Book Review: Learning to Solve Problems: A Handbook for Designing Problem-Solving Learning Environments

Holly R. Henry
University of Missouri

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I first encountered David Jonassen's *Learning to Solve Problems: A Handbook for Designing Problem-Solving Learning Environments* as a teaching assistant in his course, "Designing Problem-Based Learning Environments." Thus, this review represents an "insider's view" informed by observing Jonassen's use of a pre-press version of this book in the classroom. While I have made a concerted effort to present an impartial review, readers should note the potential for bias in my critique.

Rather than a handbook specific to PBL, this book covers a variety of problem types and examines the strategies and skills required to solve each type. While Jonassen characterizes the book as a reference, not intended to be read from cover to cover, the organization of *Learning to Solve Problems* serves as a roadmap for students to learn about the range of problem types and the variety of learning activities that promote solving each type. The writing style is friendly to students and practitioners, as is the use of questions for the section headings, which invite readers to use the text as inquiry rather than gospel. While some sections are quite text-heavy, Jonassen generally provides diagrams as supplemental representations of key concepts, and nearly all instructional strategies discussed in the book are accompanied by screenshots exemplifying their implementation.

The first chapter gives a broad overview of problems and problem-solving, culminating in an elaboration of Jonassen's taxonomy of problem types (first described in Jonassen, 2000). The remainder of the book is divided into four parts: 1) Problem-Specific Design Models, 2) Cases: The Building Blocks of Problem-Solving Learning Environments, 3) Cognitive Skills in Problem Solving, and 4) Assessing Problem Solving.

Part I dedicates one chapter to each of six of the 11 problem types identified in the

taxonomy: story, decision-making, troubleshooting and diagnosis, strategic-performance, policy analysis, and design problems. Each chapter begins with a description of the problem type and the contexts in which it is typically encountered, followed by a survey of related research and theory. Like most textbooks, this one gives more coverage to foundational literature than to cutting edge research; however, the literature coverage is fairly comprehensive, albeit slightly more current for the problem types that are represented in Jonassen's research agenda. The chapters then shift to instructional strategies, including explanations of tools and methods historically employed. Each chapter in Part I concludes with a model listing the components of a learning environment supporting that particular problem type. Several of the chapters include examples of actual designs from Jonassen's research and teaching that illustrate the respective models in action.

The seven chapters in Part II examine different uses of cases for teaching problem-solving. Jonassen characterizes cases as "the building blocks of problem-solving learning environments (PSLEs)" because "different kinds of problems and the support needed to solve them are presented as cases" (p. 149). The chapters represent his view that cases serve different functions in problem-solving instruction, and the function of a case should help determine its form. For example, when using cases as problems to solve, as described in Chapter 8, the case "should present an authentic task to solve," (p. 165), "allow for student errors and error recovery," (p. 166), and contain sufficient detail (determined by the desired level of student research for the instructional activity) to allow students to solve the problem without revealing the solution in the case. On the other hand, when using cases as worked examples, as described in Chapter 9, each case necessarily includes both the solution to the presented problem and the path taken to arrive at that solution. Each chapter in Part II provides at least one example of a design incorporating the form and function discussed.

Part III addresses seven key cognitive skills that Jonassen sees as central to problem solving: problem schemas, analogical comparison, causal relationships, questioning, modeling, arguing, and metacognitive regulation. These chapters begin with an overview of the skill and why it is important for solving problems, continues with a discussion of foundational theory and relevant research, and concludes with specific instructional strategies for fostering the skill within a problem-solving learning environment. Here again, Jonassen draws in examples primarily from his own research and teaching to illustrate how these instructional strategies can be implemented. Chapter 17, "Understanding Causal Relationships in Problems," is particularly extensive. Jonassen provides persuasive warrants from the literature to emphasize his argument that causal relationships are critical to nearly all types of problem solving and dedicates significant attention to their attributes before offering methods for facilitating causal reasoning.

Finally, a single chapter on assessment serves as Part IV. While designers will find many useful ideas here for assessing the cognitive skills described in Part III, the organiza-

tion of this section could be improved, particularly for students, by more closely following the organization of Part III. Instead, Jonassen chooses "four different ways of assessing problem solving knowledge and skills" (p. 354) that reuse the skills terminology from Part III, but group them in ways that may be confusing, particularly because the explanatory figure accompanying the assessment categories doesn't quite match the text. Given that Jonassen emphasizes, in the introduction to this chapter, the importance of appropriate and multiple forms of assessment for learning to solve problems and implies that there are more methods available than those included here, Part IV of this book is also ripe for expansion, perhaps beyond this single chapter treatment.

Overall, *Learning to Solve Problems* is a rich, detailed exploration of the breadth of problem solving that designers will find provides a useful addition to their shelves. For instructors and students of instructional design, it is a focused follow up suited to those students already grounded in ID techniques and interested in designing for problem-solving. Researchers will find that it encompasses and summarizes much of Jonassen's own research in problem-solving and may prompt ideas for future research (particularly in the area of assessment) as not all of the provided design examples have been studied. The book is available in hardcover, softcover, and eBook formats. Be forewarned that the various figures and tables do not enlarge clearly in the eBook version, making some of the text-heavy diagrams difficult to read compared to the other formats. Finally, it should be mentioned that IJPBL readers have the unique opportunity to read a general overview of the content of the handbook in this issue's invited article by Jonassen: *Supporting Problem Solving in PBL*.

Reference

Jonassen, D. (2000). Toward a design theory of problem solving. *Educational Technology Research and Development*, *48*(4), 63-85.

Holly R. Henry is an Instructional Designer at the University of Missouri System and a Doctoral Candidate in the School of Information Sciences and Learning Technologies at the University of Missouri.