FOURTH EDITION

LEARNING

principles and applications

STEPHEN B. KLEIN

FOURTH EDITION

Learning

PRINCIPLES AND APPLICATIONS

Stephen B. Klein
Mississippi State University

Boston Burr Ridge, IL Dubuque, IA Madison, WI New York San Francisco St. Louis
Bangkok Bogotá Caracas Kuala Lumpur Lisbon London Madrid Mexico City
Milan Montreal New Delhi Santiago Seoul Singapore Sydney Taipei Toronto

McGraw-Hill Higher Education
*A Division of The **McGraw-Hill** Companies*

LEARNING: PRINCIPLES AND APPLICATIONS
FOURTH EDITION

Published by McGraw-Hill, a business unit of The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, New York, NY 10020.

This book is printed on acid-free paper.

International 1 2 3 4 5 6 7 8 9 0 DOC/DOC 0 9 8 7 6 5 4 3 2 1
Domestic 2 3 4 5 6 7 8 9 0 DOC/DOC 0 9 8 7 6 5 4 3 2

ISBN 0–07–249046–2
ISBN 0–07–113143–4 (ISE)

Editorial director: *Jane E. Karpacz*
Senior sponsoring editor: *Melissa Mashburn*
Editorial coordinator: *Cheri Dellelo*
Senior marketing manager: *Chris Hall*
Project manager: *Christine Walker*
Production supervisor: *Sherry L. Kane*
Designer: *K. Wayne Harms*
Cover design: *Nathan Bahls*
Senior supplement producer: *Stacy A. Patch*
Media technology senior producer: *Sean Crowley*
Compositor: *GAC—Indianapolis*
Typeface: *10/12 Palatino*
Printer: *R. R. Donnelley & Sons Company/Crawfordsville, IN*

The credits section for this book begins on page 534 and is considered an extension of the copyright page.

Library of Congress Cataloging-in-Publication Data
Klein, Stephen B.
Learning : principles and applications / Stephen B. Klein.—4th ed.
p. cm.
Includes bibliographical references (p.) and indexes.
ISBN 0–07–249046–2 (alk. paper)
1. Learning. 2. Conditioned response. I. Title.

LB1060 .K59 2002
370.15'23—dc21 2001030711
CIP

INTERNATIONAL EDITION ISBN 0–07–113143–4

www.mhhe.com

About the Author

STEPHEN B. KLEIN is professor and head of the psychology department at Mississippi State University. He received a B.S. degree in psychology in 1968 from Virginia Polytechnic Institute and a Ph.D. degree in psychology in 1971 from Rutgers University. Professor Klein taught at Old Dominion University for twelve years and at Fort Hays State University for seven years prior to coming to Mississippi State University in 1990. He has written numerous articles for psychological journals in the area of the biological basis of learning and memory and is the author of *Motivation: Biosocial Approaches,* published by McGraw-Hill in 1982; *Learning: Principles and Applications,* published by McGraw-Hill in 1987, 1991, 1996, and 2002; and *Biological Psychology,* published by Prentice-Hall in 2000. Dr. Klein coedited the two-volume text *Contemporary Learning Theories* in 1989 and *Handbook of Contemporary Learning Theories* in 2001, both published by Lawrence Erlbaum. His family includes his wife, Marie, and five children, Dora, David, Jason, Katherine, and William. In his spare time, he enjoys sports, most passionately baseball, and science fiction, especially Star Trek and Star Wars.

To my wife, Marie, and my daughter, Dora,
who have helped in innumerable ways
with the writing of this text.

Preface

Learning: Principles and Applications seeks to provide students with an up-to-date presentation of the current knowledge in learning. Basic principles are described and supplemented by research studies to provide validation of those principles, and both classic experiments and important contemporary studies are incorporated into the text. The fourth edition continues to uphold the same uncompromising scholarship of earlier editions. Psychologists who study the nature of the learning process have uncovered many important principles about how we acquire information about the structure of our environment and how we use this understanding to interact effectively with our environment. As in earlier editions, the fourth edition provides a thorough, up-to-date coverage of such principles and applications.

Much exciting new research in learning has occurred in the last few years, and I focus attention on these findings throughout the text. Some of the key new discoveries include the conditioning of immune system suppression, the identification of behavioral economic principles in operant conditioning, the determination of conditions that lead to a reinforcer being devalued, the recognition of processes that provide the reinforcing power of psychoactive drugs, the study of the question of whether language learning occurs in primates, and the relevance of memory reconstruction to understanding the validity of repressed memories.

As in previous editions, the text presents the important contributions of both human and nonhuman animal research, as both are crucial to our understanding of the learning process. In many instances, nonhuman animal studies and human research have yielded identical results, indicating the generality of the processes governing learning. While there are many general laws of learning, there are also instances in which species differ in their ability to learn a particular behavior. The use of different animals has shown that biological character affects learning. Furthermore, in some situations, only animal research can be

ethically conducted, while in other cases, only human research can identify the learning process that is unique to people.

ORGANIZATION

Based on feedback from users of the previous edition of the book, the discussion of theories of learning has been moved to follow the presentation of the basic learning principles. This change allows the student to understand the basic principles by which behavior is learned or eliminated before the discussion of the nature of that learning. Brief descriptions of chapter coverage follow.

Chapter 1 gives a brief introduction to learning as well as a discussion of the origins of behavior theory. The student is first introduced to basic learning principles through a description of the research findings and theories of Thorndike, Pavlov, and Watson. The importance of their work will be evident throughout the text. A brief presentation of the ethics of conducting research is also included in this chapter.

Chapter 2 describes the nature of instinctive processes and how instincts govern behavior. This chapter also describes two learning processes, habituation and sensitization, by which experience can alter instinctive behaviors. Opponent process theory, which describes the affective responses both during and following an event, also is introduced in this chapter.

Chapter 3 details Pavlovian conditioning, a process that involves learning when and where events will or will not occur. This discussion first explores the factors that govern the acquisition or elimination of conditioned responses. Several procedures (higher order conditioning, sensory precondition, and vicarious conditioning) in which a conditioned response can be learned with direct CS-UCS pairings can be found in this chapter. Several of the Pavlovian conditioning principles that have been used to establish effective and eliminating impairing conditioned responses are also presented.

Chapters 4 and 5 describe instrumental or operant conditioning, a process that involves learning how to behave in order to obtain the positive aspects (reinforcers) and avoid the negative aspects (punishers) that exist in our environment. The variables influencing the development or extinction of appetitive or reinforcer-seeking behavior are described in Chapter 4, while Chapter 5 presents the determinants of escape and avoidance behavior as well as the influence of punishment on behavior. The use of reinforcement and punishment to establish appropriate and eliminate inappropriate behavior also is described in these chapters.

Chapter 6 describes traditional learning theory. The theories of Hull, Spence, Guthrie, Tolman, and Skinner are explored in this chapter. The student will be able to see the changes that have taken place in the understanding of the nature of the learning process during the first half of the 20th century.

Chapter 7 discusses the environmental control of behavior and how the stimulus environment can exert a powerful influence on how we act. A discussion of stimulus generalization and discrimination learning is the major focus of the chapter. Special attention is given to understanding the difference between the eliciting and occasion-setting functions of conditioned and discriminative stimuli.

Chapter 8 describes the cognitive processes that affect how and when we behave. This chapter examines the relative contributions of expectancies and habits to determining one's actions. The relevance of cognitive learning for understanding the causes of depression and phobias also is discussed in this chapter.

Chapter 9 describes the ideas of contemporary learning theories. This chapter discusses these contemporary views on the nature of the learning process as well as how these ideas have been shaped by the theories developed by previous generations of psychologists. These contemporary theories have focused on an examination of the nature of Pavlovian conditioning and an understanding of behavioral economic principles.

Chapter 10 discusses the biological processes that influence learning. In some instances, learning is enhanced by instinctive systems, whereas in others, learning is impaired by our biological character. This chapter also describes the biological processes that provide the pleasurable aspects of reinforcement and the negative aspects of punishment.

Chapter 11 details three complex learning processes. This chapter explores how we identify concepts, solve problems, and learn to use language. A discussion of animal cognition is an important focus of this chapter, and the issue of whether language is unique to humans is one of the key areas of this discussion.

Chapters 12 and 13 discuss memory, the process that allows us to retain the influence of a learning experience into the future. The nature of memory storage and the encoding or organization of our experiences is described in Chapter 12. The processes that allow us to retrieve some experiences or forget others are detailed in Chapter 13. Further, the biological basis of memory storage and retrieval is presented in these chapters.

PEDAGOGICAL FEATURES

Pedagogy remains a central feature of this new edition, but approaches have been reworked to enhance their impact. In addition, all-new pedagogical features have been added to promote students' understanding of the learning process and better enable them to see its relevance to their everyday lives.

Vignettes. A vignette opens each chapter, and some chapters include vignettes within the chapter as well. This pedagogical feature serves three purposes: First,

it lets students know what type of material will be presented in the chapter and provides them with a frame of reference. Second, the vignette arouses the student's curiosity and enhances the impact of the text material. Third, references to the vignette have been incorporated into the text to give it a seamless quality. I have found that students like the chapter-opening vignettes, and I believe that their use solidifies the link between the text material and the students' lives.

"Before You Go On" Sections. I have included two critical thinking questions in each of the *Before You Go On* sections, which appear throughout the chapter. The *Before You Go On* questions ensure that the students understand the material and allow them to apply this knowledge in original, creative ways. My students report that the use of this pedagogy is quite helpful in understanding what can be difficult concepts.

"Application" Sections. Although applications of the text material are presented throughout, each chapter has at least one stand-alone application section. Many of the discoveries made by psychologists have been applied to solving real-world problems. These applications demonstrate that psychologists are interested in solving problems and not merely in accumulating knowledge. The application sections also enhance the relevance of the abstract ideas presented in the text, showing the student that the behaviors described do exist and are not just laboratory phenomena.

"Chapter Summaries." I have provided a review of key points at the end of each chapter, as another tool for students to check their understanding of the material that has just been covered. Once the students have read the chapter, they can easily use the review sections as a study guide to prepare for examinations.

"Critical Thinking Questions." Critical thinking questions in the form of scenarios are presented at the end of each chapter. Answering these questions requires creative application of one or more of the major concepts presented in the chapter, further assisting students in relating the principles presented in the text to situations that they may encounter in the real world.

SUPPLEMENTS

Instructor's Manual/Test Bank (0-07-2490470). This Instructor's Manual/Test Bank provides many useful tools to enhance your teaching. For each chapter, a general overview, a detailed chapter outline, teaching tips, and activities are provided. The Test Bank portion of this manual includes 50 questions for each chapter: 25 multiple choice, 15 true/false, and 10 fill-in-the-blank questions.

Custom Website (0-07-249048-9). The custom-crafted website to accompany *Learning, Fourth Edition* includes a number of resources for instructors and students to enhance their teaching and learning experience. For the instructor, this website includes an image gallery and Web links. The student portion of the site

includes a Guide to Electronic Research, Web resources, Internet exercises, key terms, practice quizzes, and Web links. Visit it at www.mhhe.com/klein4.

ACKNOWLEDGMENTS

The textbook has had input from many people. I thank the students in my learning classes who read drafts of the chapters and pointed out which sections they liked, which they disliked, and which were unclear. The staff at McGraw-Hill played an important role in the creation of this edition. Melissa Mashburn and Cheri Dellelo guided the development of the text from its inception to this final product. The project manager, Christine Walker, ensured that the text was not only easy to read but also aesthetically appealing.

I also thank my colleagues who reviewed chapters of the fourth edition. I am especially grateful to John Caruso, University of Massachusetts at Dartmouth; Carl D. Cheney, Utah State University; Donna Dahlgren, Indiana University; Joel S. Freund, University of Arkansas; Michael D. Hall, University of Nevada, Las Vegas; Henry Marcucella, Boston University; Denis Mitchell, University of Southern California; and Danielle Polage, Pepperdine University for their detailed and constructive comments.

I wish to thank Barbara Butler and Brenda Lambert for their secretarial assistance and my graduate assistant, Amanda Netterville, for her technical support. Their help allowed the project to progress quite smoothly.

My family has been very supportive of my work on this edition, and I am grateful for their help and understanding.

Stephen B. Klein

Mississippi State University

Contents

An Introduction to Learning

The Gift of Knowledge

Marcus entered college 3 years ago with the intention of studying law. His interest in the law was spurred by a course he had taken in high school. However, over the past year, he has found several of his psychology courses more exciting and challenging than his political science classes, and he now wants to obtain a degree in clinical psychology. Marcus's concern over his younger sister Yolanda's drug problems has stimulated his interest in psychology. Yolanda, an excellent student before she began to experiment with drugs several years ago, is now addicted, has quit school, and has left home. Marcus wants to understand the factors that can lead to addictive behavior, and he hopes to contribute someday to the development of an effective drug addiction therapy. Dr. Martinez, Marcus's advisor, suggested that Marcus enroll in a course on learning in order to fulfill the Psychology department's degree requirements. Spending endless hours watching rats run through mazes and analyzing pages and pages of data did not appeal to Marcus. Interested in the human aspect of psychology, Marcus wondered how this course would benefit him. However, he worried that if he did not take the course, it would adversely affect Dr. Martinez's evaluation of him for graduate school, so he enrolled in the class. Marcus soon discovered that his preconceived ideas about the learning course were incorrect. The course covered research with both human and nonhuman subjects, and the various types of experimentation complemented each other in revealing the nature of the learning processes that govern behavior. The experiments, far from boring, made the learning principles described in class seem real. Marcus soon found that learning involves developing effective methods to obtain reward and to avoid punishment, as well as an understanding of when and where these responses are appropriate. He became interested in learning how basic research has stimulated the development of behavior modification techniques and how understanding the principles of learning benefits the student of clinical psychology.

Psychology relies heavily on theory to guide its research; theory is especially important in investigations of the learning process. As Marcus discovered, many generations of psychologists have speculated on the nature of learning; and they have shown that the learning process is governed by complex, yet lawful, principles. For instance, Marcus learned that although past psychologists

attempted to use a stimulus-response approach to describe the learning process, contemporary psychologists recognize that several processes are involved in the acquisition or elimination of a behavior.

Marcus now thinks that the knowledge gained from the learning class will undoubtedly help in his search for an effective treatment of addictive behavior. You will learn from this book what Marcus discovered about learning in his course. I hope your experience will be as positive as his. We begin our exploration by defining *learning*.

A DEFINITION OF LEARNING

What do we mean by the term **learning?** Learning can be defined as an experiential process resulting in a relatively permanent change in behavior that cannot be explained by temporary states, maturation, or innate response tendencies. This definition of learning has three important components. First, learning reflects a change in the potential for a behavior; it does not automatically lead to a change in behavior. We must be sufficiently motivated to translate learning into behavior. For example, although you may know the location of the campus cafeteria, you will not be motivated to go there until you are hungry. Also, we are sometimes unable to exhibit a particular behavior even though we have learned it and are sufficiently motivated to exhibit it. For example, you may learn from friends that a good movie is playing but not go because you cannot afford it.

Second, the behavior changes that learning causes are not always permanent. As a result of new experiences, previously learned behavior may no longer be exhibited. For example, you may learn a new and faster route to work and no longer take the old route. Also, we sometimes forget a previously learned behavior, and therefore are no longer able to exhibit that behavior. Forgetting the story line of a movie is one instance of the transient aspect of learning.

Third, changes in behavior can be due to processes other than learning. Our behavior can change as the result of a motivational change rather than because of learning. For example, we eat when we are hungry or study when we are worried about an upcoming exam. However, eating or studying may not necessarily be due to learning. Motivational changes, rather than learning, could trigger eating or studying. You may have already learned to eat, and your hunger motivates your eating behavior. Likewise, you may have learned to study to prevent failure, and your fear motivates studying behavior. These behavior changes are temporary; when the motivational state changes again, the behavior will also change. Therefore, you will stop eating when you are no longer hungry and quit studying when you no longer fear failing the examination. Becoming full or fatigued and ceasing to eat or study is another instance where a temporary state, rather than learning, leads to a change in behavior.

Many behavioral changes are the result of maturation. For example, a young child may fear darkness, while an adult does not show an emotional reaction to the dark. This change in emotionality reflects a maturational process and is not dependent on experiences with darkness. Another example of the

impact of maturation is a child who cannot open a door at age 1, but can do so at age 2. The change in the child's behavior reflects the physical growth that allows the child to reach the doorknob.

Not all psychologists agree on the nature of the learning process. Some even argue that instinct, rather than experience, determines behavior. We begin our discussion by examining the view that instinctive processes govern human actions. Later in the chapter, we will explore the origins of behavior theory, the view that emphasizes the central role of experience in determining behavior. Throughout the rest of the text, we will discuss what we now know about the nature of learning.

HISTORICAL ORIGINS OF BEHAVIOR THEORY

Psychology has not always been interested in the role of experience in governing human behavior. Early thinking focused on the importance of instinct in human activity.

Functionalism

Functionalism was an early school of psychology that emphasized the instinctive origins and adaptive function of behavior. According to this theory, the function of behavior is to promote survival, and adaptive behaviors allow an animal to survive. However, the functionalists expressed various ideas concerning the mechanisms controlling human behavior. John Dewey (1886) suggested that the reflexive behaviors of lower animals have been replaced in humans by the mind, which has evolved as the primary mechanism for human survival. The brain enables the individual to adapt to the environment. The main idea in Dewey's functionalism was that the manner of human survival differs from that of lower animals.

In contrast to Dewey, William James, also a nineteenth-century psychologist, argued that the major difference between humans and lower animals lies in the character of their respective inborn or instinctual motives. According to James (1890), human beings possess a greater range of **instincts** that guide behavior (for example, rivalry, sympathy, fear, sociability, cleanliness, modesty, and love) than do lower animals. These social instincts directly enhance (or reduce) our successful interaction with our environment and, thus, our survival. William James also proposed that all instincts, both human and nonhuman, have a mentalistic quality, possessing both purpose and direction. Unlike Dewey, James believed that instincts motivated the behavior of both humans and lower animals.

Some psychologists (see Troland, 1928) who opposed a mentalistic concept of instinct argued that internal biochemical forces motivate behavior in all species. Concepts developed in physics and chemistry during the second half of the nineteenth century provided a framework for this mechanistic approach to motivation. Ernst Brucke stated in 1874 that "the living organism is a dynamic system in which the laws of chemistry and physics apply"—a view which led to

great advances in physiology. This group of functionalists used a physiochemical approach to explain the motivation for human and animal behavior.

A number of scientists strongly criticized the instinct concept that the functionalists proposed. First, anthropologists pointed to a variety of values, beliefs, and behaviors among different cultures, an observation inconsistent with the idea of universal human instincts. Second, Watson and Morgan's (1917) observations of human infants led them to conclude that only three innate emotional responses existed—fear, rage, and love—and that only a small number of stimuli could elicit these responses. Third, some argued that the widespread and uncritical use of the instinct concept did not advance our understanding of the nature of human behavior. Bernard's (1924) analysis illustrates the weaknesses of the instinct theories of the 1920s. Bernard identified several thousand often-conflicting instincts the functionalists had proposed. For example, Bernard described one instinct as "with a glance of the eye we can estimate instinctively the age of a passerby" (page 132). With this type of proposed "instinct," it is not surprising that many psychologists reacted so negatively to the instinct concept.

BEFORE YOU GO ON

- **How would Marcus explain addictive behavior using our definition of learning?**
- **What could Marcus learn about addiction from our discussion of functionalism?**

In the 1920s, American psychology moved away from the instinct explanation of human behavior and began to emphasize the learning process. The psychologists who viewed experience as the major determinant of human actions were called behaviorists. Contemporary views suggest that behavior is traceable to both instinctive and experiential processes. We will look at instinctive processes, and how experience affects instinctive reactions, in the next chapter. In this chapter, we will examine the behaviorists' ideas concerning the nature of the learning process. We will discuss contemporary learning theories in Chapter 9, and the influence of instincts on learning in Chapter 10.

Behaviorism

The Importance of Experience

Behaviorism is a school of thought that emphasizes the role of experience in governing behavior. According to behaviorists, the important processes governing our behavior are learned. We learn both the drives that initiate behavior and the specific behaviors motivated by these drives through our interaction with the environment. A major goal of the behaviorists is to determine the laws governing learning. This concern about the nature of learning has dominated academic psychology for most of the last century. A number of ideas contributed to the behavioral view. The Greek philosopher Aristotle's concept of the association of ideas is one important origin of behaviorism.