Although instruction is only one of many possible performance interventions, it is one of the most valuable, flexible, and frequently used. This chapter begins by placing instruction into the larger context of performance improvement. Next, it provides guides to planning instruction, with emphasis on selecting an appropriate lesson framework and then selecting appropriate methods and media within that framework. It also provides data on how different forms of instruction are being implemented currently in the workplace. It concludes with an overview of assessing learner outcomes and evaluating the impact of instruction.

INSTRUCTION AIMS AT IMPROVING CAPABILITIES

Instruction is a generic term referring to any effort to stimulate learning by the deliberate arrangement of conditions and experiences. Instruction is often viewed as covering a spectrum of efforts, ranging from very narrow in scope to very broad in scope and with purposes ranging from immediate application in the workplace to general personal development. Some advocate labeling the ends of the spectrum as "training" and "education." Stolovitch and Keeps (2002) refer to the aim of *training* as equipping learners to "consistently reproduce without variation" (p. 10). Figure skating, keyboarding, assembling a rifle, and remembering the multiplication tables are the sorts of repetitious, even mechanical,

abilities that they would consider the subjects of training. They define education, on the other end of the spectrum, as efforts to achieve the broader goal of developing generalized abilities with underlying mental models and value systems. Leading project teams, responding flexibly to customer needs, and devising strategic plans are the sorts of complex abilities that could be viewed as goals of education. However, such distinctions are somewhat arbitrary, and both training and education can take place either in the workplace or in formal education institutions. The more generic term, *instruction*, encompasses the whole range of types, and so it is used here as a common denominator that can be used in different sectors to refer to the whole range of learning interventions.

The critical attribute of instruction is that it is directed at facilitating *learning*. Learning is defined as a persisting or quasi-permanent change in capability resulting from the learner's experience and interaction with the world (Driscoll, 2000). Instruction, therefore, has as its goal a lasting change in capability. This is a crucial point in distinguishing instruction from merely providing information.

Instruction can be defined as the arrangement of purposive and controlled events that lead to the achievement of some learning goal. The learning goal can range from recalling information to comprehending and applying principles to attaining mastery of physical skills to new attitudes, or many other types of outcomes, as is discussed later.

Instruction Is One of Many Performance Interventions

Training does not take place in a vacuum, but some training professionals behave as though it does. The corporate training literature tends to place learning, instead of performance, at the center of the universe, ignoring the impact of the many environmental factors surrounding performance in the workplace. Some involved in business consulting began to see the larger picture more clearly in the 1970s as they saw instruction-only solutions fail to have lasting effects on persistent business problems. The view began to emerge that instruction alone seldom was sufficient to enable people to become effective achievers, in society or in the workplace. Over time, a new perspective emerged that the goal should be the improvement of human performance, which could best be accomplished by combining instructional interventions with noninstructional interventions, such as enhanced incentives, better tools, job aids, more supportive organizational structures, and so on.

This handbook is based on this newer view, the human performance technology perspective. One way of depicting this approach is through a visual model developed by Molenda and Pershing (2004), shown in Figure 15.1.

The major theme of the Strategic Impact Model is that instruction alone seldom solves performance problems. Almost all performance problems are rooted in more than one cause, and although training or education may be part of the solution, other interventions, such as job redesign, incentive adjustments, job

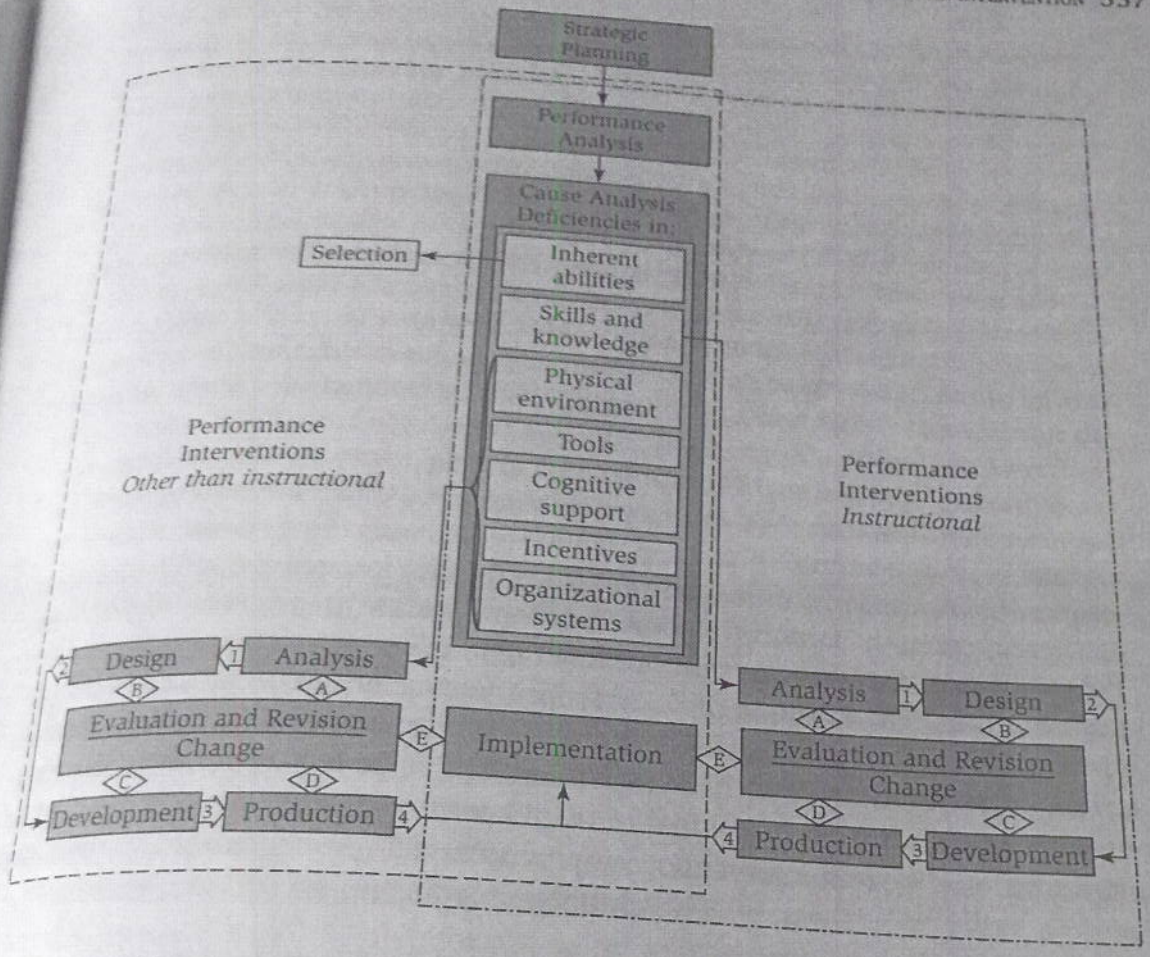

Figure 15.1. The Strategic Impact Model.

aids, better tools, or the like, are invariably required in order to make the instruction pay off. Instruction comes into play when people's performance is inhibited by the lack of needed knowledge or skills.

The model shows explicitly how instructional interventions and other sorts of performance interventions relate to each other, springing from a common performance analysis and converging in a common implementation phase. The model specifies an array of performance interventions, of which instruction is one. It incorporates the typology developed by Wile (1996) specifying seven sources of performance shortfalls: (1) inherent abilities, (2) skills and knowledge, (3) physical environment, (4) tools, (5) cognitive support, (6) incentives, and (7) organizational systems. This typology proposes that people fail to perform adequately in the workplace when they (1) lack the basic qualifications, such as intelligence, strength, or speed, to do the job; (2) lack the specific knowledge, skills, or attitudes; (3) are

given surroundings that are detrimental to good work: hot, noisy, crowded, unsafe, having poor ergonomics, and so on; (4) don't have proper tools to do the job: obsolete machines, clumsy computer systems with faulty software, and so on; (5) lack job aids or electronic help systems that can provide information as needed; (6) have insufficient incentives: money, benefits, recognition, advancement opportunities, and so on; (7) struggle in an organizational structure with poor communication, weak leadership, oppressive supervision, and the like; or (8) some combination of two or more deficiencies.

The point is to keep constantly in mind that instruction is the solution to only one type of problem, the problem of lack of the sorts of knowledge and skills that can be learned. In many cases, people know how to do something but do not have the incentive to do it. Or they have the knowledge and incentive but do not have the tools to do the job well. Training will not give them the motivation or the tools.

Although instruction is just one tool among many in the performance-improvement toolbox, it is an extremely vital one. When addressing business problems or opportunities, the capabilities of the workforce are often the most important component, so training or education are frequently the keystones of the change process. Even when other interventions are at the center of a change, there is almost always some need for training or education to support those other interventions. For example, if the wordprocessing system is upgraded, implementing a tool intervention, the users will need some orientation to and practice on the new hardware or software, which would be an instruction-type intervention. Or in a shift from individual to team-based operation, which would be an organizational system intervention, supervisors will need extensive reorientation of their skills and values, which would be an education-type intervention.

Distinguishing Information Giving from Instruction

Information consists of facts, news, comments, and similar representations of knowledge. Receivers are not responsible for measurable, specific actions or performance as a result of being presented with information. Often the presentation, which may be live, printed, or on the Internet, is general in content, and its purpose is to give an overview of ideas or subject matter: to generate interest, to provide background information, or to give procedural details. Information can be presented in a memo, in the classroom, in the textbook, or on the Web.

Giving information, the presentation of content, is much different from and less than instruction, the arrangement of information and events to facilitate learning. In other words, "telling ain't training" (Stolovitch and Keeps, 2002). Trainees should not be expected to be responsible for the retention or use of information they have only seen or heard. Meaningful understanding, retention, and use require instructional activities, including practice with feedback. Active engagement with the material by questioning it, discussing it, or applying it to practice

problems is the critical component of instruction. And, of course, there should be assessment to determine whether the trainees have mastered the objectives.

Distinguishing Cognitive Support from Instruction

It is easy to lose sight of the differences between two related interventions, cognitive support and instruction. Both deal with mental operations, and both may entail some presentation of information. In some cases, cognitive support can substitute for and complement instruction, but they are not equivalent.

An example can be found in the digital work environment, where people are near computer screens as they work. The computer system makes it possible to give them electronic help systems to provide advice as needed. The most common example is the help button built into most wordprocessing programs. If you don't know how to change the margins on a page you can click on the help button, type in some key words, and receive specific advice on how to do it.

Besides computer help systems, cognitive support is provided by other sorts of job aids, which can take many forms (Rossett and Gautier-Downes, 1991). A telephone directory saves you from having to memorize every phone number you might ever need. Tables in the back of statistics textbooks provide sequences of random numbers and charts to determine levels of significance. Nearly every appliance comes with a booklet of operating procedures; the power lawnmower has the most critical operation rules inscribed on the handle. Decision-tree charts can quickly help decide if an applicant qualifies for disability payments under Social Security.

There is a real distinction between mere cognitive support and instruction. The information provided by the job aid is not meant to be memorized. It is assumed that the user will look up the information on the rare occasions that it is needed. Alternatively, instruction is meant to lead to learning, a quasi-permanent change in capability. However, with computers, it has become possible to give ever more rapid and detailed advice in specific problem situations, to the point that the computer could be said to be coaching the user. This can lead into a grey area between telling and training. That is, with consistent use, the user could gradually internalize the advice of the help system, remembering more and more of the information provided. At this point the help system may be contributing to learning, although its aim is only to provide just-in-time assistance.

In the future, the line between cognitive support and instruction will be further blurred by the trend toward work-embedded training, instruction that occurs at the worksite. Employers are increasingly reluctant to take workers off the job for training, especially since there is a lot of evidence that the training that transfers to the job is the training that most closely resembles working conditions. Transfer of training increases as the practice is more realistic. So cognitive support may take on more and more of the traits of training, what some

refer to as just-in-time training, and training may incorporate more and more cognitive supports, especially in the form of electronic performance-support systems, such as help systems.

PLANNING INSTRUCTION

There are two broad types of guides to the preparation of effective, appealing instruction. First, there are instructional design and development models, procedural guides that focus on the steps to be followed by the planners as they proceed from conceptualizing the problem to evaluating the success of the intervention. Such models attempt to specify what decisions need to be made and in what order. Models that follow the systems approach generally recommend the sequence of analyze, design, develop, implement, and evaluate. Based on this sequence, the acronym ADDIE is often used to refer to this family of models.

Second, there are lesson frameworks or templates for the structure of instructional units, which might be referred to as a lesson, unit, module, program, or other term. These frameworks specify the nature and sequence of learning activities that should be incorporated into any effective lesson. A familiar example is the Events of Instruction framework (Gagne and Medsker, 1996). Such lesson frameworks are vitally useful during the design stage, when planners are deciding how to structure the lesson or series of lessons. Particular lesson frameworks are better suited to particular sorts of objectives, so the team's choice may be guided by the types of outcomes that are being pursued.

Instructional Design and Development Models

In the world of formal education, teachers usually plan their own lessons, select or develop the instructional materials, conduct the classroom activities, assign and grade practice exercises, and develop and administer the tests. Their planning processes tend to be informal and pragmatic.

Alternatively, in business, military, and other large organizations, instructional processes are often allotted to different specialists: managers and supervisors decide on training needs, analysts conduct surveys and observations, designers create lesson blueprints and tests, production specialists create materials, trainers conduct the lessons, and evaluators measure the results. Coordinating the whole process may be a small team headed by an instructional design-development specialist.

Furthermore, organizations other than formal education institutions tend to place a higher value on efficiency and efficacy. Instruction must accomplish its goals for the organization to survive. To do this, instructional planning procedures must be efficient, and their results must be demonstrable. In complex organizations with many units and even multiple sites there must be a

standardized process for carrying out instructional planning, to avoid expensive waste and duplication of effort. Thus, in organizational settings managers and training specialists prefer instructional design and development processes that follow a systems approach.

Systems Approach Models. The essence of the systems approach is to break the instructional planning process into small steps, to arrange the steps in logical order, then to use the output of each step as the input of the next. At the most general level, most planners agree that the major stages are analysis, design, development, implementation, and evaluation. Therefore, the outputs of the analysis stage—a description of the learners, the tasks to be learned, and a listing of the instructional objectives to be met—serve as input to the design stage, in which those descriptions and objectives are transformed into specifications or a blueprint for the lesson. Next, the design specifications serve as inputs to the development stage, where they are used to construct the materials and activities of the lesson. In the implementation stage the instructors, materials, activities, and learners come together to use the products of the development stage. Finally, those instructional activities are evaluated to determine whether the original objectives have been met and whether further instruction is necessary.

Another key attribute of the systems approach is a commitment to conducting evaluation and revision at each step of the design and development process. At each major decision point there is an opportunity to gather data to test that decision and other prior decisions to verify that the project is moving ahead toward a solution of the originally defined problem. If the results of a step are not satisfactory—for example, if trainees in a sample group are confused by the directions in the prototype of a new simulation exercise—then the design step must be repeated to find ways to clarify the directions. Of course, sometimes it happens that further analysis leads developers to shift the target objectives and continue in a different line. This process of repeating steps until satisfactory results are achieved is referred to as an *iterative* approach. Because of this commitment to evaluation at each phase of the process, the ADDIE label is a bit of a misnomer. Evaluation is not just conducted at the conclusion of training, but at the conclusion of each phase of development.

Numerous systems-approach models have been proposed. They differ in terms of the number of steps, the names of the steps, and the recommended sequence of functions. Gustafson and Branch's *Survey of Instructional Development Models* (1997) includes eighteen models. Their list is not intended to be exhaustive, but to be illustrative of the various ways of implementing a systems approach. Most organizations use their own home-grown model, often adapting or combining other models to guide their design and development activities.

The major steps of the systems approach are shown in Figure 15.2.

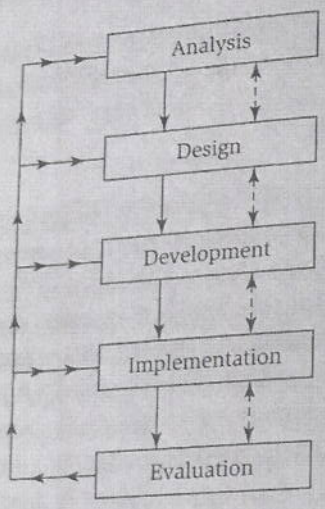

Figure 15.2. The Major Steps of the Systems Approach, Also Known as the "ADDIE Model."

Gagne, Wager, Golas, and Keller (2005) provide an expansion of these basic steps into a more detailed procedural guide:

I. Analysis
   a. First determine the needs for which instruction is the solution.
   b. Conduct an instructional analysis to determine the target cognitive, affective, and motor skill goals for the course.
   c. Determine what skills the entering learners are expected to have, and which will impact learning in the course.
   d. Analyze the time available and how much might be accomplished in that period of time. Some authors also recommend an analysis of the context and the resources available.

II. Design
   a. Translate course goals into overall performance outcomes and major objectives for each unit of the course.
   b. Determine the instructional topics or units to be covered and how much time will be spent on each.
   c. Sequence the units with regard to the course objectives.
   d. Flesh out the units of instruction, identifying the major objectives to be achieved during each unit.
   e. Define lessons and learning activities for each unit.
   f. Develop specifications for assessment of what students have learned.

III. Development
   a. Make decisions regarding the types of learning activities and materials.
   b. Prepare draft materials and/or activities.
   c. Try out materials and activities with target audience members.
   d. Revise, refine, and produce materials and activities.
   e. Produce instructor training or adjunct materials.

IV. Implement
   a. Market materials for adoption by instructors and potential learners.
   b. Provide help or support as needed.

V. Evaluate
   a. Implement plans for learner assessment.
   b. Implement plans for program evaluation.
   c. Implement plans for course maintenance and revision [p. 22].

The Dick and Carey Model. The most widely known and used ADDIE-type model is the one developed by Dick, Carey, and Carey (2005), shown in Figure 15.3. It is taught in most introductory courses at colleges and universities, it has been widely adopted, and it serves as the basis for other models. The model is typical of the overall planning process for instructional interventions in business, industry, government, and military training.

The Dick and Carey model begins with needs assessment to determine whether there is an ignorance problem. It then recommends analyzing the instructional content, the learners, the instructional context, and the context in which the skills will be applied. The initial analysis leads to the specification of objectives. A unique aspect of the Dick and Carey model is that it then recommends specifying the assessment instruments and methods aligned with those objectives, prior to designing the instruction. Their concept is that if the developers can be clear enough about what and how they will be testing, they will have a much better idea of what instructional strategies to select in the next step. After developing the instructional materials and procedures to implement the strategy, the model wraps up with evaluation and revision. It recommends first a formative evaluation of the instruction, small-scale testing of the early drafts of the lesson elements, followed by revision. Then a summative evaluation is conducted at the end of the actual lesson to determine whether the lesson achieved the expected learning results.

In the Dick and Carey model and other similar models the central focus is on the design phase, creating or selecting the methods and materials that will constitute the learner's experience. The steps of specifying objectives, selecting methods and media, and deciding on a lesson framework deserve special attention.

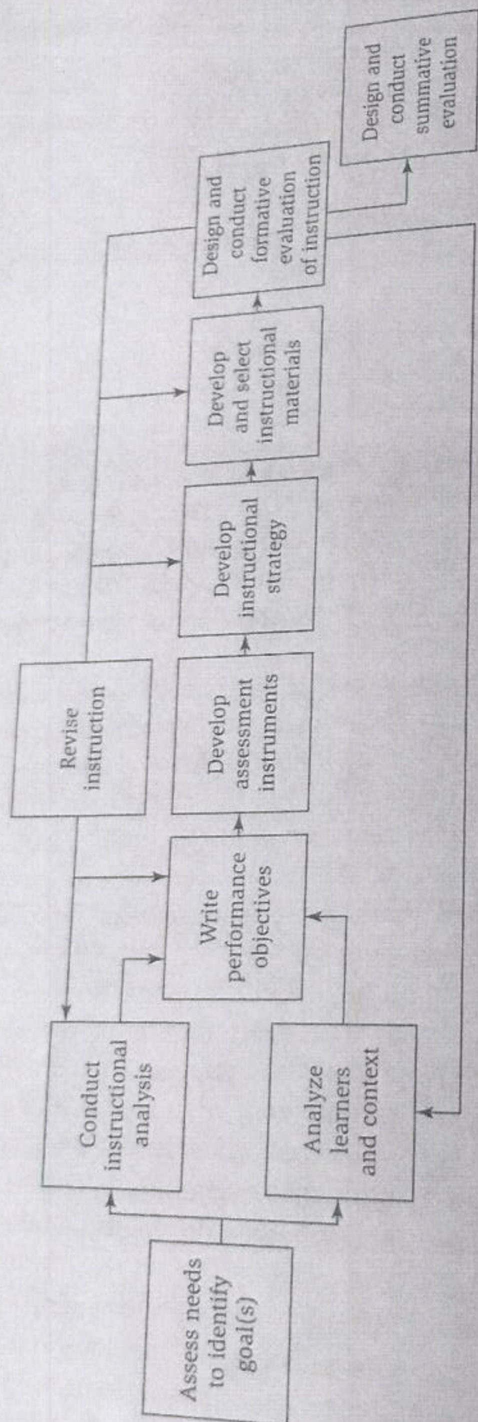

Figure 15.3. The Dick and Carey Model.

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Specifying Goals and Objectives

Goals for instruction are typically classified under three broad headings according to the type of learning being pursued: cognitive, affective, and psychomotor. This classification system was proposed in Bloom (1956) and has continued to be the most popular taxonomy. Cognitive refers to intellectual skills, from simple knowledge of facts through complex problem solving. Affective refers to attitudinal and emotional changes, from the formation of preferences to complex value systems. Psychomotor refers to physical skills, including manual dexterity, athletic skills, and the like; the stem *psycho-* is included in this term to remind us that many physical skills also entail mental activity. Romiszowski (1981) proposes a fourth category, interpersonal, to cover objectives related to human relations, such as those involved in teamwork, sales, coaching, and supervision.

Sometimes it is difficult to classify a learning goal or objective into just one category because most real-world instructional objectives have cognitive, affective, interpersonal, and psychomotor aspects. It is difficult to conceive of any instructional objective that doesn't have some mental component, emotional overtone, or observable physical activity. For example, if the goal is to have the learner write a memo in proper format, this does entail the physical act of writing or keyboarding. Nevertheless, the focus is on the mental skill of remembering and applying the proper format, so this would be classified as a cognitive, not psychomotor, objective. Thus instructional objectives are classified according to which category of skill is being emphasized at any given time. Advocates of a systematic approach place great importance on clear specification of objectives at an early stage in the planning process, as the selection of instructional methods is to a great extent dependent on exactly what learning objective is being pursued.

Instructional Methods and Media

During the design phase, planners have to decide what methods to employ and what media channels to use to carry out the instruction. The term *method* simply means a way of doing something. An *instructional* method is a way of instructing or a way of involving learners in a particular sort of teaching-learning activity. Instructional methods are defined here as teaching-learning activities distinguished by the pattern of communication among teacher, learner, and different types of materials. For example, a presentation is a one-way information exposition by a teacher, or software substituting for a teacher, to a number of learners. A discussion entails free exchange of information among a group of learners. Instructional methods can be classified into about ten broad families: presentation, demonstration, tutorial, reading, reflection, discussion, expression, construction, drill and practice, and discovery-inquiry; these are shown visually in Figure 15.4.

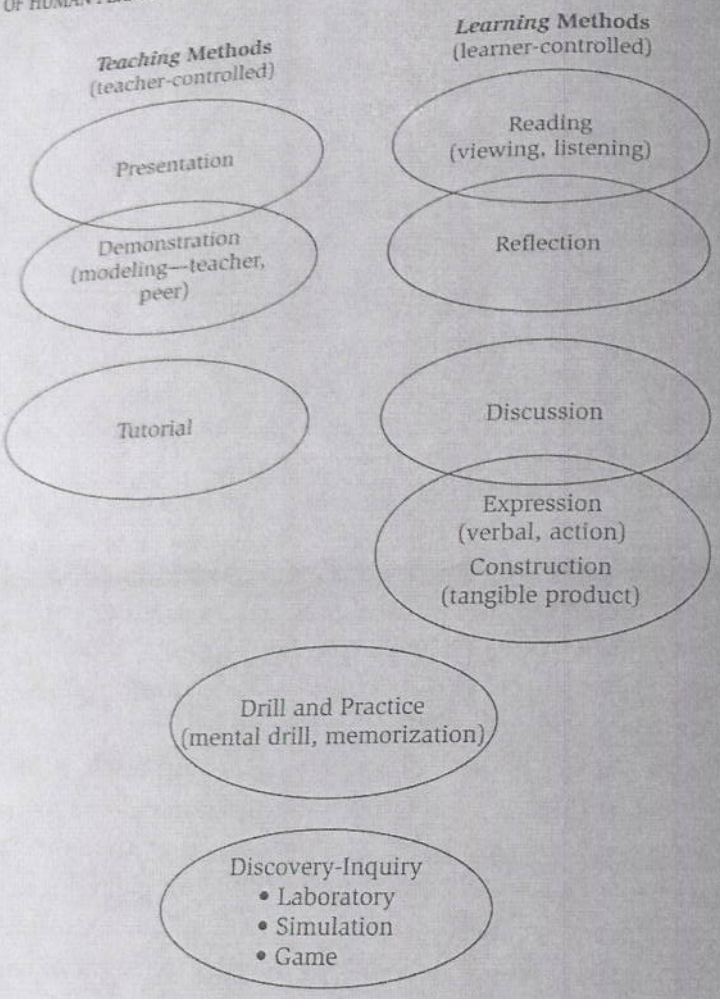

Figure 15.4. Typology of Instructional Methods.

Some of these methods are centered on activities controlled by the teacher or instructional system, such as presentations and demonstrations; others are more learner controlled, such as reading, reflection, and discussion; yet others can share or alternate control between teacher and learner, such as drill and practice and discovery-inquiry.

Table 15.1 gives a verbal definition of each category and shows typical formats in which these methods are embodied.

Media can be distinguished from methods. A medium is a channel that carries information between a source and a receiver (Smaldino and Russell, 2005). Today's electronic media are often made up of multiple sets of channels constituting the delivery systems through which messages are sent. Radio programs are broadcast through the air, then picked up by radios from which the program

Table 15.1. Methods, Their Definitions, and Their Typical Formats.

Methods	*Definitions*	*Typical Formats*
Presentation	One-way information flow from source (Teacher) to many receivers (Learners) • Typically verbal • May have visual supplement	Lecture, oral presentation • With display: whiteboard, overhead transparencies, handouts, PowerPoint slides Film showing Radio program Television program Video clip Statement made via audio or video conference
Demonstration	One-way information flow, featuring realistic "showing" rather than "telling" • May be human or device, Teacher or Learner • May be planned behavior modeling • May be unconscious modeling	Showing "how to do it" (live, recorded) • Teacher demo in music, dance master class • Video: sports skills Teacher as role model Peers as role models
Tutorial	Two-way interchange between Teacher and Learner • Learner exerts some control • Teacher must be able to respond flexibly	Apprenticeship Athletics: coaching Music: master class Mentoring Socratic dialogue Structured tutoring Branching programmed instruction Adaptive computer-assisted instruction Teacher-student exchange in Web chat Teacher-student exchange via e-mail
Reading	Learner engages with text or visual material • Material instructionally encoded • Learner controls pace	Reading textbooks, modules, handouts Reading Web pages, "tutorials" Linear programmed instruction or computer-assisted instruction Watching video, listening to audio Video-streaming on the Web

(*Continued*)

Table 15.1. Methods, Their Definitions, and Their Typical Formats. (*Continued*)

Methods	*Definitions*	*Typical Formats*
Reflection	Learner examines own performance and thoughts • Analyzes and may report	Coach-student dialogue Medical, psych: case conference Written • Short paper • E-mail to teacher • Post-class recap (+, −, ?) Evaluative checklist Debriefing: post-simulation or game, or field work "Think-aloud" protocol Small-group process analysis
Expression	Learner creates a verbal product or physical performance • Meant to express thought, feeling	Answers to study or quiz questions Essay, poem E-mail messages • Chat, bulletin board comments Performance: dance, speech Musical performance or composition
Construction	Learner creates a tangible product • Not a verbal message • Meant to express thought, feeling	Multimedia presentation Art: painting, sculpture Design: drafting, interior decor, lighting, landscape, architecture
Discussion	Two-way interchange among Learners • Teacher may initiate, monitor, not control	Seminar T-group Buzz group Debate (for participants) Panel discussion Reacting to someone's posting in a discussion forum Participating in a Web chat Participating actively in an audio or video conference
Drill and Practice	Learner practices skill repeatedly • May be internal memorization • Usually self-paced	Memorization drill Language lab Athletic practice, drama rehearsal End-of-chapter exercises Recitation Instructional game • Math, reading, spelling drills

Table 15.1. (*Continued*)

Methods	*Definitions*	*Typical Formats*
Discovery-Inquiry: Laboratory	Learner acts on real environment, raw materials • Usually self-paced exploration	Science experiment Studio art, drama Clinic (diagnosis, problem solving) Field work • Archeology, anthropology • Student teaching Case study (real instances) Project
Discovery-Inquiry: Simulation *Game*	Learner acts on *artificial* environment, materials, characters • May be group-based • Games include artificial rules, a goal, and competition	Physical simulator Decision-making simulation (policy) Social simulation • Role play, one-to-one • Group interaction (sociodrama) Business scenario (simulated case) Business game (competitive)

signals are conveyed through a speaker into the air to the listener's ear. Videotapes pass through playback devices, which send the recorded signals through wires to a TV set or monitor, generating images on a screen, which are scanned by the viewer's eye. These common electronic delivery systems illustrate the sometimes complex chain of senders, receivers, and channels comprising a given medium. Some media are much simpler, such as the human voice traveling through the air to the listener's ear. Whether simple or complex, the media themselves are merely channels through which almost any sorts of messages can be transmitted. They can be used effectively or ineffectively for instruction.

Sometimes people confuse media with methods. For example, the terms *e-learning* or *video-based instruction* might be used purportedly to describe what instructional methods are being used. However, although these terms tell you something about what communication channels or media are being used, they tell you very little about what teaching-learning activities or methods are being used.

E-learning simply refers to the use of words, images, and sounds that are filtered through some computer system and displayed on a viewing screen. Learners might interact with the display by clicking or scrolling with a mouse, touching a touch-sensitive screen, or typing on a keyboard. In the most prevalent type of e-learning, the learner simply reads verbal information on a screen,

with the interaction limited to clicking on links or possibly on multiple-choice items, leading to more pages of text. In this case, the teaching-learning activity or *method* is simply reading, one of the most commonly used methods.

The Relationships among Methods, Media, and Learning. Although the issue is still debated in instructional technology circles, there is compelling evidence, both from research and from logic, that methods influence learning far more than media do. Clark (2001) convincingly argues this point, pointing to hundreds of media comparison studies and the meta-analyses of those studies. In research studies in which two different media are used to teach the same content, it usually turns out that the winning treatment is the one that uses more effective instructional methods. Even more certainly, when the studies are tightly controlled so that both media treatments use the same instructional methods, then a finding of no significant difference is inevitable.

The choice of medium does make a difference, of course. Different media can have definite cost and time advantages. If you want a thousand sales representatives scattered over eighty-five cities to participate in an interactive simulation exercise, it will probably be faster and cheaper to distribute the simulation on the Web than to arrange for live, face-to-face meetings, assuming the reps have access to Internet-accessible computers at work or home. The medium accounts for the savings in time and cost; the instructional method, simulation, accounts for the learning effect.

Certainly, some delivery systems are better suited to incorporate certain methods. A demonstration is easier to communicate by television than by radio. A book is better for reading than a computer monitor. Face-to-face interaction is better for discussion than a telephone. But these built-in disadvantages can be overcome with the investment of enough time, money, and ingenuity. A highly detailed verbal description, with sound effects, can approximate a visual demonstration. Given attention to font size and background color, printed material can be read from a TV screen. High-quality multiparty discussions can be done by telephone if planned well. With ingenuity, the normal bounds of a medium can be stretched to accommodate methods that are not really well-matched with that medium. To do this, though, requires additional effort, creativity, and cost.

Alternatively, the built-in advantages of a medium can be ignored by designers. Consider the use of television to show talking heads or shots of written material; these are not the most powerful instructional methods that television is capable of carrying. Again, media can be used well or poorly; they can incorporate effective or ineffective methods. The secret of *effective* instruction is the selection of methods suited to the particular content and objectives. The secret of *efficient* instruction is the selection of media that can carry the required methods to the largest number of learners at the lowest cost.

Models Versus Lesson Frameworks. There are, of course, other ways of viewing the design of instruction besides the systems approach. Dozens of alternative

approaches are described in *Instructional Development Paradigms* (Dills and Romiszowski, 1997). However, most of these approaches actually are closer to lesson frameworks, as described in the following section, than to road maps for the entire instructional planning process. Approaches that attempt to portray the whole process tend to resemble the systems models, although using synonyms for the elements of the process.

Even within the systems-approach community, though, some practitioners and researchers feel that many instructional design and development models do not provide sufficiently specific directions on how to actually carry out each step, especially the crucial step of design—deciding how to construct the lesson (McCombs, 1986; Gordon and Zemke, 2000). Although such steps may not be specified within instructional design or development models, there is a related body of knowledge that does provide such guidance. There are a number of well-known, tested frameworks around which designers can flesh out the plan for the individual units or lessons.

LESSON FRAMEWORKS

A major decision at the design stage is to select an overall framework for the lesson or other instructional unit. Many different frameworks have been proposed, usually inspired by a particular theory of learning. Theories of learning attempt to describe what is going on as people learn. Deeper understanding of the learning process can suggest ways to shape instruction to fit more naturally with that process, giving rise to new instructional theories and new frameworks for structuring lessons. Four lesson frameworks that are well known and widely applied are explored here in some depth: behaviorist, cognitive, constructivist, and eclectic. Many other frameworks are explained fully in Reigeluth (1983, 1999), Davis and Davis (1998), and Medsker and Holdsworth (2001).

Behaviorist Framework

The first major post–World War II influence on thinking about lesson design was B. F. Skinner's innovation, programmed instruction, which he created to embody the principles of learning that he and others had discovered in the operant conditioning laboratory (Skinner, 1954).

Theory Base. Operant conditioning focuses on the observable behavior of the learner and the events that follow the behavior. The theory holds that any behavior that is followed by reinforcing events is more likely to be learned and exhibited in the future. Complex performances can be broken into smaller components and each component can be built up by practice followed by reinforcement.

Application of the Theory. To apply this theory to cognitive abilities, Skinner proposed using a framework called "programmed instruction." The

programmed-instruction framework specified five major elements, according to Schramm (1962): "an ordered sequence of stimulus items; to each of which a student responds in some specified way, his responses being reinforced by immediate knowledge of results, so that he moves by small steps, therefore making few errors and practicing mostly correct responses, from what he knows, by a process of successively closer approximations, toward what he is supposed to learn from the program" (p. 2).

As research and practical experience accumulated, exemplified by Lumsdaine and Glaser (1960) and Glaser (1965), the robustness of many of these specifications came into question. That is, the sequence of experiences, the nature of the response, the timing of feedback, and the size of steps all appeared to be contingent on various learner characteristics and learning conditions. Since the specific formulaic elements of programmed instruction didn't seem to account for its success, developers began to see that the benefit was in the underlying principles. Programmed instruction's specifications were then broadened and simplified by Popham (1971) to four principles: "1. Provide relevant practice for the learner. 2. Provide knowledge of results. 3. Avoid the inclusion of irrelevancies. 4. Make the material interesting" (p. 171).

Instructional Pattern. The behaviorist approach today is characterized by precisely phrased performance objectives and breakdown of the learning task into small steps, each of which can be practiced and corrected until mastery is attained. This pattern can take the form of a self-study module in printed or computer-based form or a face-to-face session conducted by a coach or mentor with an individual learner or small group.

Methods. This approach favors methods that allow learners to progress at their own pace while getting feedback:

- *Reading,* including use of programmed texts, programmed audiovisual modules, and linear computer-assisted instruction (CAI)
- *Tutorial,* including on-the-job apprenticeship, structured tutoring, and adaptive CAI
- *Drill and practice,* including language labs, practice exercises embedded in Web lessons, and instructional games
- *Demonstration,* displaying the desired behavior to be learned, most likely in the form of behavior modeling (Bandura, 1969)
- *Discovery-inquiry,* including social simulations, role-play exercises, and computer-based scenarios.

Uses. The behaviorist approach is well-suited to skill development of the sort that Stolovitch and Keeps (2002) would place into the domain of training, routine tasks—simple or complex—that must be completed repeatedly with accuracy and

efficiency. Intellectual skills of the lower levels, such as discrimination, concept learning, association, and chaining, which is automatically performing a multistep procedure, have been taught successfully with the behaviorist approach (Ertmer and Newby, 1993, p. 56). Such intellectual tasks are often embedded in a larger procedural skill lesson.

Cognitive Framework

In the decades since the 1960s, instruction has been informed increasingly by principles drawn from other sources, especially cognitive psychology. The cognitive approach emphasizes the importance of the learners' mental and emotional processes during the course of instruction. From this perspective, learners use their memory and thought processes to generate strategies as well as store and manipulate mental representations and ideas.

Theory Base. One branch of cognitive theory, information-processing theory, conceives the human learner as a processor of information, similar to a computer. In this view, represented by the work of Atkinson and Schiffrin (1968), sensory inputs are selected, encoded, and stored in short-term and possibly long-term memory. Later, well-stored information may be retrieved and used.

Another branch, assimilation theory, focuses on the human learner's cognitive structure and the processes whereby new information is integrated into the overall structure. Ausubel's schema theory (1980) views schemata as providing mental scaffolding, containing slots that can be filled in with particular cases. These schemata allow learners to organize information into meaningful units. This theory implies that the learner's cognitive structure at the time of learning is the most important factor in determining the likelihood of successful learning.

All branches of cognitive theory emphasize that the new knowledge must be meaningful to the learner if it is to be retained and used in the future. Another major cognitive theorist, Jerome Bruner (1966) promoted the value of learning by inquiry or discovery, discussed further on.

Application of the Theory. One cognitive approach, the expository strategy, involves instructional activities that present information to the learner or allow learners to read or view material and think about it, after which they practice applying it in some realistic form. The concerns revolve around attending to relevant messages, interpreting the new material, relating it to existing mental structures, and remembering it so that it can be retrieved later when needed. Designers must devise ways to gain the learner's attention, in competition with the many distracting stimuli in the environment. Then they want to present the new information in ways that will encourage melding it into the learner's existing mental structures or schemata. One instructional technique derived from schema theory is the advance organizer—a brief preview based on the learner's

existing knowledge, which serves as a framework for new learning. Analogies, examples, outlines, and mnemonic devices also make new information easier to remember. To improve retention and use of combinations of knowledge and skills, it is helpful to embed practice in a realistic setting.

Another cognitive approach, the inquiry strategy, turns the expository strategy upside down. It begins by immersing learners in real-world problems, leads the learners to make hypotheses about these problems, and guides them to discover an answer. This approach is commonly found in management training: for example, in desert-survival simulations.

A rather complete and thorough set of cognitive prescriptions is offered by Foshay, Silber, and Stelnicki (2003) as "a cognitive training model" (p. 23). They offer seventeen specific tactics organized around the strategic phases of gaining attention, linking to prior knowledge, structuring the content, presenting the new knowledge, and strengthening the new knowledge through practice and feedback.

Instructional Pattern. Training and education based on the cognitive framework are likely to take the form of lectures or recorded presentations illustrated with audiovisual supplements. In many cases it is more efficient to package cognitive instruction for self-study in the form of textbooks, manuals, or Web documents. In any case, the pattern is likely to consist of a carefully constructed arrangement of information designed to attract and hold attention, to meld the new knowledge with the learner's previous knowledge, and to suggest ways of applying this new knowledge to practical use. The presentation will likely include opportunities to practice in the form of embedded quizzes, provocative questions, or other types of exercises.

Methods. The cognitive approach is likely to incorporate methods focusing on the presentation of information and learner interactions with the material and each other:

- *Presentation,* including illustrated lectures, videos, and PowerPoint shows
- *Reading,* including textbooks, training manuals, and Web so-called tutorials, which usually are not truly tutorial, in the sense of a rich two-way exchange
- *Demonstration,* including how-to-do-it demonstrations, video demonstrations, and peers or instructors serving as role models
- *Drill and practice,* including end-of-chapter exercises, recitation, and memorization drills such as spelling bees or other game-type activities
- *Discussion,* including debates, seminars, and buzz groups.

Uses. The cognitive approach is well suited to helping learners recall new information, comprehend how things work, and remember and use new procedures (Davis and Davis, 1998). It applies generally to objectives in the cognitive domain, particularly to tasks at the lower and middle levels of complexity.

A Constructivist Framework

A more recent educational theory, constructivism, revolves around the notion that "knowledge is constructed by the learners as they attempt to make sense of their experiences" (Driscoll, 2000, p. 376). Constructivism can be viewed as a philosophy, an epistemology, or an instructional orientation. The label has been used by theoreticians working in different realms. Even within education there is no comprehensive set of beliefs that is embraced by all constructivists. Beyond a certain set of core beliefs, constructivists diverge into several subgroups, some of which hold positions that are contradictory to others. This discussion focuses on the core beliefs that are most widely accepted.

Theory Base. A core philosophical belief is that while there is a real world out there, there is no meaning inherent in it; meaning is constructed by people and cultures. In terms of epistemology, then, knowledge is constructed from and shaped by experience, and understanding of the world is socially negotiated. The name, constructivism, is a reminder that whatever is done *to* the learner in the name of instruction, ultimately nothing happens until the learner takes those inputs and *constructs* some meaning from them. Hence, giving learners ownership of the knowledge is crucial. Furthermore, that knowledge is useful only to the extent that it is embedded in a real-world context. Generalizations stripped of their context are of little practical use (Duffy and Jonassen, 1992).

Application of the Theory. Prescriptive principles derived from constructivism include "1. Embed learning in complex, realistic, and relevant environments. 2. Provide for social negotiation as an integral part of learning. 3. Support multiple perspectives and the use of multiple modes of representation. 4. Encourage ownership in learning. 5. Nurture self-awareness of the knowledge construction process" (Driscoll, 2000, pp. 382–383).

Although Merrill rejects the constructivist label for his work, he proposes a set of instructional principles, which he calls "first principles of instruction" (2002a, p. 43), that are problem-centered, progressively more realistic, and focused on knowledge construction by the learner, as shown in Figure 15.5. These ideas are clearly aligned with the constructivist view. So until another representation of the constructivist perspective comes along that is at least equally coherent, Merrill's framework can represent this perspective.

Merrill's theory proposes four phases in the instructional process: (1) *activation* of prior experience, (2) *demonstration* of skills, (3) *application* of skills, and

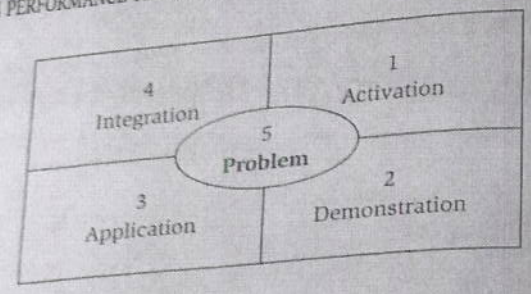

Figure 15.5. Visual Model of the Major Elements of Merrill's "First Principles."

(4) *integration* of these skills into real-world activities, with all four phases revolving around (5) a *problem*. Each of these five elements has supporting generalizations or principles, which provide the prescriptions for effective instruction. The broadest generalizations about each step of the instructional sequence are

1. *Activation:* Learning is facilitated when the learner is directed to recall, relate, describe, or apply knowledge from relevant past experience that can be used as a foundation for the new knowledge.
2. *Demonstration:* Learning is facilitated when the learner is shown rather than told.
3. *Application:* Learning is facilitated when the learner is required to use his or her new knowledge to solve problems.
4. *Integration:* Learning is facilitated when the learner can demonstrate his or her new knowledge or skill.
5. *Problem:* Learning is facilitated when the learner is engaged in solving a real-world problem [Merrill, 2002a, pp. 45–50].

Instructional Pattern. Merrill also proposes a simple framework for applying his first principles to training situations, called the "Pebble-in-the-Pond" model (Merrill, 2002b). The essence of his framework is to begin by imagining the simplest whole version of the task that the learner must be able to perform, the first ripple of the pebble dropped into the pond, then to identify the expanding ripples: "a progression of such problems of increasing difficulty or complexity such that if learners are able to do all of the whole tasks thus identified, they would have mastered the knowledge and skill to be taught" (p. 41). The focus on actual on-the-job problems makes this approach highly suited to immediate application on the job, one of the keys to retention and transfer of training. Merrill reports documented success in terms of better and faster learning.