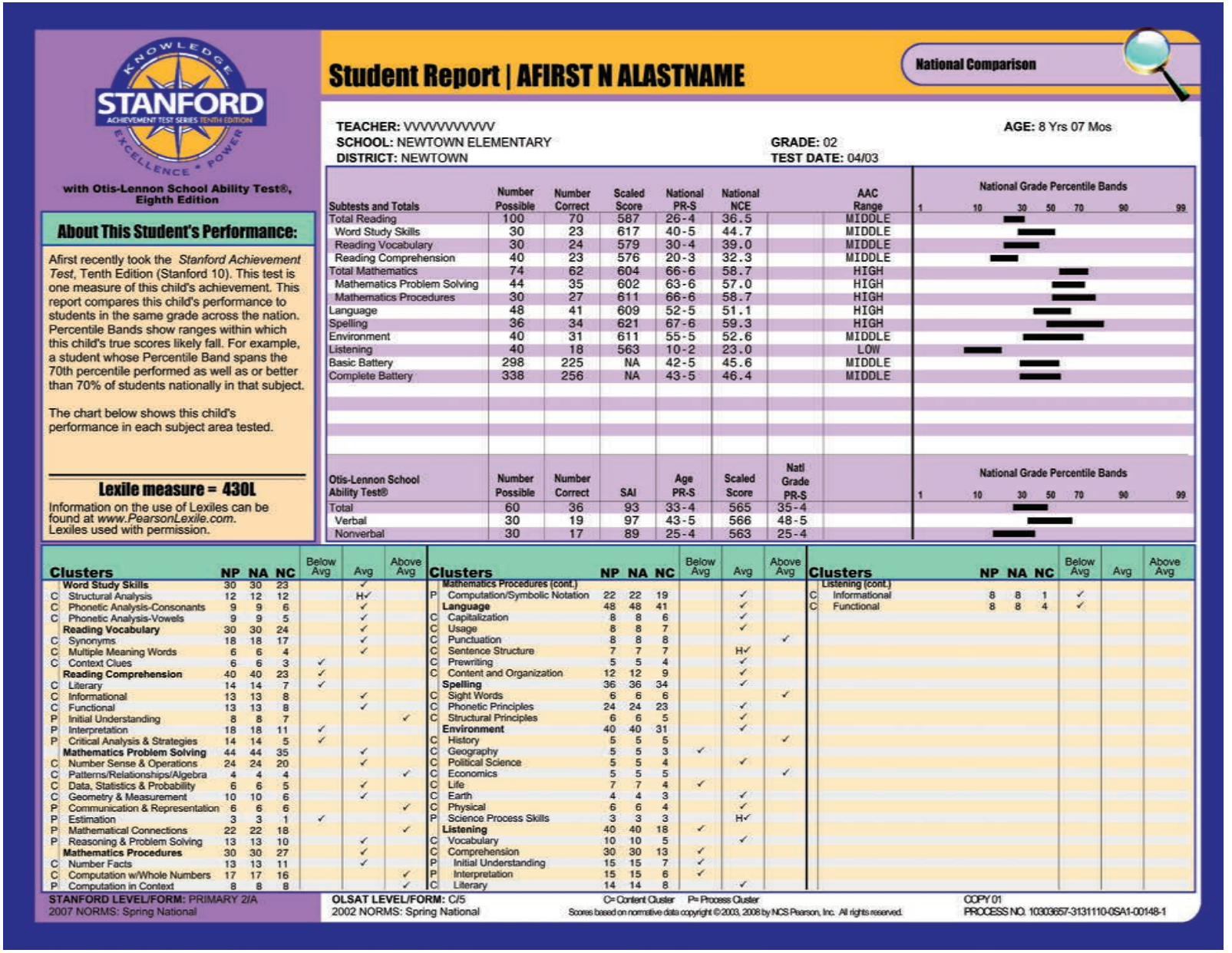
Notice how the numbers at the bottom of the computer printout (1, 5, 10, 20, etc.) are unevenly spaced. Remember a point made earlier about percentile ranks: They overestimate differences near the mean and underestimate differences at the extremes. The uneven spacing is the test publisher's way of showing this fact: It squishes the middle percentile scores closer together and spreads high and low percentile scores farther apart. In this way, it tries to give students and parents an idea about where students' test scores fall in a normal distribution.

Now let's turn to a much more detailed report—the kind you're more likely to see in today's high-tech world. Figure B.6 presents a hypothetical example for a student we'll call Sarah, who took both the Stanford Achievement Test and the Otis-Lennon School Ability Test in second grade. As you can see in the purple-and-white-striped section of the form, the Stanford Achievement Test yields scores related to students' overall achievement in a variety of content domains and subdomains. The Otis-Lennon (at the bottom of the purple-and-white section) is designed to assess students' general cognitive abilities with respect to both *verbal* tasks (those that depend heavily on language skills) and *nonverbal* tasks (those that involve numbers, pictures, or graphical configurations).

At first glance, the report can be quite daunting, but let's make sense of some of the data presented in the top section. The "Number Correct" columns are, of course, Sarah's raw scores on the overall tests and various subtests within them. The PR-S scores are really two separate scores: The first two digits indicate a percentile rank, and the digit after the hyphen is a stanine score. The Stanford yields percentiles and stanines based on a national norm group of second-graders; the Otis-Lennon yields two sets of percentiles and stanines, one set derived from the second-grade norms (the "Natl Grade PR-S") and the other derived from students in the norm group who are the same age as Sarah (the "Age PR-S"). We've previously explained the nature of NCE scores, and the SAI scores on the Otis-Lennon are based on the IQ-score scale we also described earlier ("SAI" refers to "School Ability Index"). We haven't specifically talked about scaled scores or what an AAC range might be, and we don't want to overwhelm our readers with too much information, so we're putting explanations of these columns in a footnote for readers who might be curious.[2]

[2] The "Scaled Scores" are statistical adjustments that reflect the difficulty level of a particular form of each test; they allow comparisons among students who've taken different forms of the tests, with some forms almost inevitably being slightly more difficult than others. "AAC Range" refers to "Ability–Achievement Comparison"; entries in this column indicate how Sarah's various achievement test scores compare with the Otis-Lennon's estimates of her general cognitive ability. For example, Sarah is "High" in her Math achievement scores, indicating that she has done better than have most students with Otis-Lennon scores similar to hers.

Figure B.6 Hypothetical report for a second-grader's performance on the Stanford Achievement Tests and Otis-Lennon School Ability Test



KNOWLEDGE
STANFORD
ACHIEVEMENT TEST SERIES TENTH EDITION
EXCELLENCE • POWER

with Otis-Lennon School Ability Test®, Eighth Edition

Student Report | AFIRST N ALASTNAME

National Comparison

TEACHER: VVVVVVVVVV
SCHOOL: NEWTOWN ELEMENTARY
DISTRICT: NEWTOWN
GRADE: 02
TEST DATE: 04/03
AGE: 8 Yrs 07 Mos

About This Student's Performance:

Afirst recently took the *Stanford Achievement Test*, Tenth Edition (Stanford 10). This test is one measure of this child's achievement. This report compares this child's performance to students in the same grade across the nation. Percentile Bands show ranges within which this child's true scores likely fall. For example, a student whose Percentile Band spans the 70th percentile performed as well as or better than 70% of students nationally in that subject.

The chart below shows this child's performance in each subject area tested.

Lexile measure = 430L

Information on the use of Lexiles can be found at *www.PearsonLexile.com*. Lexiles used with permission.

Subtests and Totals	Number Possible	Number Correct	Scaled Score	National PR-S	National NCE	AAC Range
Total Reading	100	70	587	26-4	36.5	MIDDLE
Word Study Skills	30	23	617	40-5	44.7	MIDDLE
Reading Vocabulary	30	24	579	30-4	39.0	MIDDLE
Reading Comprehension	40	23	576	20-3	32.3	MIDDLE
Total Mathematics	74	62	604	66-6	58.7	HIGH
Mathematics Problem Solving	44	35	602	63-6	57.0	HIGH
Mathematics Procedures	30	27	611	66-6	58.7	HIGH
Language	48	41	609	52-5	51.1	HIGH
Spelling	36	34	621	67-6	59.3	HIGH
Environment	40	31	611	55-5	52.6	MIDDLE
Listening	40	18	563	10-2	23.0	LOW
Basic Battery	298	225	NA	42-5	45.6	MIDDLE
Complete Battery	338	256	NA	43-5	46.4	MIDDLE

National Grade Percentile Bands: 1 10 30 50 70 90 99

Otis-Lennon School Ability Test®	Number Possible	Number Correct	SAI	Age PR-S	Scaled Score	Natl Grade PR-S
Total	60	36	93	33-4	565	35-4
Verbal	30	19	97	43-5	566	48-5
Nonverbal	30	17	89	25-4	563	25-4

National Grade Percentile Bands: 1 10 30 50 70 90 99

	Clusters	NP	NA	NC	Below Avg	Avg	Above Avg
	Word Study Skills	30	30	23		✓	
C	Structural Analysis	12	12	12		H✓	
C	Phonetic Analysis-Consonants	9	9	6		✓	
C	Phonetic Analysis-Vowels	9	9	5		✓	
	Reading Vocabulary	30	30	24		✓	
C	Synonyms	18	18	17		✓	
C	Multiple Meaning Words	6	6	4		✓	
C	Context Clues	6	6	3	✓		
	Reading Comprehension	40	40	23	✓		
C	Literary	14	14	7	✓		
C	Informational	13	13	8		✓	
C	Functional	13	13	8		✓	
P	Initial Understanding	8	8	7			✓
P	Interpretation	18	18	11	✓		
P	Critical Analysis & Strategies	14	14	5	✓		
	Mathematics Problem Solving	44	44	35		✓	
C	Number Sense & Operations	24	24	20		✓	
C	Patterns/Relationships/Algebra	4	4	4			✓
C	Data, Statistics & Probability	6	6	5		✓	
C	Geometry & Measurement	10	10	6		✓	
P	Communication & Representation	6	6	6			✓
P	Estimation	3	3	1	✓		
P	Mathematical Connections	22	22	18			✓
P	Reasoning & Problem Solving	13	13	10		✓	
	Mathematics Procedures	30	30	27		✓	
C	Number Facts	13	13	11		✓	
C	Computation w/Whole Numbers	17	17	16			✓
P	Computation in Context	8	8	8			✓

	Clusters	NP	NA	NC	Below Avg	Avg	Above Avg
	Mathematics Procedures (cont.)						
P	Computation/Symbolic Notation	22	22	19		✓	
	Language	48	48	41		✓	
C	Capitalization	8	8	6		✓	
C	Usage	8	8	7		✓	
C	Punctuation	8	8	8			✓
C	Sentence Structure	7	7	7		H✓	
C	Prewriting	5	5	4		✓	
C	Content and Organization	12	12	9		✓	
	Spelling	36	36	34		✓	
C	Sight Words	6	6	6			✓
C	Phonetic Principles	24	24	23		✓	
C	Structural Principles	6	6	5		✓	
	Environment	40	40	31		✓	
C	History	5	5	5			✓
C	Geography	5	5	3	✓		
C	Political Science	5	5	4		✓	
C	Economics	5	5	5			✓
C	Life	7	7	4	✓		
C	Earth	4	4	3		✓	
C	Physical	6	6	4		✓	
P	Science Process Skills	3	3	3		H✓	
	Listening	40	40	18	✓		
C	Vocabulary	10	10	5		✓	
C	Comprehension	30	30	13	✓		
P	Initial Understanding	15	15	7	✓		
P	Interpretation	15	15	6	✓		
C	Literary	14	14	8		✓	

	Clusters	NP	NA	NC	Below Avg	Avg	Above Avg
	Listening (cont.)						
C	Informational	8	8	1	✓		
C	Functional	8	8	4	✓		

STANFORD LEVEL/FORM: PRIMARY 2/A
2007 NORMS: Spring National

OLSAT LEVEL/FORM: C/5
2002 NORMS: Spring National

C= Content Cluster P= Process Cluster

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COPY 01
PROCESS NO. 10303657-3131110-0SA1-00148-1

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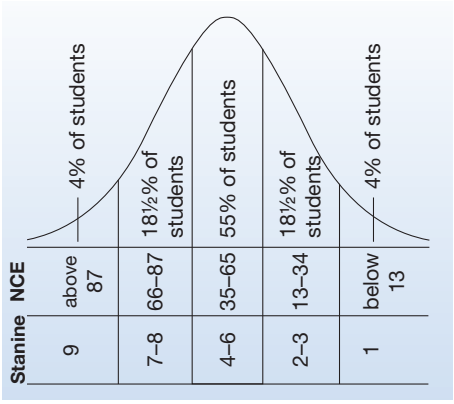
Figure B.7 A graphic for helping parents understand stanines and NCE scores



Notice the "National Grade Percentile Bands" in the upper right part of the figure. These are confidence intervals intended to reflect the amount of error (and imperfect reliability) affecting Sarah's percentile scores. As is true in the simpler printout in Figure B.5, the graph squishes middle-range percentile ranks close together and spreads the high and low percentiles farther apart as a way of reflecting the scores' underlying normal distribution.

Helping Parents Understand Standardized Test Results

As noted in Chapter 10, one of the stipulations of the Family Educational Rights and Privacy Act (FERPA; passed by the U.S. Congress in 1974) is that school personnel must present and interpret test scores in a way that parents can understand. Given the complexity of most standardized test reports these days, that's a pretty tall order. Many parents are familiar with percentile ranks, and many others can easily grasp the notion of a percentile if it's explained to them. But we authors must say that, in our own experiences, explaining standard scores so that parents truly understand them can be a bit of a challenge, especially when the parents have little or no background in statistics. (And let's face it, most parents don't have such a background!) The simple graphic in Figure B.7 can help parents make better sense of stanines and NCE scores by seeing how these scores are related to simple percentages—in particular, to the relative proportions of students getting scores in different ranges.

Despite the considerable data that standardized tests can yield, educators and parents must remember that students' scores on these tests are, at best, only *imprecise estimates* of what students generally know and can do, and they may have little or no validity for certain students. We must all be *extremely cautious*—and occasionally downright skeptical—in our interpretations of students' standardized test results, and we mustn't place too much stock in the *exact* numbers we see in test reports.

Glossary

abstract thinking Thinking about objects, principles, or ideas that are not concrete physical objects or experiences.

academic engagement Extent of behavioral, cognitive, and emotional involvement in an academic activity.

accommodation Process of dealing with a new object or event by either modifying an existing scheme or forming a new one.

accountability Mandated obligation of teachers and other school personnel to accept responsibility for students' performance on high-stakes assessments.

achievement goal theory Theoretical perspective that explains individuals' motivations by examining whether they engage in an activity because they want to develop or to demonstrate competence; these goals include mastery goals, performance-approach goals, and performance-avoidance goals.

action research Research conducted by teachers and other school personnel to address issues and problems in their own schools or classrooms.

activity level Extent to which one has a high level of physical activity.

adaptive assessment Assessment instrument in which students' performance on early items determines which items are presented subsequently; often administered via computer technology.

advance organizer Introduction to a lesson that provides an overall organizational scheme for the lesson.

age-equivalent score Test score matching a particular student's performance with the average performance of students of a certain age.

algorithm Prescribed sequence of steps that guarantees a correct problem solution.

antecedent stimulus Stimulus that tends to evoke a particular kind of response.

anxiety Feeling of uneasiness and apprehension about a situation with an uncertain outcome.

APA style Rules and guidelines on referencing, editorial style, and manuscript format prescribed by the American Psychological Association.

applied behavior analysis (ABA) Systematic application of stimulus–response principles to address a chronic behavior problem.

apprenticeship Mentorship in which a novice works intensively with an expert to learn how to perform complex new skills.

assessment Process of observing a sample of a student's behavior and drawing inferences about the student's knowledge, skills, and/or attitudes.

assessment bias Extent to which assessment tasks either unfairly penalize or offend some students because of their membership in a particular group (e.g., students of a particular gender or ethnic group).

assimilation Process of dealing with an object or event in a way that is consistent with an existing scheme.

astrocyte Star-shaped brain cell involved in learning and memory; has chemically mediated connections with many other astrocytes and neurons.

attention Focusing of mental processing on particular stimuli.

attention-deficit hyperactivity disorder (ADHD) Disorder marked by inattention, hyperactivity, impulsive behavior, or some combination of these characteristics.

attribution theory Theoretical perspective that explains how peoples' motivation is affected by their causal explanation for an event, such as why they succeeded or failed at an activity.

authentic activity Task or activity similar to one students might encounter in the world outside of school.

authentic assessment Assessment of students' knowledge and skills in a context similar to one that might be found in the outside world.

authoritarian parenting Parenting style characterized by rigid rules and expectations for behavior that children are asked to obey without question.

authoritative parenting Parenting style characterized by emotional warmth, high standards for behavior, explanation and consistent enforcement of rules, inclusion of children in decision making, and reasonable opportunities for autonomy.

autism spectrum disorders Disorders marked by impaired social cognition, social skills, and social interaction, presumably due to a brain abnormality; extreme forms often associated with significant cognitive and linguistic delays and highly unusual behaviors.

automaticity Ability to respond quickly and efficiently while mentally processing or physically performing a task.

backward design Approach to instructional planning in which a teacher first determines the desired end result of instruction (i.e., what knowledge and skills students should acquire), then identifies appropriate assessments, and finally determines appropriate instructional strategies.

basic interpersonal communication skills (BICS) Proficiency in English sufficient for day-to-day conversation with English speakers but *not* sufficient for academic success in an English-only curriculum.

behaviorism Theoretical perspective in which learning and behavior are described and explained in terms of stimulus–response relationships.

belongingness General sense that one is an important and valued member of the classroom.

bilingual education Second-language instruction in which students are instructed in academic subject areas in their native language while simultaneously being taught to speak and write in the second language.

Bloom's taxonomy Taxonomy of six cognitive processes, varying in complexity, that lessons might be designed to foster.

bully Person who frequently threatens, harasses, or causes injury to particular peers.

Cattell–Horn–Carroll theory of cognitive abilities Theoretical perspective that intelligence is comprised of three strata, including general intelligence, specific abilities (e.g., processing speed, general world knowledge), and very specific abilities (e.g., reading speed, mechanical knowledge).

central executive Component of human memory that oversees the flow of information throughout the memory system.

cerebral cortex Upper and outer parts of the human brain, which are largely responsible for conscious and complex cognitive processes.

checklist List of characteristics that good performance on assessment tasks should have.

class inclusion Recognition that an object simultaneously belongs to a particular category and to one of its subcategories.

classical theory of concepts Theoretical perspective that concepts can be defined precisely with rules that determine whether an object is a member of a category or not.

classroom climate Overall psychological atmosphere of the classroom.

classroom management Establishment and maintenance of a classroom environment conducive to students' learning and achievement.

clinical method Procedure in which an adult presents a task or problem and asks a child a series of questions about it, tailoring later questions to the child's responses to previous ones.

clique Moderately stable friendship group of perhaps four to eight members.

cognition Broad term that refers to any type of mental process, intellectual activity, or information processing in the mind, such as thinking, reasoning, remembering, perceiving, or imagining.

cognitive academic language proficiency (CALP) Mastery of English vocabulary and syntax sufficient for English learners to achieve academic success in an English-only curriculum.

cognitive apprenticeship Mentorship in which an expert and novice work together on a challenging task, with the expert giving guidance about how to think about the task.

cognitive development Developmental changes in thinking, reasoning, and language.

cognitive developmental theory Theoretical perspective that proposes that one or more aspects of development can be characterized by a predictable sequence of stages.

cognitive dissonance Feeling of mental discomfort caused by new information that conflicts with current knowledge or beliefs.

cognitive load Cognitive burden that a particular learning activity places on working memory at any one time; includes both the amount of information learners must simultaneously think about and the specific cognitive processes learners must engage in to understand what they're studying.

cognitive load theory Theoretical perspective that instruction should be designed to manage the cognitive load on a learner's working memory in order to promote effective learning.

cognitive modeling Verbalizing thoughts and reasons for actions while demonstrating a behavior for someone else.

cognitive process Particular way of thinking about and mentally responding to a certain event or piece of information.

cognitive psychology Theoretical perspective that focuses on the mental processes underlying learning and behavior (such as perception, memory, and reasoning) and includes information processing theory, individual constructivism, and related perspectives.

cognitive styles Individual differences in the ways that people perceive, think, solve problems, learn, and relate to others; also called *learning styles* or *learning preferences*.

cognitive tool Concept, symbol, strategy, procedure, or other culturally constructed mechanism that helps people think about and respond to situations more effectively.

color-blind racial ideology (CBRI) Ideology that (1) denies potential racial differences by emphasizing the sameness among races and (2) denies that racism exists because everyone in the society has the same opportunities.

Common Core State Standards Set of standards that most U.S. states have adopted to guide instruction and assessment in English-language arts and mathematics (see corestandards.org).

community of learners Class in which the teacher and students actively and collaboratively work to create a body of knowledge and to help one another learn.

community of practice Group of people who share common interests and goals and regularly interact and coordinate their efforts in pursuit of those interests and goals.

complex cognitive processes Cognitive processes in which learners go beyond the specific information they're studying, perhaps to apply it to a new situation, use it to solve a problem or create a product, or critically evaluate it; example processes include self-regulation, metacognition, transfer, problem solving, creativity, and critical thinking.

comprehension monitoring Process of checking oneself to be sure one understands and can recall newly acquired information.

computer-based instruction (CBI) Approach to instruction in which academic instruction is provided by means of specially designed computer software, apps, and/or websites.

computer-supported collaborative learning (CSCL) Student-directed approach to instruction in which students communicate and collaborate via computer technology and the Internet.

concept Mental grouping of objects or events that have something in common.

concept map Diagram of concepts and their interrelationships; used to enhance learning and memory of a topic.

conceptual change Significant revision of one's existing beliefs about a topic, enabling new and discrepant information to be better understood and explained.

conceptual understanding Meaningfully learned and well-integrated knowledge about a topic, including many logical connections among specific concepts and ideas.

concrete operations stage Piaget's third stage of cognitive development, in which adult-like logic appears but is limited to concrete reality.

confidence interval Range around an assessment score reflecting the amount of error that might have influenced the student's performance on this particular occasion (reflecting imperfect reliability of the assessment instrument).

confirmation bias Tendency to seek information that confirms rather than discredits one's current beliefs.

conservation Realization that if nothing is added or taken away, an amount stays the same regardless of alterations in shape or arrangement.

consolidation Neurological process in which newly acquired knowledge is firmed up in the brain; often takes several hours, sometimes even longer.

construct validity Extent to which an assessment instrument measures a particular human trait or characteristic.

construction Mental process in which a learner takes many separate pieces of information and uses them to build an overall understanding or interpretation.

constructivism Theoretical perspective proposing that learners construct (rather than passively absorb) knowledge from their experiences.

content validity Extent to which an assessment includes a representative sample of tasks within the content domain being assessed.

content-area standards General statements regarding the knowledge and skills that students should gain and the characteristics that their accomplishments should reflect in a particular academic discipline.

contextual theory Theoretical perspective that focuses on how people's general physical, social, and/or cultural surroundings support their learning, development, and behavior.

contingency Situation in which one event (e.g., reinforcement) happens only after another event (e.g., a specific response) has already occurred; one event is *contingent* on the other's occurrence.

contingency contract Written agreement between teacher and student that identifies behaviors the student will exhibit and the reinforcers that will follow.

control group Group of people in a research study who are given either no intervention or a placebo treatment that is unlikely to have an effect on the dependent variable.

controversial student Student whom some peers strongly like and other peers strongly dislike.

conventional morality Uncritical acceptance of society's conventions regarding right and wrong behaviors.

conventional transgression Action that violates a culture's general expectations regarding socially appropriate behavior.

convergent thinking Process of pulling several pieces of information together to draw a conclusion or solve a problem.

cooperative learning Approach to instruction in which students work with a small group of peers to achieve a common goal and help one another learn.

core goal Long-term goal that drives much of what a learner does.

co-regulated learning Process through which an adult and child share responsibility for directing various aspects of the child's learning.

correlation Extent to which two variables are associated, such that when one variable increases, the other either increases or decreases somewhat predictably.

correlation coefficient Statistic that indicates the strength and direction of an association between two variables.

correlational study Research study that explores possible relationships among two or more variables.

covert strategy Learning strategy that is strictly mental (rather than behavioral) in nature and thus cannot be directly observed by others.

creativity Process of generating novel ideas (in the form of responses, solutions, products, concepts, or approaches) that meet the constraints of the task.

criterion-referenced score Assessment score that specifically indicates what a student knows or can do.

critical thinking Process of evaluating the accuracy, credibility, and worth of information and lines of reasoning.

crowd Large, loose-knit social group that shares certain common interests and attitudes.

crystallized intelligence Knowledge and skills accumulated from prior experience, schooling, and culture.

cueing Use of simple signals to indicate that a certain behavior is desired or that a certain behavior should stop.

cultural mismatch Situation in which a child's home and school cultures hold conflicting expectations for the child's behavior.

culturally responsive teaching Use of instructional strategies that build on students' existing knowledge and skills and that accommodate their accustomed ways of behaving and learning.

culture Behaviors and belief systems that members of a long-standing social group share and pass along to successive generations.

culture of transfer Learning environment in which applying school subject matter to diverse situations and topics is both the expectation and the norm.

culture shock Sense of confusion when a student encounters a culture with behavioral expectations very different from those learned previously in other contexts.

curriculum-based measurement (CBM) Use of frequent assessments to track students' progress in acquiring basic skills; assessments are typically quite short (e.g., 1–4 minutes) and each focus on a specific skill.

cyberbullying Engaging in psychological aggression via wireless technologies or the Internet.

debilitating anxiety Anxiety of sufficient intensity that it interferes with performance.

decay Gradual weakening of information stored in long-term memory, especially if the information is used infrequently or not at all.

declarative knowledge Knowledge concerning the nature of how things are, were, or will be.

delay of gratification Ability to forego small, immediate reinforcers to obtain larger ones at a later time.

descriptive study Research study that enables researchers to draw conclusions about the current state of affairs regarding an issue but not about correlation or cause-and-effect relationships.

development Orderly, enduring changes that occur over the lifespan.

developmental milestone Appearance of a new, developmentally more advanced behavior.

diagnostic assessment Assessment conducted before instruction to identify students' existing knowledge and skills.

differentiated instruction Practice of individualizing instructional methods—and possibly also individualizing specific content and instructional goals—to align with each student's existing knowledge, skills, and needs.

direct instruction Approach to instruction in which a variety of techniques (e.g., explanations, questions, guided and independent practice) are used in a fairly structured manner to promote learning of fundamental knowledge and skills.

discovery learning Approach to instruction in which students construct their own knowledge about a topic through firsthand interaction with an aspect of their environment.

discussion Approach to instruction in which the teacher and students talk to each other with the purpose of exploring or developing students' knowledge, skills, and/or feelings.

disequilibrium State of being unable to address new events with existing schemes; typically accompanied by mental discomfort.

disposition General inclination to approach and think about learning and problem-solving tasks in a particular way; typically has a motivational component in addition to cognitive components.

distributed cognition Enhancement of thinking and problem solving through the use of physical objects (e.g., technology), the cognitive tools of one's culture, and/or social collaboration and support; also known as *distributed intelligence*.

distributed intelligence Enhancement of thinking and problem solving through the use of physical objects (e.g., technology), the cognitive tools of one's culture, and/or social collaboration and support; also known as *distributed cognition*.

distributed knowledge Distribution of expertise across various members of a social group, such that group members must rely on one another to maximize their personal and collective success.

divergent thinking Process of generating many different ideas from a single starting point.

divided attention Ability to pay attention to two or more streams of information at the same time.

dynamic assessment Systematic examination of how easily and in what ways a student can acquire new knowledge or skills, perhaps within the context of instruction or scaffolding.

ecological systems theory Theoretical perspective emphasizing the various layers of a learner's social environment (family, community, etc.) and their interactive effects in influencing the learner's development.

educational psychology Academic discipline that (1) systematically studies the nature of human learning, development, motivation, and related topics and (2) applies its research findings to the identification and development of effective instructional practices.

effortful control Extent to which one can sustain attention, inhibit impulses, and engage in planning.

elaboration Cognitive process in which learners embellish on new information based on what they already know.

emotion regulation Process of monitoring, evaluating, and modifying one's emotional reactions to accomplish one's goals.

emotions Conscious, subjectively experienced reactions to objects or events that are accompanied by physiological and behavioral changes in the body.

emotional and behavioral disorders Emotional states and behavior patterns that consistently and significantly disrupt academic learning and school success.

empathy Experience of sharing the same feelings as someone in unfortunate circumstances.

encoding Mentally changing the format of new information in order to remember it more easily.

engineering design Process that includes devising a system, component, or process that meets a human need.

English learner (EL) (a.k.a., English language learner) School-age child who is not fully fluent in English because of limited exposure to English prior to enrollment in an English-speaking school.

environmental sensitivity Extent to which people are able to perceive and process environmental stimuli.

epistemic belief Belief about the nature of knowledge or knowledge acquisition.

equilibration Movement from equilibrium to disequilibrium and back to equilibrium, a process that promotes the development of more complex thought and understandings.

equilibrium State of being able to address new events with existing schemes.

ethnic group People who have common historical roots, values, beliefs, and behaviors and who share a sense of interdependence.

ethnic-racial identity Awareness of one's membership in a particular ethnic, racial, or cultural group, and one's willingness to adopt behaviors characteristic of the group.

ETS score Standard score with a mean of 500 and a standard deviation of 100.

Every Student Succeeds Act (ESSA) U.S. legislation passed in 2015 that mandates frequent assessments of students' progress in language arts, math, and science.

evidence-based practice Instructional method or other classroom strategy that research has consistently shown to bring about significant gains in students' development and/or academic achievement.

exemplar theory Theoretical perspective that people compare objects to specific examples (exemplars) in their minds to determine whether an object fits in a category or not.

expectancy-value theory Theoretical perspective in which students' expectancies for success and values (utility value, attainment value, intrinsic interest value, and cost) for an activity predict their choices, effort, and performance in that activity.

experimental study (experiment) Research study that involves both (1) the manipulation of one variable to determine its possible effect on another variable and (2) control of additional variables that might have an impact on the outcome; potentially allows conclusions about cause-and-effect relationships.

expertise Extensive and well-integrated knowledge of a topic that comes from many years of study and practice.

externalizing behavior Symptom of an emotional or behavioral disorder that has a direct effect on other people (e.g., aggression, lack of self-control).

extinction Gradual disappearance of an acquired response; in the case of a response acquired through operant conditioning, it results from repeated lack of reinforcement for the response.

extrinsic motivation Motivation to engage in an activity because it leads to a desired reward or consequence.

extrinsic reinforcer Reinforcer that comes from the outside environment, rather than from within the learner.

facilitating anxiety Level of anxiety (usually relatively low) that enhances performance.

Family Educational Rights and Privacy Act (FERPA) U.S. legislation passed in 1974 that gives students and parents access to school records and limits other people's access to those records.

fixed mindset Belief that intelligence is a distinct ability that is relatively permanent and unchangeable.

flipped classroom Approach to instruction in which students engage in student-directed instructional approaches during class time and watch teacher-made videos or complete readings outside of class time.

flow Intense form of intrinsic motivation, involving complete absorption in and concentration on a challenging activity.

flow theory Theoretical perspective that describes the characteristics of experiences in which one is completely focused on and absorbed in a challenging activity.

fluid intelligence Ability to acquire knowledge quickly and adapt effectively to new situations.

formal assessment Preplanned, systematic attempt to ascertain what students have learned.

formal operations stage Piaget's fourth and final stage of cognitive development, in which logical reasoning processes are applied to abstract ideas as well as to concrete objects and more sophisticated scientific and mathematical reasoning processes emerge.

formative assessment Assessment conducted during instruction to ascertain students' progress.

functional analysis Examination of inappropriate behavior and its antecedents and consequences to determine one or more purposes (functions) that the behavior might serve for the learner.

g Theoretical general factor in intelligence that influences one's ability to learn and perform in a wide variety of contexts.

gang Cohesive social group characterized by initiation rites, distinctive colors and symbols, territorial orientation, and feuds with rival groups.

gender identity Individual's internal sense of being male, female, or something else.

gender schema Self-constructed, organized body of beliefs about characteristics and behaviors of male, female, and transgender individuals.

general transfer Instance of transfer in which the original learning task and the transfer task are different in both content and structure.

giftedness Unusually high ability in one or more areas, to such a degree that students require special educational services to help them meet their full potential.

goal-setting theory Theoretical perspective that describes the types of goals that are most likely to lead to high performance.

goodness of fit Situation in which classroom conditions and expectations are compatible with students' temperaments and personality characteristics.

grade-equivalent score Test score matching a particular student's performance with the average performance of students at a certain grade level.

growth mindset Belief that intelligence can and does improve with effort and practice.

guided participation Child's performance, with guidance and support, of an activity in the adult world.

guilt Feeling of discomfort about having caused someone else pain or distress.

heuristic General strategy that facilitates problem solving or creativity but does not always yield a successful outcome.

high-stakes testing Practice of using students' performance on a single assessment to make major decisions about students, school personnel, or overall school quality.

higher-level question Question that requires students to use previously learned information in a new way, that is, to engage in one or more complex cognitive processes.

homework Approach to instruction in which students work on assignments outside of regular class time.

hostile attributional bias Tendency to interpret others' behaviors as reflecting hostile or aggressive intentions.

hot cognition Learning or cognitive processing that is emotionally charged.

humanism Theoretical perspective that people have many uniquely human qualities propelling them to engage in productive, worthwhile activities.

hypothetical reasoning Thinking logically about things that may or may not be true.

identity Self-constructed definition by individuals that includes who they think they are, what they find important, and what they want to accomplish in life.

ill-defined problem Problem in which the desired goal is unclear, some information needed to solve the problem is missing and/or several possible solutions to the problem may exist.

illusion of learning Believing that one has learned something that one actually has *not* really learned.

imaginary audience Belief that one is the center of attention in any social situation.

incentive Hoped-for, but not guaranteed, future consequence of behavior.

inclusion Practice of educating all students, including those with severe and multiple disabilities, in neighborhood schools and general education classrooms.

incompatible behaviors Two or more behaviors that cannot be performed simultaneously.

individual constructivism Theoretical perspective that focuses on how learners each construct their own idiosyncratic meanings from their experiences.

individual interest Long-term, relatively stable interest in a particular topic or activity.

Individuals with Disabilities Education Act (IDEA) U.S. legislation granting educational rights to people with cognitive, emotional, or physical disabilities from birth until age 21; initially passed in 1975, it has been amended and reauthorized several times and is now officially known as the Individuals with Disabilities Education Improvement Act.

induction Explanation of why a certain behavior is unacceptable, often with a focus on the pain or distress that someone has caused another.

informal assessment Assessment that results from a teacher's spontaneous, day-to-day observations of how students behave and perform at school.

information processing theory Theoretical perspective that focuses on the specific ways in which learners mentally think about, or process, new information and events.

inner speech Process of talking to and guiding oneself mentally rather than aloud.

inquiry-based learning Approach to instruction in which students answer questions through investigations, such as by conducting experiments, making observations, or collecting information, with the ultimate goal of identifying underlying concepts or principles.

in-school suspension Consequence for misbehavior in which a student is placed in a quiet, boring room within the school building, typically to do schoolwork, under close adult supervision.

instructional goal Desired long-term outcome of instruction.

instructional objective Desired outcome of a lesson or unit.

instructional simulation Approach to instruction that simulates real-world activities to provide learners with experiences that promote learning.

intellectual disability Disability characterized by significantly below-average general intelligence and deficits in adaptive behavior, both of which first appear in infancy or childhood; previously termed *mental retardation*.

intelligence Ability to apply prior knowledge and experiences flexibly to accomplish challenging new tasks; involves many different mental processes and may vary in nature depending on one's culture.

intelligence test General measure of current cognitive functioning; often used to predict academic achievement over the short run.

intelligent tutoring system Computer software program that provides individually tailored instruction and practice, supplemented with ongoing guidance and feedback, related to a particular topic and set of skills.

interest Perception that a particular topic or activity is intriguing and enjoyable; typically accompanied by both cognitive engagement and positive affect.

interest theories Theoretical perspectives that explain the factors that affect and that are affected by short-term *situational interests* and longer-term *individual interests*.

interleaved practice Strategy of intermixing practice problems with problems from previous lessons.

internalization Process through which learners gradually incorporate socially based activities into their internal cognitive processes.

internalizing behavior Symptom of an emotional or behavioral disorder that adversely affects the student with the disorder but has little or no direct effect on other people (e.g., depression, social withdrawal).

intrinsic motivation Motivation to engage in an activity because it is enjoyable and interesting.

intrinsic reinforcer Reinforcer provided by oneself or inherent in a task being performed.

IQ score Score on an intelligence test, determined by comparing a person's performance on the test with the performance of others in the same age group; for most tests, it's a standard score with a mean of 100 and a standard deviation of 15.

IRE cycle Adult–child interaction marked by adult initiation (usually a question), child response, and adult evaluation.

keyword method Mnemonic technique in which a learner mentally connects two ideas by forming a visual image of one or more concrete objects (*keywords*) that either sound similar to, or symbolically represent, those ideas.

knowledge base Learner's existing knowledge about specific topics and the world in general.

learned helplessness General, fairly pervasive belief that one is incapable of accomplishing tasks and has little or no control over the environment.

learner-centered instruction Approach to teaching in which instructional strategies are chosen largely on the basis of students' existing abilities, predispositions, and needs.

learning Long-term change in mental representations or associations due to experience.

learning disability Deficiency in one or more specific cognitive processes despite relatively normal cognitive functioning in other areas.

learning strategy Intentional use of one or more specific cognitive processes for a particular learning task.

lecture Approach to instruction in which a teacher presents information to students.

lecture-discussion Approach to instruction in which a teacher presents information and also asks students questions that lead to discussions.

legitimate peripheral participation Initial involvement at the fringe of a community of practice as a way of gaining knowledge and skills related to the group's typical ways of doing things.

lesson plan Predetermined guide for a lesson that identifies instructional goals or objectives, necessary materials, instructional strategies, and one or more assessment methods.

logical consequence Unpleasant consequence that follows naturally or logically from a student's misbehavior.

long-term memory Component of memory that holds knowledge and skills for a relatively long time.

lower-level question Question that requires students to retrieve and recite what they have learned in essentially the same form they learned it.

mastery goal Desire to develop competence by acquiring new knowledge or mastering new skills.

mastery learning Approach to instruction in which students learn one topic thoroughly before moving to a subsequent one.

mastery orientation General, fairly pervasive belief that one is capable of accomplishing challenging tasks.

maturation Gradual, genetically driven acquisition of more advanced physical and neurological capabilities over the course of childhood and adolescence.

mean (M) Mathematical average of a set of scores.

meaningful learning Cognitive process in which a learner relates new information to prior knowledge.

mediated learning experience Social interaction in which an adult helps a child interpret a phenomenon or event in particular (usually culturally appropriate) ways.

memory Ability to mentally "save" newly acquired information and behaviors; also, the mental "location" where such information is saved.

mental set Inclination to represent a problem or situation in a way that excludes potential solutions.

metacognition Knowledge and beliefs about one's own cognitive processes, as well as conscious attempts to engage in behaviors and thought processes that increase learning and memory.

mind wandering Engaging in internal thoughts that are unrelated to your present environment.

mirror neuron Neuron in the brain that fires in either of two situations: (1) when a person is performing a particular behavior or (2) when the person sees someone else perform the behavior.

misbehavior Action that disrupts learning and planned classroom activities, puts students' physical safety or psychological well-being in jeopardy, or violates basic moral standards.

misconception Belief that is inconsistent with commonly accepted and well-validated explanations of certain phenomena or events.

mixed methods research Research yielding information that includes both quantitative and qualitative findings.

mnemonic Memory aid or trick designed to help students learn and remember one or more specific pieces of information.

model Real or fictional individual who demonstrates a behavior that learners might emulate; alternatively, a set of instructions for successfully executing the behavior.

modeling Demonstrating a behavior for another person *or* observing and imitating another person's behavior.

moral dilemma Situation in which two or more people's rights or needs may be at odds and the morally correct action is not clear-cut.

moral transgression Action that causes harm or infringes on the needs or rights of others.

morality One's general standards regarding right and wrong behaviors.

motivation Inner state that energizes, directs, and sustains behavior.

multicultural education Instruction that integrates perspectives and experiences of numerous cultural groups throughout the curriculum.

multiple intelligences theory Theoretical perspective that portrays intelligence as being comprised of eight or more relatively independent abilities, with most people being more "intelligent" in some abilities than in others.

MUSIC Model of Motivation Theoretical model that groups motivation strategies into five categories using the acronym MUSIC: eMpowerment, Usefulness, Success, Interest, and Caring.

myelination Growth of a fatty coating (myelin) around neurons, enabling faster transmission of messages.

nativist theory Theoretical perspective proposing that the foundations of some behaviors and abilities are biologically built-in traits and possibly unique to the human species.

NCE score Standard score with a mean of 50 and a standard deviation of 21.06; an NCE score of 1 equals a percentile rank of 1, and an NCE score of 99 equals a percentile rank of 99.

need for arousal Ongoing need for either physical or cognitive stimulation.

need for autonomy Basic need to believe that one can act with a full sense of willingness and volition.

need for competence Basic need to believe that one can deal effectively with one's environment.

need for relatedness Basic need to feel socially connected to others and to secure others' love and respect.

negative reinforcement Phenomenon in which a response increases as a result of the removal (rather than presentation) of a stimulus.

negative transfer Phenomenon in which something learned at one time interferes with learning or performance at a later time.

neglected student Student about whom most peers have no strong feelings, either positive or negative.

neuron Cell in the brain or another part of the nervous system that specializes in transmitting information to other cells.

Next Generation Science Standards Set of standards that some U.S. states have adopted to guide instruction and assessment in science (see nextgenscience.org).

niche-picking Tendency for learners to seek out environmental conditions that are a good match with their existing characteristics and behaviors.

norm-referenced score Assessment score that indicates how a student's performance compares with the average performance of others.

normal distribution (normal curve) Theoretical pattern of educational and psychological characteristics in which most individuals score somewhere in the middle range and only a few score at either extreme.

operant conditioning Form of learning in which a response increases in frequency as a result of being followed by reinforcement.

organization Cognitive process in which a learner makes connections among new pieces of information (e.g., by forming categories, identifying hierarchies, determining cause-and-effect relationships).

overt strategy Learning strategy that is at least partially evident in the learner's behavior (e.g., taking notes during a lecture).

paper-and-pencil assessment Assessment in which students provide written responses to written items.

pedagogical content knowledge Knowledge about effective methods of teaching a specific topic or content area.

peer contagion Phenomenon in which certain behaviors, attitudes, and/or values spread from one child or adolescent to another, perhaps through modeling, peer reinforcement, social sanctions, or self-socialization.

peer mediation Approach to conflict resolution in which a student (acting as a mediator) asks peers in conflict to express their differing viewpoints and then work together to identify a reasonable resolution.

peer tutoring Approach to instruction in which one student provides instruction to help another student master a classroom topic.

percentile rank (percentile) Test score indicating the percentage of peers in the norm group getting a raw score less than or equal to a particular student's raw score.

performance assessment Assessment in which students demonstrate their knowledge and skills in a nonwritten fashion.

performance goal Desire to demonstrate competence and make a good impression.

performance-approach goal Desire to look good and receive favorable judgments from others.

performance-avoidance goal Desire not to look bad or receive unfavorable judgments from others.

permissive parenting Parenting style characterized by emotional warmth with few expectations and little control over children.

personal fable Belief that one is completely unlike anyone else and so cannot be understood by others.

personality Combination of traits that represents the typical ways in which a person behaves, thinks, and feels across situations and time.

perspective taking Ability to look at a situation from someone else's viewpoint.

physical aggression Action that can potentially cause bodily injury.

plasticity Ability to reorganize in order to adapt to changing circumstances; term often used in describing the human brain.

popular student Student whom many peers like and perceive to be kind and trustworthy.

portfolio Collection of a student's work compiled systematically over a lengthy time period.

positive behavioral interventions and supports (PBIS) Variation of traditional applied behavior analysis that involves identifying the purposes of undesirable behaviors and encouraging alternative behaviors that more appropriately accomplish those purposes.

positive psychology Theoretical perspective that focuses on human strengths and examines the good and functional aspects of humanity.

positive reinforcement Phenomenon in which a response increases as a result of the presentation (rather than removal) of a stimulus.

positive transfer Phenomenon in which something learned at one time facilitates learning or performance at a later time.

postconventional morality Thinking in accordance with self-constructed, abstract principles regarding right and wrong behaviors.

practicality Extent to which an assessment instrument or procedure is inexpensive and easy to use and takes only a small amount of time to administer and score.

preconventional morality Lack of internalized standards about right and wrong behaviors; decision making based primarily on what seems best for oneself.

predictive validity Extent to which scores on an assessment instrument predict performance in some future activity.

Premack Principle Opportunity to engage in a more valued activity can reinforce someone's engagement in a less valued activity.

preoperational stage Piaget's second stage of cognitive development, in which children can think about objects and events beyond their immediate experience but do not yet reason in logical, adult-like ways.

presentation punishment Punishment involving presentation of a new stimulus, presumably one a learner finds unpleasant.

primary reinforcer Consequence that satisfies a built-in biological or psychological need.

principle Description of the specific effects of certain variables on other variables or outcomes, such as those related to learning or development.

prior knowledge activation Process of reminding learners of things they already know relative to a new topic.

proactive aggression Deliberate aggression against another as a means of obtaining a desired goal.

problem solving Using existing knowledge or skills to address an unanswered question or troubling situation.

problem-based learning Approach to instruction in which students acquire new knowledge and skills as they work on an ill-defined problem similar to certain real-world problems.

procedural knowledge Knowledge concerning how to do something (e.g., a skill).

professional learning community Schoolwide collaborative effort in which teachers and administrators share a common vision for students' learning and achievement and work together to bring about desired student outcomes.

project-based learning Classroom activity in which students acquire new knowledge and skills while working on a complex, multifaceted project that yields a concrete end product.

prosocial behavior Behavior directed toward promoting the well-being of one or more other people rather than one's own well-being.

prototype theory Theoretical perspective that concepts are organized around a prototype that is an abstract, idealized example of the concept that has many of the typical features of the concept but that does not necessarily resemble any real-life example.

proximal goal Concrete goal that can be accomplished within a short time period; may be a stepping-stone toward a longer-term goal.

psychological aggression Action intended to cause mental anguish or reduce self-esteem.

psychological safety Extent to which students feel comfortable being themselves in the learning environment.

punishment Consequence that decreases the frequency of the response it follows.

qualitative research Research yielding nonnumeric data that typically involves an in-depth examination of a complex phenomenon.

quantitative research Research yielding data that is inherently numerical in nature or can easily be reduced to numbers.

quasi-experimental study Research study that involves the manipulation of one variable to determine its possible effect on another variable, but without total control of additional variables that might have an impact on the outcome.

racial battle fatigue Physiological and psychological strain and energy lost by individuals in racial-ethnic minority groups who cope with racial microaggressions and racism.

racial ideology Worldview that includes someone's views about race, including how race functions in society and how racial information is interpreted.

racial microaggressions Brief, everyday, subtle insults that may be conveyed intentionally or unintentionally to individuals because they are members of a racial/ethnic minority group.

rating scale Numerical scale used to evaluate a performance or product on one or more characteristics.

raw score Assessment score based solely on the number or point value of correctly answered items.

reactive aggression Aggressive response to frustration or provocation.

reciprocal causation Mutual cause-and-effect relationships among environment, behavior, and personal variables, as these three factors influence learning and development.

reciprocal effects model Theoretical perspective that academic self-concept affects achievement and, then, achievement affects self-concept in a reciprocal manner over time.

reciprocal teaching Approach to teaching reading and listening comprehension strategies in which students learn to ask one another questions about textbook passages or literature.

reconstruction error Construction of a logical but incorrect "memory" by combining information retrieved from long-term memory with general knowledge and beliefs about the world.

recursive thinking Thinking about what other people may be thinking about oneself, possibly through multiple iterations.

reflective teaching Regular, ongoing examination and critique of one's assumptions and instructional strategies and revision of them as necessary to enhance students' learning and development.

rehearsal Cognitive process in which a learner repeats information over and over as a possible way of learning and remembering it.

reinforcer Consequence of a response that leads to increased frequency of the response; the act of following a response with a reinforcer is known as **reinforcement**.

rejected student Student whom many peers identify as being an undesirable social companion.

reliability Extent to which an assessment instrument yields consistent information about the knowledge, skills, or characteristics being assessed.

removal punishment Punishment involving removal of an existing stimulus, presumably one a learner finds desirable and doesn't want to lose.

resilient self-efficacy Belief that one can perform a task successfully even after experiencing setbacks.

resilient student Student who succeeds in school and in life despite exceptional hardships at home or in other important environmental contexts.

response Specific behavior that an individual exhibits.

response cost Loss either of a previously earned reinforcer or of an opportunity to obtain reinforcement.

response to intervention (RTI) Approach to diagnosing significant learning difficulties in which students are identified for in-depth assessment after failing to master certain basic skills despite evidence-based whole-class and small-group instructional practices.

retrieval Process of mentally "finding" information previously stored in memory.

retrieval cue Stimulus that provides guidance about where to "look" for a piece of information in long-term memory.

retrieval failure Inability to locate information that currently exists in long-term memory.

rote learning Cognitive process in which a learner tries to remember information in a relatively uninterpreted form, with little or no effort to make sense of or attach meaning to it.

rubric Two-dimensional table used to evaluate a multifaceted performance or product. On one dimension it includes two or more characteristics and on the other dimension it includes a rating scale and concrete criteria for rating the characteristics.

scaffolding Support mechanism that helps a learner successfully perform a challenging task.

schema Mental structure that includes a tightly organized set of facts about a specific concept or phenomenon.

scheme Mental structure that underlies physical or mental actions that are used repeatedly in response to the environment.

school climate Schoolwide atmosphere in which students feel physically and psychologically safe and also perceive a widespread commitment to everyone's academic progress and personal well-being.

schoolwide positive behavioral interventions and supports (SWPBIS) Systematic use of behaviorist principles to encourage and reinforce productive behaviors in all students; typically involves multiple layers of support in order to accommodate the varying needs and behavior patterns of different students.

script Schema that involves a predictable sequence of events related to a common activity.

secondary reinforcer Consequence that becomes reinforcing over time through its association with another reinforcer.

selective attention Ability to focus on some information while at the same time ignore other information in the environment.

self-concept One's self-perceptions of competence in a particular domain, such as mathematics or swimming.

self-conscious emotion Affective state based on self-evaluations regarding the extent to which one's actions meet society's standards for appropriate and desirable behavior; examples are pride, guilt, and shame.

self-determination theory Theoretical perspective that people have three basic psychological needs—the need for autonomy, competence, and relatedness—that are essential to their well-being and life satisfaction.

self-efficacy Belief that one is capable of executing certain behaviors or reaching certain goals.

self-esteem Emotional reaction to your overall evaluation of yourself as a person of worth.

self-evaluation Judgment of one's own performance or behavior.

self-fulfilling prophecy Expectation for an outcome that either directly or indirectly leads to the expected result.

self-handicapping Behavior that undermines one's own success as a way of protecting self-worth during potentially difficult tasks.

self-imposed contingency Self-reinforcement or self-punishment that follows a particular behavior.

self-instructions Instructions that one gives oneself while executing a complex task.

self-monitoring Observing and possibly recording one's own behavior to check progress toward a goal.

self-regulation Process of taking control of, monitoring, and evaluating one's own learning and behavior.

self-socialization Tendency to integrate personal observations and others' input into self-constructed standards for behavior and to choose actions consistent with those standards.

self-talk Process of talking to oneself as a way of guiding oneself through a task.

self-theories of intelligence Theoretical perspective that addresses students' beliefs about the nature of their intelligence.

self-worth theory Theoretical perspective that individuals try to establish and maintain their sense of personal value to themselves and others by demonstrating that they are good and competent people.

sense of community Shared belief that teacher and students have common goals, are mutually respectful and supportive, and all make important contributions to classroom learning.

sense of school community Shared belief that all faculty and students within a school are working together to help everyone learn and succeed.

sense of self Perceptions, beliefs, judgments, and feelings about oneself as a person; includes *self-concept* and *self-esteem*.

sensitive period Genetically determined age range during which a certain aspect of a child's development is especially susceptible to environmental conditions.

sensory register Component of memory that holds incoming information in an unanalyzed form for a very brief time (2 or 3 seconds at most, depending on the modality).

service-learning Approach to instruction in which (1) students provide service to meet a need in a community; (2) students learn by applying academic concepts, content, and/or skills to the service experience; and (3) students learn by reflecting on the service experience.

sexual orientation identity Component of identity that is based on an enduring pattern of emotional, romantic, and sexual attractions to males, females, or both sexes.

shame Feeling of embarrassment or humiliation after failing to meet certain standards for moral behavior.

shaping Process of reinforcing successively closer and closer approximations to a desired behavior.

situated learning and situated cognition Knowledge, behaviors, and thinking skills acquired and used primarily within certain contexts, with little or no retrieval and use in other contexts; sometimes involves dependence on physical or social support mechanisms available only in certain contexts.

situated motivation Motivation that emerges at least partly from conditions in a learner's immediate environment.

situational interest Interest evoked temporarily by something in the immediate environment.

sociability Extent to which one is eager to interact with others.

social and emotional learning Learning and development of social and emotional abilities that contribute to students' academic success and personal well-being.

social cognition Process of thinking about how other people are likely to think, act, and react.

social cognitive theory Theoretical perspective that focuses on how people learn by observing others; how internal behaviors, the environment, and behaviors affect one another; and how people's behaviors and motivations are affected by their self-efficacy, outcome expectations, goals, and values.

social constructivism Theoretical perspective that focuses on how learners construct their knowledge through their interactions with another person or a group of people.

social goal Desire related to establishing or maintaining relationships with other people.

social information processing Mental processes involved in making sense of and responding to social events.

socialization Process of molding children's behavior and beliefs to be appropriate for their cultural group.

society Large, enduring social group that is socially and economically organized and has collective institutions and activities.

sociocultural theory Theoretical perspective that emphasizes the importance of society and culture in promoting learning and development.

socioeconomic status (SES) One's general social and economic standing in society; encompasses family income, occupation, educational level, and related factors.

spacing effect Research finding that students perform better on tests when their study sessions are spaced over time.

specific transfer Instance of transfer in which the original learning task and the transfer task overlap in some way.

stage theory Theory that depicts development as a series of relatively discrete periods (*stages*).

standard deviation (SD) Statistic indicating the amount of variability characterizing a set of scores.

standard score Test score indicating how far a person's performance is from the mean with respect to standard deviation units.

standardization Extent to which assessments involve similar content and format and are administered and scored similarly for everyone.

standardized test Test developed by test construction experts and published for use in many different schools and classrooms.

stanine Standard score with a mean of 5 and a standard deviation of 2; always reported as a whole number.

stereotype Rigid, simplistic, and erroneous view of a particular group of people.

stereotype threat Threat that members of a stigmatized group can experience when they are in a situation in which they could confirm the negative stereotype of their group.

stimulus (pl. stimuli) Specific object or event that influences an individual's learning or behavior.

storage Process of mentally "putting" new information into memory.

student at risk Student who is on a path toward undesirable long-term developmental outcomes (e.g., failure to graduate, criminal behavior, suicide).

student-directed instruction Approach to instruction in which students have considerable control regarding the issues they address and the ways to address them.

students with disabilities Students who are different enough from peers that they may require require modifications to their learning goals (e.g., alternative texts or assignments) or accommodations that allow them to access class content (e.g., Braille, recorded texts, assistive technologies).

subculture Group that resists the ways of the dominant culture and adopts its own norms for behavior.

summative assessment Assessment conducted after instruction to assess students' final achievement.

superimposed meaningful structure Familiar shape, word, acronym, sentence, poem, or story imposed on information in order to facilitate recall.

sympathy Feeling of sorrow for another person's distress, accompanied by concern for the person's well-being.

synapse Microscopic gap across which one neuron regularly communicates with another; reflects an ongoing but modifiable connection between the two neurons.

synaptic pruning Universal process in brain development in which many previously formed synapses wither away.

synaptogenesis Universal process in brain development (especially in the first few years) in which many new synapses spontaneously form.

table of specifications Two-way grid indicating the topics to be covered in an assessment and the things students should be able to do with those topics.

task analysis Process of identifying the specific behaviors, knowledge, or cognitive processes necessary to master a particular topic or skill.

teachable moment Situation or event (often unplanned) in which students might be especially predisposed to acquire particular knowledge or skills.

teacher-directed instruction Approach to instruction in which the teacher is largely in control of the content and course of the lesson.

test anxiety Excessive anxiety about a particular test or about assessment in general.

testing effect Research finding that students are more likely to remember information from instruction over time when they practice actively retrieving the information.

testwiseness General test-taking know-how that enhances test performance.

theory Integrated set of variables and principles developed to explain the underlying mechanisms of a phenomenon; may be constructed jointly by researchers over time (see Chapter 1) or individually by a single learner (see Chapter 2).

theory of mind Self-constructed understanding of one's own and other people's mental and psychological states (thoughts, feelings, etc.).

time-out Consequence for misbehavior in which a student cannot interact with others and has no opportunity to receive the kinds of reinforcement to which classmates have access.

token economy Classroom strategy in which desired behaviors are reinforced by small, insignificant items (tokens) that learners can use to "purchase" a variety of other, more desirable reinforcers.

traits Typical ways in which a person behaves, thinks, and feels across situations and time.

transfer Phenomenon in which something a person has learned at one time affects how the person learns or performs in a later situation.

treatment group Group of people in a research study who are given a particular experimental intervention (e.g., a particular method of instruction).

triarchic theory of intelligence Theoretical perspective that people vary with respect to three relatively independent types of thinking: analytical intelligence, creative intelligence, and practical intelligence.

uninvolved parenting Parenting style characterized by low responsiveness and low control with few expectations for children.

universal (in development) Similar pattern in how children change and progress over time regardless of their specific environment.

validity Extent to which an assessment actually measures what it is intended to measure and allows appropriate inferences about the characteristic or ability in question.

value Belief that an activity has direct or indirect benefits.

value-added assessment Approach to evaluating teacher and school effectiveness based on students' academic progress rather than on absolute achievement levels.

variable Something that can vary over time, across contexts, or among individuals.

verbal mediator Word or phrase that forms a logical connection, or mental "bridge," between two pieces of information.

vicarious punishment Phenomenon in which a response decreases in frequency when another person is observed being punished for that response.

vicarious reinforcement Phenomenon in which a response increases in frequency when another person is observed being reinforced for that response.

visual imagery Cognitive process in which a learner forms a mental picture of an object or idea.

wait time Length of time a teacher pauses, after either asking a question or hearing a student's comment, before saying something.

webquest Structured activity in which students use a number of teacher- or expert-chosen websites to tackle an engaging, challenging task that requires complex cognitive processes (e.g., problem solving, critical thinking).

well-defined problem Problem in which the goal is clearly stated, all the information needed to solve the problem is present, and only one correct answer exists.

withitness Classroom management strategy in which a teacher gives the impression of knowing what all students are doing at all times.

working memory Component of memory that holds and actively thinks about and processes a limited amount of information for a short time.

worldview General, culturally based set of assumptions about reality that influence understandings of a wide variety of phenomena.

zone of proximal development (ZPD) Range of tasks that a child can perform with the help and guidance of others but cannot yet perform independently.

z-score Standard score with a mean of 0 and a standard deviation of 1.

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Chapter 1

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Appendix A

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