LEARNING and INSTRUCTION

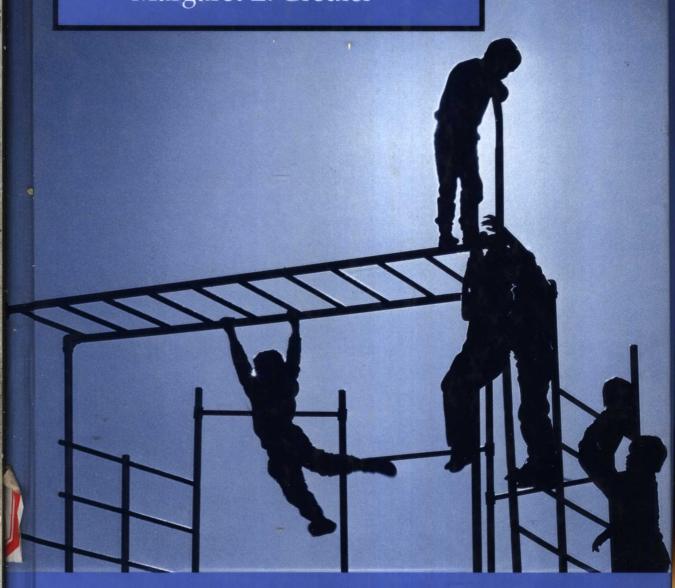## Theory Into Practice

Third Edition

Margaret E. Gredler

LEARNING AND INSTRUCTION
Theory Into Practice

THIRD EDITION

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In memory of my beloved daughter,
Margaret Lynn,
and for her sister,
Elizabeth Lee

Preface

Since the second edition of this text, the learner and the social setting have moved to center stage in theory development. Important issues discussed in this edition are the role of individual strategies in learning, the development of metacognition, the role of self-efficacy and self-regulation, and the influence of personal and classroom goal structures. Also discussed in this edition are the construction of possibility and necessity in Piagetian thinking and Vygotsky's interpretation of cognitive development in children with disabilities.

On the educational scene, a multifaceted perspective known as constructivism has emerged as part of current educational reform efforts. The reform focus, like that of John Dewey's progressivism in the early twentieth century, is to redirect classroom efforts from the teacher to the learner. Although currently in embryonic phases of development, the basic beliefs of the various views of constructionism also are discussed. Only time will tell which of the various interpretations will emerge as a theory with clearly defined and testable principles.

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Margaret E. Gredler

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PART I
Introduction

The human capacity for learning is an important characteristic with far-reaching implications for both the individual and society. Discussed in chapter 1 are the role of learning in human life and the various sources of knowledge about learning. Described are the limitations of traditional wisdom, maxims, and fragmented data in expanding knowledge about learning. Also discussed is the role of theory in developing information about the process of learning, the design of instruction, and the analysis of classroom situations.

By the 1920s, learning had become a major focus of study for American psychology. Until the 1950s, two broad perspectives sought to develop the one theory that would explain all learning. Behaviorism, the dominant perspective during this period, is described in chapter 2. This perspective views learning as behavioral change, and researchers attempt to identify the environmental events and conditions responsible for such change.

A different perspective, discussed in chapter 3, is Gestalt psychology. Initiated in Germany, Gestalt psychology maintains that learning is a sudden perceptual reorganization of a problem situation. Gestalt theorists named this process insight.

By the mid-1950s, efforts to develop the one comprehensive learning theory began to decline. New developments redirected psychologists to other problems. Chapter 4 describes these developments and current trends in theory development, and it also introduces the seven contemporary theories presented in this text.

CHAPTER 1
The Role of Theory in Learning and Instruction

Man's power to change himself, that is, to learn, is perhaps the most impressive thing about him (Thorndike, 1931, p. 3).

L earning is a process that individuals typically do not examine unless they are having difficulty in some situation that requires the acquisition of new knowledge or skills. However, learning is central to the development of both the individual and society. Discussed in this chapter are the importance of learning, the sources of knowledge about learning, the role of research and theory in knowledge development, and the functions of learning theory. The chapter concludes with an overview of the organization of the text.

WHY IS THE STUDY OF LEARNING IMPORTANT?

Two 8-year-olds compare their separate approaches for determining the age of a book that was written in 1960. Together, they devise a shortcut method for solving the problem. A neophyte computer user successfully installs a spreadsheet program and begins the construction of a monthly financial statement. An amateur gourmet cook intently watches a videotape of the preparation of a new dish several times and prepares the delicacy for Sunday dinner.

These events and countless others are the result of the process referred to as learning. It begins in infancy with a baby's acquisition of a few simple skills, such as holding its own bottle and recognizing its mother. During childhood and adolescence, a number of attitudes, values, and social interaction skills are acquired as well as competencies in various subject areas. In adulthood, the individual is expected to have mastered specific job tasks and other functional skills, including driving a car, balancing a checkbook, and getting along with others.

The human capacity for learning is an important characteristic that sets the species apart from all others. It provides benefits for both the individual and society. For the individual in our culture, the capacity for continued learning contributes to the development of highly diverse lifestyles. Sewing, basic home repair, water skiing,

playing Scrabble, and mountain climbing are only a few of the leisure-time activities acquired through learning. In our society, we are not surprised to find engineers who are gourmet cooks and college professors who grow prize-winning roses.

The capacity for continued learning is particularly important for the individual in today's information age. New developments in technology are both increasing the store of knowledge and the ways that information and knowledge are transmitted. Individuals are facing the need for continued learning both for changing job markets and taking advantage of new opportunities to access information.

For society, learning is essential in producing group members that can continue the customs, the values, the language, and the contributions of the particular culture. Learning also makes possible new discoveries and inventions by subsequent generations that build on past developments. Our grandparents, for example, marveled at the changes in daily life brought by electricity. They were also intrigued with the new invention of the day, the telephone. Young adults today, in contrast, grew up with electricity, the telephone, and television. Their children, however, are growing up with new technologies driven by microprocessors and innovations such as laser surgery.

Both the individual and society have a vested interest in the successful management of learning. Individuals who have become skilled at self-directed learning are able to acquire a variety of new leisure-time and job skills. They also have developed the capacity to endow their lives with lifelong creativity.

Society, on the other hand, cannot risk leaving the acquisition of learning to chance. Some system is needed to teach the cultural heritage to the young and to train them to take on productive adult roles in the society. In primitive societies, the collective wisdom and folklore often are acquired by each member, usually by word of mouth. In technological societies, the available knowledge and information is so vast that no one can begin to learn all of it. Instead, formal educational systems address both broad areas of knowledge and areas of particular expertise that individuals select for further study. This process requires several years and often includes the learning of particular prerequisite knowledge, such as chemistry for pharmacists and music theory for symphony conductors.

The importance of learning to society is conceptualized in two ways. First, suppose that each new generation would only be able to learn those things that are half as difficult as the things currently learned (Thorndike, 1931). For example, instead of members of the present generation learning calculus, they would learn only algebra. Then the next generation would learn only arithmetic, and so on. The result is obvious. Most of human civilization's accomplishments would be unusable in one generation, and civilization itself would soon disappear from the face of the earth (Thorndike, 1931).

Another analysis of the importance of learning to society is derived from the perspective that learners construct meanings for themselves from the contexts in which they live. That is, individuals select information from interpersonal and other interactive events occurring in the family, school, peer, community, and work environments. Individuals then relate the selected information to their prior knowledge, analyze it, and construct a representation in memory. In this view of learning, the knowledge in the mind is coextensive with the relationships that compose one's interpersonal and societal environments. From this perspective, each new generation constructs a new society for itself (Meacham, 1993, p. 259). The key question

then becomes, Can adults in democratic societies, for example, be confident that the next generation will construct society so as to reproduce the society's traditions, values, commitments, and hopes? (p. 264). For example, How will farm children in the midwest, growing up in an environment of worry, hopelessness, fear, and alienation as large numbers of independent family farms collapse, construct society? Or others of the one in four children under the age of 6 years whose families are below the poverty line? According to Meacham (1993), these and similar questions have serious implications for any discussion of learning.

WHAT ARE THE SOURCES OF KNOWLEDGE ABOUT LEARNING?

Throughout history, people have relied on different sources of knowledge to provide information about learning. Early societies primarily relied on folklore and organized belief systems. In the 20th century, empirical research and formal theories became sources of knowledge about learning.

Folklore and Traditional Wisdom

Folklore consists of traditional customs, tales, or sayings that typically are preserved orally among people. Traditional wisdom, a subset of folklore, consists of proverbs and maxims that often are derived from experience. An example is, "Spare the rod and spoil the child." One problem with such sayings is their generality. Maxims may be interpreted in a variety of ways and therefore are inadequate as guidelines for educational practice.

Some individuals, however, contend that good teaching practice constitutes a "traditional wisdom" that can inform others about learning and instruction. In other words, more can be learned from good teachers than from either research or psychology. Of course, much can be learned from skilled teachers (Hilgard, 1964). However, ignoring the possibility of improving instruction through well-designed research is like "returning medical practice to the prescientific physician because we still value the bedside manner" (Hilgard, 1964, p. 404).

Organized Belief Systems

Early societies lacked a systematic means for analyzing events. Instead, they developed some type of organized belief system to explain the world. Two examples are a system of organized myths and philosophy.

Organized Myths

The early Egyptians, Greeks, and Romans created myths in which different gods and goddesses were responsible for particular events in both the natural world and human affairs. The early Greeks, for example, believed that ocean storms were caused by Poseidon, the sea god, and lightening bolts were Zeus' arrows unleashed in punishment. In human affairs, the goddess Aphrodite was believed to influence

love relationships, and wisdom was the gift of Athena. Such a system led to activities to placate the gods and goddesses, so that events would go well. However, these myths did not advance society's knowledge about the actual workings of the physical or social environment.

Philosophy

The early myths gradually were replaced by logically consistent belief systems known as philosophies. Each philosopher first defined the nature of reality. He then proceeded to answer questions such as, What is truth? What is knowledge? What does it mean "to know"? consistent with his assumptions about the nature of reality. The result was a logical unified view of the external world and the inner world of the individual.

The philosopher Plato (327–417 B.C.), for example, defined reality as the pure ideas of the mind. He believed that ideas and concepts are innate or inherited in a form not unlike shadowy images. Learning, therefore, is the process of developing these innate or inborn ideas into a knowledge system. In Plato's view, the mind was developed through the study of the pure forms of mathematics, such as the circle and the square, and the classics.

A contrasting view of learning was developed by Aristotle, Plato's pupil. Aristotle defined reality as the relationships found in nature and the physical environment. The source of knowledge, therefore, is the physical environment, and learning occurs through contact with that environment. According to Aristotle, knowledge is initially acquired by forming images of sensory experiences, and associations are then made among the images.

Two major problems may be identified in using a philosophy to develop knowledge about real-world events. First, the information is likely to be limited in nature because only general questions are asked. Second, the information is developed using logic and reasoning but is not tested in real-world situations. Therefore, errors in the conclusions in terms of explaining cause and effect go undetected.

Nevertheless, some philosophers, in their efforts to describe the nature of knowledge, identified some general concepts that later were to appear in different learning theories. Aristotle's model of memory, in which public orators were taught to form vivid, active images of ideas to be remembered, is a device currently used to recall foreign language words and their meanings. Similarly, the association of ideas described by early philosophers reappears later in behaviorism. However, instead of the association of ideas, the behaviorists describe learning as the association of responses to particular objects or events known as stimuli.

From 400 B.C. to the 19th century, philosophy served as the primary source of information about the human mind. Although other methods had been used to discover information about the physical world since the 16th century, the mind, like the soul, was viewed as the gift of God. Also, the primary function of the mind was to become attuned to ultimate reality, and a philosophy was the mechanism for this task.

Empirical Research

In the mid-16th century, experimentation with objects emerged as a new method of developing knowledge about the physical world. Introduced by Galileo in the 1500s,

it is referred to as the scientific approach. One of Galileo's experiments, for example, involved dropping several objects from the top of a tower and calculating the rate of descent. This experiment contradicted the philosophical belief that a pound of lead and a pound of feathers fall to earth at different speeds.

Conducting experiments greatly expanded knowledge about the physical environment. Mystical beliefs and untested maxims gradually were replaced by reliable laws and principles. The science of chemistry supplanted the practice of alchemy, and the methods of astrology were replaced by the science of astronomy.

Rationale for Psychological Research

For almost 300 years, research methods were confined to the natural sciences. One reason was that to conduct research on the mind would call into question the gift of God. Second, philosophy was an adequate knowledge base for the mind's task of becoming attuned to an ultimate reality.

Two events in the 19th century set the stage for scientific investigations of mental functions. One was the publication of Charles Darwin's *Origin of Species* in 1859, in which his theory of evolution was set before the public. The theory states that the biological species found on earth are not a preestablished set or group. Instead, species survive, perish, or develop new variations as a result of their ability to adapt biologically to changing conditions. Thus, the theory defined a new reality, one in which change rather than some static order predominates. One result was that the formerly accepted views about the mind were altered: that is, if the human mind is part of the evolutionary process, then defining the static relationship between the human mind and the mind of God is no longer a major issue.

The second key event that set the stage for psychological research of mental functions was Hermann von Helmholtz's introduction of the concept of scientific empiricism. Von Helmholtz, a medical doctor, scientist, and philosopher, maintained that since ideas are products of human experience, they are subject to human observation and analysis. The term *scientific empiricism* refers to the accumulation of facts through carefully designed experiments. He demonstrated the usefulness of experimentation on ideas by his invention of the ophthalmoscope for observing the operations of the eye.

From research on the senses, which are living tissue, to research on the mind was only one short step. That step was taken by Wilhelm Wundt. In addition to publishing a text that summarized the research on sensory functions, Wundt established the first psychological research laboratory in 1879 at the University of Leipzig. The first studies included research on reaction time, sensation, auditory perception, and attention. Individuals from around the world, including the United States, came to study and conduct research in Wundt's laboratory.

Wundt's text on physiological psychology and his laboratory initiated psychology as an experimental discipline and formally marked its separation from the discipline of philosophy. By 1895, 24 laboratories were in existence in the United States as well as 3 journals and several textbooks. Laboratory research and a few classroom studies were conducted by faculty in the new discipline.

An educational study conducted in the 1920s illustrates the contributions of empirical research to the development of knowledge and learning. The experiment,