SECOND EDITION

1

Introduction to Learning and Instruction

Chapter Outline

Wild Boy

Suppose a child was freed completely of all social interaction with other humans. Suppose this child was allowed to develop without any social contact with other people. This experiment could be viewed as providing a child with the ultimate in educational freedom. What would happen to such a child? What would the child be like? Is society needed in order to help children develop to their fullest potential as human beings? Take a moment to provide some predictions in Figure 1–1.

These questions were at the heart of a historic educational experiment that began in 1800 in Paris. The experiment involved only one student, an adolescent boy named Victor, and his teacher, a physician named Dr. Jean-Marc Itard. Victor had been discovered living in the forests of Aveyron in France. Apparently, the boy had grown up in the forest, without any human contact. When captured, the boy was completely naked, dirty, and inarticulate. He seemed insensitive to temperature and pain, and was incapable of maintaining attention. He ate his food raw, using only his hands. Although physically healthy, he was totally unsocialized. The public showed great interest in the boy, and he became popularly known as the "enfant sauvage de l'Aveyron"—that is, the "wild boy of Aveyron." Dr. Itard was convinced that the boy, whom he named Victor, could be taught to become a civilized member of French society. For the next 5 years, Dr. Itard worked with his student, often having to develop new materials and instructional techniques.

Dr. Itard's educational program was based on several principles. First, he believed that the needs and characteristics of the student should dictate the educational program, an approach that can be called *learner centered*. Instead of letting the curriculum determine what students would learn in lockstep fashion, the teacher must be free to shape instruction to suit the needs of the student. Second, he believed that education depends on the student having had certain experiences (i.e., he recognized that most educational programs assume that the child has acquired "readiness skills" through natural interactions with the physical and social environment). For example, a student needs experiences with objects before learning the language names for them. If a student lacks appropriate sensory experiences, then these experiences must be provided as prerequisites to more academic components of an educational program. Third, he believed that the student had to be motivated to learn. According to Dr. Itard, Victor successfully learned to cope in the wild because his survival depended on it. Now, Dr. Itard introduced new needs for Victor so that the boy would be motivated to learn social skills. Finally, Dr. Itard believed that instruction often requires the development of new instructional devices and techniques. Many of the materials and techniques of behavior modification that Dr. Itard developed became the basis for subsequent programs to teach special education students.

How far did Victor progress during the 5 years of instruction? He learned basic social skills, such as dressing himself, sleeping in bed without wetting, and eating with utensils. He learned to make use of his senses, including sight, sound, and taste. He learned to show affection and to try to please others. Although he never learned to speak effectively, he did learn to communicate using written language. However, Victor did not reach full self-sufficiency and spent the rest of his life under the supervision of a caretaker. The lack of complete success has been attributed to many causes including the lack of appropriate stimulation during critical periods of development, the limitations of Itard's methods (including his insistence

[illegible] In the most isolated savage as in the most highly civilized man, there exists a constant relation between ideas and needs."

[illegible] "The progress of education can and ought to be illuminated by the light of modern medicine, which of all the natural sciences can help most powerfully toward the perfection of the human species."

[illegible] individual characteristics of [illegible] "Progress will be made by discerning the organic and intellectual peculiarities of each individual and determining from there what education ought to do for him."

The conclusions of Itard, written 200 years ago, can serve as a starting point for this book on the promise of educational psychology's future. Like Itard's research, this book is based on a learner-centered approach in which the learner is at the heart of all learning (Lambert & McCombs, 1998). [illegible] approach, the first overarching goal [illegible] used by learners in carrying out [illegible] the cognitive processes that a skilled reader engages in while reading a textbook lesson? What are the cognitive processes that a skilled writer engages in while composing an essay? What are the cognitive processes that a skilled mathematician engages in while solving a mathematics problem? What are the cognitive processes that a skilled scientist uses in investigating a new phenomenon? These kinds of cognitive questions are addressed in the first section of this book on learning. In short, I seek to understand what skilled readers, writers, mathematicians, and scientists know.

[illegible] how to help students develop the cog[illegible] academic tasks. How can we help a beginning reader know what a skilled reader knows? How can we help an aspiring writer know what a skilled writer knows? How can we help novice mathematics and science students acquire the knowledge needed to think like skilled mathematicians and scientists? These kinds of instructional questions are addressed in the second section of this book on instruction. In short, I seek to understand the kinds of learning experiences that foster cognitive growth in learners.

In summary, this book takes a learner-centered approach to learning and instruction. In particular, I examine the learning issue of what students need to learn to accomplish academic tasks and the instructional issue of how to help students achieve meaningful learning. The remainder of this chapter explores some of the basic issues in educational psychology.

Definitions and Overview

WHAT IS EDUCATIONAL PSYCHOLOGY?

Based on the learner-centered perspective described in the previous section, educational psychology can be defined as [illegible] of psychology concerned with understanding [illegible] and the characteristics of the learner interact to produce [illegible]. In particular, educational psychology focuses on the

scientific study of techniques for fostering changes in the learner's knowledge. There are three major components in this definition:

1. Educational psychology is a science, namely a branch of psychology.
2. Educational psychology investigates the instructor's manipulation of the environment (i.e., instruction).
3. Educational psychology investigates resulting changes in the learner's knowledge (i.e., learning).

In short, educational psychology studies how instruction affects learning.

WHAT IS INSTRUCTION?

Educational psychology stands between instruction and learning (i.e., between the instructional manipulations provided by the teacher and the changes in knowledge created in the learner). Instruction refers to the teacher's construction of environments for the student where such environments are intended to foster changes in the learner's knowledge. For example, Gagné (1974) defines instruction as "the arrangement of external events to activate and support the internal processes of learning" (p.vii). Thus, the definition of instruction has two main components:

1. Instruction is something the teacher does.
2. The goal of instruction is to promote learning in the student.

This definition of instruction is broad enough to include lectures, discussions, educational games, textbooks, research projects, and Web-based presentations.

WHAT IS LEARNING?

If the goal of instruction is to promote learning, it is worthwhile to understand what learning is. Learning refers to lasting changes in the learner's knowledge where such changes are due to experience. Thus, learning is defined as a relatively permanent change in someone's knowledge based on the person's experience. This definition has three parts:

1. Learning is long-term rather than short-term, such as learning how to use a word processing program. A change that disappears after a few hours does not reflect learning.
2. Learning involves a cognitive change that is reflected in a behavioral change, such as changing from not knowing to knowing the procedure for erasing a word in a word processing program. If there is no change, then no learning occurred.
3. Learning depends on the experience of the learner, such as reading a word processing manual. A change that occurs solely because of a physiological state—such as being tired, hitting one's head, or taking a mind-altering drug—is not an example of learning. Furthermore, it depends not on what is done to the learner, but rather on how the learner interprets what happens; that is, it depends on the learner's personal experience.

Although two of the components of the definition of learning (learning is permanent and experience based) have remained consistent for a century, the issue of what is

changed (or what is learned) has been more controversial (Mayer, 1992a, 2001a) b
learning involve a behavioral change or a cognitive change? This question reflects
classic tension between behaviorist and cognitive approaches to learning. In this b
I take a cognitive approach by defining "what is learned" as a cognitive change th
reflected in a behavioral change. Overall this definition of learning is broad enough
include everything from how children learn to talk when they are toddlers to how
eventually learn to read, write, and compute, to how they become able to navigate in
social world. In his classic textbook *Principles of Teaching*, E. L. Thorndike (1913) re
nized that the central theme in education is an externally manipulated change in
learner:

> The word *education* is used with many meanings, but in all its usages it refers to changes
> No one is educated who stays as he was. We do not educate anybody if we do nothing that
> makes any difference or change in anybody. . . . In studying education, then, one studies
> always the existence, nature, causation, or value of change of some sort. (p. 1)

In summary, teaching and learning are inevitably connected processes that involve
fostering of change within the learner.

In his provocative little book *Experience & Education*, John Dewey (1938) described
relationship between teaching—providing students with useful experiences—and learn
or the acquisition of knowledge. "All genuine education comes about through experien
(p. 25) Dewey argued. However, he added an important warning that "all experiences
not genuinely or equally educative" (p. 25). Unfortunately, many instructional manipu
tions are what Dewey calls "mis-educative":

> Some experiences are mis-educative. Any experience is mis-educative that has the effect of
> arresting or distorting the growth of further experiences. . . . Every experience lives on in
> further experiences. Hence the central problem of an education based on experience is
> to select the kind of present experiences that live fruitfully and creatively in subsequent
> experiences.

In summary, instructional manipulations result in changes in the learner's knowledg
Because all learning involves connecting new information to existing knowledge, it
crucial to help students develop knowledge structures that can support the acquisition
useful new information. If students have not acquired knowledge, then information can
be successfully connected with it.

Three Approaches to Research on Learning and Instruction

How can we tell whether instruction affects learning? In short, how can we tell whether
way of teaching is better than another at helping students learn? In this section I explo
three ways of conducting research on instructional methods: the behaviorist approa
which focuses on whether one method is better than another; the cognitive approach, wh
focuses on how instructional methods affect underlying learning processes and learning
comes; and the contextual approach, which focuses on how instructional methods are us
in real classroom settings.

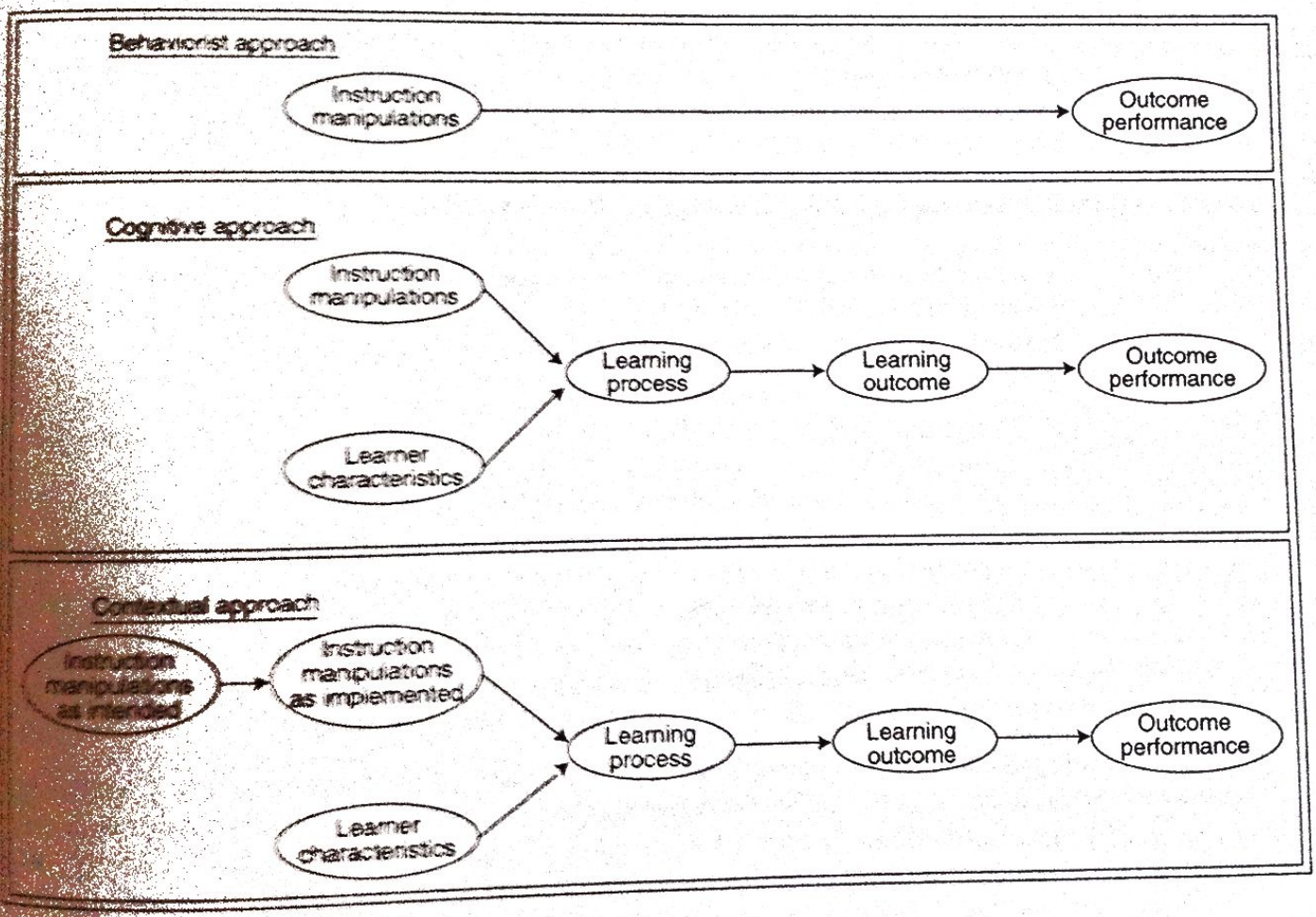
BEHAVIORIST APPROACH

The traditional approach to instructional research has been to conduct some instructional manipulation (such as presence versus absence of an outline on the board before the start of a lecture) and then measure the performance of students who learned under each method. Thus the goal of research is to determine the effects of some observable manipulation on some observable behavior. This approach is summarized in the top panel of Figure 1–2, which shows only two observable variables. In general, the results of such studies may be summarized as "method A is better than method B."

COGNITIVE APPROACH

One problem with the behaviorist approach is that it does not provide an understanding of why or how method A is better than method B. A teacher could make better use of instructional methods by understanding the general principles that mediate between instruction and test performance. The cognitive approach to instruction seeks to determine how instructional procedures influence internal information-processing events and the acquired cognitive knowledge. For example, we might be interested in how various methods of instruction affect how a learner selects relevant information, organizes it into a

FIGURE 1–2 Three approaches to research on instructional methods



coherent cognitive structure, and integrates it with existing knowledge. This approach is shown in the middle portion of Figure 1–2; in addition to the two observable variables, internal cognitive processes and learning outcomes have been added. Instead of focusing simply on how much is learned, our focus shifts to what is learned—that is, to qualitative differences in the learner's cognitive processing during learning and in the resulting learning outcome.

CONTEXTUAL APPROACH

Although the cognitive approach offers a deeper picture of how teaching affects learning than does the behaviorist approach, the picture is still not complete. According to the contextual approach, instructional methods cannot be separated from the context in which they are used—including the social and cultural background of the students, the classroom, the school, and the educational system at large. Using method A versus method B may mean different things for different teachers and different students in different classrooms. Thus, an increasingly important aspect of instructional research concerns how instructional programs are actually implemented in real classrooms. This approach is represented in the bottom of Figure 1–2.

Each of the three approaches offers something useful, and you will find all three in this book. As you read research studies on instructional methods, you may be able to tell whether the authors are taking a behaviorist, cognitive, or contextual approach. However, I focus somewhat on the cognitive approach because I think it offers advantages over the older behaviorist approach and because research on the newer contextual approach is not yet well developed.

Three Roads for Psychology in Education

Psychology involves the study of *how* people learn and develop, whereas education involves *helping* people learn and develop. What do you think should be the relation between psychology and education? Check one of the following answers:

_____ Psychologists should conduct laboratory research about learning and development and explain the resulting theories to educators; educators should apply this scientific research to their instruction.

_____ Psychologists should conduct laboratory research about learning and development without concern for educators; educators should develop instruction that meets the practical needs of their students without examining irrelevant psychological theories.

_____ Psychologists should study how people learn and develop in real educational situations, basing their research on the challenges of educators; educators should base their instructional decisions on psychological theories of how students learn and develop.

If you chose the first answer, you opted for a one-way street that runs from psychology to education. If you chose the second answer, you selected a dead-end street in which psychology and education do not meet. If you chose the third answer, your path lies on a two-way street that runs from psychology to education and from education to psychology.

These three kinds of paths represent three phases in the history of psychology in education (Mayer, 1992a, 1999a). By the 1890s psychologists, who had recently given birth to what Gardner (1985) called "the mind's new science," were struggling to keep their infant science alive. At the same time, educators, who faced the daunting task of providing universal compulsory education, were struggling to professionalize the practice of teaching. The rise of both psychology and education at the end of the 1800s suggested the question of what should be the proper relation between psychologists and educators. In short, what should be the path between the science of psychology and the practice of education? The answer to this question passed through [redacted] These three paths are summarized in Table 1–1.

PHASE 1: ONE-WAY STREET FROM PSYCHOLOGY TO EDUCATION

At the start of the 20th century educational psychologists were optimistic that psychological science could improve educational practice. They viewed educational psychology as the "guiding science of the school" (Cubberly, 1920, p. 755), a discipline that borrowed its research methods from psychology and its research agenda from education. In his classic book *The Principles of Teaching Based on Psychology*, E. L. Thorndike (1906) proclaimed:

> The efficiency of any profession depends in large measure upon the degree to which it becomes scientific. The profession of teaching will improve (1) in proportion as its members direct their work by the scientific spirit and methods, that is by honest, open-minded consideration of facts by freedom from superstitions, fancies, and unverified guesses, and (2) in proportion as the leaders in education direct their choices of methods by the results of scientific investigation rather than general opinion. (p. 206)

TABLE 1–1

Three paths for psychology and education

Phase	Direction of Relation	Period	Emotional Tone	Vision for Psychology and Education
Phase 1	One-way street	Early 1900s	Naive optimism	Psychology is applied to education; education is recipient of psychology
Phase 2	Dead-end street	Mid-1900s	Pessimism	Psychology ignores education; education ignores psychology
Phase 3	Two-way street	Late 1900s	Cautious optimism	Education shapes psychological research; psychology shapes educational practice