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978-0-521-79333-9 - The Psychology of Problem Solving

Edited by Janet E. Davidson and Robert J. Sternberg

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The Psychology of Problem Solving

Problems are a central part of human life. *The Psychology of Problem Solving* organizes in one volume much of what psychologists know about problem solving and the factors that contribute to its success or failure. There are chapters by leading experts in this field, including Miriam Bassok, Randall Engle, Anders Ericsson, Arthur Graesser, Norbert Schwarz, Keith Stanovich, and Barry Zimmerman.

The Psychology of Problem Solving is divided into four parts. Following an introduction that reviews the nature of problems and the history and methods of the field, Part II focuses on individual differences in, and the influence of, the abilities and skills that humans bring to problem situations. Part III examines motivational and emotional states and cognitive strategies that influence problem-solving performance, while Part IV summarizes and integrates the various views of problem solving proposed in the preceding chapters.

Janet E. Davidson is Associate Professor of Psychology at Lewis & Clark College. She conducts research on several aspects of problem solving, including the roles that insight and metacognitive skills play in problem solving.

Robert J. Sternberg is IBM Professor of Psychology and Education at Yale University and Director of the Yale Center for the Psychology of Abilities, Competencies and Expertise (PACE Center). Professor Sternberg is Editor of *Contemporary Psychology* and past Editor of *Psychological Bulletin*.

Together, Professors Davidson and Sternberg have edited two previous books, *Conceptions of Giftedness* (Cambridge, 1986) and *The Nature of Insight* (1995).

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Edited by

JANET E. DAVIDSON

Lewis & Clark College

ROBERT J. STERNBERG

Yale University



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Contributors

Miriam Bassok
University of Washington

Magda Campillo
Graduate School and University Center,
City University of New York

Janet E. Davidson
Lewis & Clark College

Randall W. Engle
Georgia Institute of Technology

K. Anders Ericsson
Florida State University

Peter A. Frensch
Humboldt-University at Berlin

Arthur C. Graesser
The University of Memphis

David Z. Hambrick
Michigan State University

Kenneth Kotovsky
Carnegie Mellon University

Todd I. Lubart
Université René Descartes, Paris

Christophe Mouchiroud
Université René Descartes, Paris

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Contributors

Adam J. Naples

Yale University

Jean E. Pretz

Yale University

Norbert Schwarz

University of Michigan

Ian Skurnik

University of Michigan

Keith E. Stanovich

University of Toronto

Robert J. Sternberg

Yale University

Dorit Wenke

Humboldt-University at Berlin

Shannon Whitten

The University of Memphis

Barry J. Zimmerman

Graduate School and University Center,
City University of New York

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Preface

Almost everything in life is a problem. Even when we go on vacations to escape our problems, we quickly discover that vacations merely bring problems that differ in kind or magnitude from the ones of daily living. In addition, we often find that the solution to one problem becomes the basis of the next one. For example, closing on a house solves the problem of buying a house, but usually means the initiation of a whole new set of problems pertaining to home ownership.

Because problems are a central part of human life, it is important to understand the nature of problem solving and the sources that can make it difficult. When people have problems, how do they identify, define, and solve them? When and why do they succeed at problem solving and when and why do they fail? How can problem-solving performance be improved?

Our goal for this book is to organize in one volume what psychologists know about problem solving and the factors that contribute to its success or failure. To accomplish this goal, we gave each of our contributors the following problem: "Use your area of expertise to determine what makes problem solving difficult." By examining why problem solving is often difficult for people, we hope to discover how to make it easier and more productive. However, the book's focus is not a discouraging one that emphasizes only failures in problem solving. Instead, it provides a balanced view of why problems are and are not solved successfully. Therefore, the book is organized by factors that affect problem-solving performance, such as intellectual abilities, working memory, motivation, and transfer of training, rather than by area of endeavor, such as mathematics, social science, natural science, and history. Each chapter focuses on one or more factors that are common to the solution of a wide range of problems. However, the extent to which these factors affect problem-solving performance can vary from one type of problem to another.

The book is divided into four parts. Part I comprises the introduction to the book and to the field of problem solving. In chapter 1, Jean Pretz,

Adam Naples, and Robert Sternberg describe the steps and mental processes that individuals use when successfully solving a wide range of problems. These authors then discuss different types of problems and how these types influence our recognition, definition, and mental representation of problem situations. Anders Ericsson, in chapter 2, reviews the historical context and methodology for research on problem solving. In addition, he presents contemporary research in a variety of domains that demonstrates how and why deliberate practice affects problem-solving performance.

Part II focuses on individual differences in, and the influences of, the abilities and skills that humans bring to problem situations. In chapter 3, Dorit Wenke and Peter Frensch discuss whether intellectual ability influences individuals' ability to solve complex problems. Chapter 4, by Todd Lubart and Christophe Mouchiroud, reviews when and why creative problem solving is difficult for many individuals. In chapter 5, Janet Davidson describes the difficulties surrounding insightful problem solving and discusses four approaches that explain individual differences in its occurrence. David Hambrick and Randall Engle propose, in chapter 6, that working memory and differences in its capacity play an important role in problem solving, especially when irrelevant information needs to be suppressed or tasks are complex. The final chapter in this part, written by Shannon Whitten and Arthur Graesser, describes the roles that text comprehension and knowledge base play in most problem-solving situations. This chapter also reviews models that explain how text is represented mentally after it is comprehended.

Part III covers motivational and emotional states and cognitive strategies that influence problem-solving performance. In chapter 8, Barry Zimmerman and Magda Campillo review how and why motivation and personal resourcefulness influence problem-solving performance in both formal and informal contexts. In addition, these authors present a cyclical model of problem solving that identifies self-regulatory processes and sources of motivation that are central to successful problem solving in a wide range of situations. Norbert Schwarz and Ian Skurnik, in chapter 9, describe how our moods and emotions inhibit or facilitate thinking and problem solving. In chapter 10, Keith Stanovich presents a collection of related processing styles or computational biases that predispose individuals, for evolutionary reasons, to make particular judgments and pursue certain problem-solving paths. Miriam Bassok, in chapter 11, discusses the conditions that allow or prohibit individuals from transferring well-learned problem-solving procedures to new problem situations.

It should be noted that the division of chapters into parts II and III is not meant to imply that individuals are the sole source of problem-solving success or failure. The role of the problem is discussed throughout the book. Some problems require certain abilities, skills, states, and strategies that other problems do not require.

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The final section, part IV, is a chapter written by Kenneth Kotovsky. This chapter summarizes and integrates the various contributions to the book. It also challenges us to approach the field of problem solving in new ways.

Many people helped make this book possible. We thank all of the authors for working with us and producing excellent chapters. Their chapters will help us solve the problem of why problem solving can be difficult. Philip Laughlin, our wonderful editor at Cambridge University Press, expertly solved the problems that arose in all phases of the book's development. Our colleagues at Lewis & Clark College and Yale University provided the intellectual stimulation that inspired us to pursue this book. We also thank each other. Over the years, we have learned how to work together to solve the problems that naturally occur during cross-continental collaborations.

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J.E.D.
R.J.S