Published online: 8-4-2015

Essential Readings in Problem-Based Learning: Exploring and Extending the Legacy of Howard S. Barrows

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Recommended Citation

BOOK REVIEW

Essential Readings in Problem-Based Learning: Exploring and Extending the Legacy of Howard S. Barrows

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Essential Readings in Problem-Based Learning represents an ambitious goal to include influential articles and chapters regarding the theories and research central to ill-structured problem solving. The book is unique because it goes beyond being a traditional handbook of research by also including previously written articles germane to foundations of problem-based learning (PBL). In doing so, the chapters provide an overview of the current debates in light of established writings. Collectively, the book serves as a great resource by synthesizing various articles relevant to learning theories, practical instructional strategies, and research.

The book is separated into four sections: the process and structure of problem-based learning; new contexts for problem-based learning; combining problem-based learning with other interventions; and summarizing and assessing the impact of problem-based learning. The sections provide the reader with a logical progression of writings related to theory, implementation, and research focused on PBL. Although edited separately by distinguished researchers, within each section relevant theories and the empirical research are clearly articulated and discussed. Moreover, each of the sections highlights important debates related to PBL, such as the role of technology, scaffolding, and others.

The first section ("The Process and Structure of Problem-Based Learning"), edited by Dr. Cindy Hmelo-Silver, helps to establish the theoretical foundation of PBL. The often-cited, initial chapter of the section written by Dr. John Savery ("Overview of Problem-Based Learning: Definitions and Distinctions") is aptly situated to outline important definitions and distinctions for this instructional strategy, such as case-based learning versus problem-based learning. Section 1 further includes a broad range of the theoretical foundations, including problem types (Chapter 2), problem space (Chapter 3), and the role of the facilitator (Chapters 4 and 5).

The problem types chapter delineates various forms of problems, such as story problems, decision-making problems, and design problems. In doing so, the chapter helps the reader to avoid a one-size-fits-all approach to problem solving in their discussion of the continuum of ill-structured problems. The authors, in turn, describe how these different problems are leveraged for various disciplines. For instance, how diagnosis-solution problems are used in the medical field, whereas design problems may be more applicable to engineering. As such, the chapter primes the reader to think about how PBL is implemented in a given discipline.

Once the reader is introduced to the different problems, Chapter 3 builds off of that by exploring the problem space. This is a particularly interesting topic because it helps the reader to understand that in ill-structured problems learners encounter an array of topics as students take ownership of their learning. As the author describes, this helps to interpret and consider how students are scaffolded in the space, while also including implications for assessment where no one "right" answer exists. This is an important aspect that others have built upon (Ertmer & Koehler, 2014) as the field seeks to understand how students navigate relevant concepts within a problem.

In the preceding chapters regarding problem types and problem space, much of the focus is on the learning process of the individual student. An implicit element within those chapters is the transition from the teacher-as-lecturer toward a facilitator role. The facilitator chapters of the book (Chapters 4 and 5) allow the reader to understand how the PBL dynamic is not just from a student perspective, but also requires a shift from the instructor perspective. McCaughan (Chapter 4) introduces facilitation principles such as self-reflection as they stem from Dewey and Rogers' frameworks. Alternatively, Hmelo-Silver and Barrows (Chapter 5) include

an in-depth look at how facilitators engender skills such as causal reasoning, question-generation, and inquiry within the student. Along with introducing important theoretical foundations, the section helps the reader to avoid an over-simplification of PBL and establish a systemic way of looking at the PBL experience.

If Section 1 establishes the theoretical foundations of problem solving, Section 2 ("New Contexts for Problem-Based Learning") extends the reader perspective by investigating implementations of PBL within various contexts. As described elsewhere (Ertmer & Simons, 2006), teachers often are faced with challenges in their adaption to PBL. In her editorial introduction to the section, Dr. Peggy Ertmer describes the origin of PBL with the medical context and its increased adoption over the years. Collectively, the articles of this section investigate the efficacy of PBL in a variety of fields, such as dentistry and K–12 education, and how learning is supported in each of these disciplines. The articles thus go beyond the theoretical foundations described in Section 1 and investigate how holistic issues such as motivation, engagement, and student demographics factor into the efficacy of PBL.

In many instances, the articles highlight the "theory to reality" challenges of PBL (Hung, 2011). This section is fittingly situated after the theory introduction for two reasons. First, the initial few chapters of the section elucidate essential aspects, such as scaffolding (Chapter 6). Ertmer and Glazewski point to research that suggests students have difficulty with PBL and discuss ways to scaffold learning holistically, including motivation and engagement. Chapters 7 and 9 further explicate this by describing ways in which technology may be used to support PBL. Specifically, how technology can help negotiate meaning making (Chapters 7 and 9), collaboration (Chapters 7 and 9), and argumentation (Chapter 9). Chapter 8 expands the conversation by looking at the practical challenges of PBL and technology integration. As each article in this section emphasizes, variables such as student demographic and level of support may serve as additional considerations as readers reflect on the PBL model. Moreover, this sections helps to underscore variables that factor into the meta-analyses later described in Section 4.

Section 3 of the book ("Combining Problem-Based Learning With Other Interventions") has similar goals to that of Section 2. That is, the section builds upon the theories of situated learning (Brown, Collins, & Duguid, 1989) and scaffolding theory (Vygotsky, 1978) detailed in Section 1 by delving further into PBL implementations. However, this section is unique in the book because it does not just describe different contexts, but focuses on the evolution of PBL and its alignment with other familiar instructional approaches. For instance, Chapter 10 researches some of the issues related to pre-service teacher education and describes how PBL may be

reimagined as practice-based work (PBW). Similarly, Chapter 11 applies the framework to field learning often used in teacher education. In both of these examples, the authors explore how PBL can be used to introduce aspiring teachers into the domain and see themselves as practitioners. Others in the section focus on applying the PBL approach with other familiar strategies, such as the learning-by-design (LBD) framework (Chapter 12). The LBD chapter is especially interesting given how it describes distributed scaffolding and collaborative knowledge building, which complements the Ertmer and Glazewski chapter from Section 2.

The chapters that follow also explore how PBL intersects with unforeseen academic potential (Chapter 14) and the role of prior knowledge in medical education (Chapter 15) as important variables to consider. As in Section 2, the editor (Dr. Heather Leary) leaves the reader with an understanding of how PBL has been adopted beyond the medical field, but also stimulates the reader to ask important practical questions such as:

1. How might a specific discipline adopt PBL?
2. What accommodations are required?
3. How appropriate are those accommodations given the theories described in Section 1?
4. How might the accommodations serve as a catalyst to intersect with other educational approaches?

This section therefore strongly complements Section 2 by showing implementations alongside other instructional strategies. I believe this is important because it helps to underscore the different challenges that practitioners may encounter during implementations and provides ideas to overcome these issues.

Up to this point the book has established the theories (Section 1) and provided the reader with an understanding of implementation strategies (Sections 2 and 3). In contrast to Sections 2 and 3, the fourth and final section ("Summarizing and Assessing the Impact of Problem-Based Learning") focuses on PBL from a large-scale, quantitative data perspective. As such, statistical analysis and empirical validation related to the theories described in Section 1 are presented. Although previous manuscripts have attempted to synthesize PBL research (Alfieri, Brooks, Aldrich, & Tenenbaum, 2011; Hmelo-Silver, 2004), this section addresses the "tendency for academics to construct research silos" (p. 275). Specifically, the section explores how PBL has extended beyond the work of Barrows and Tamblyn (1980) and its adoption across disciplines such as medical education, teacher education, and engineering.

I found this section to be particularly beneficial because of its multifaceted approach to describing the research. In addition to traditional bar graphs, Chapter 16 by Drs. Xian

and Madhavan includes visualization analyses such as scatter plots, word clouds, and network analysis. The authors visually depict the PBL research and its validation over the years and across disciplines. Of particular interest is how the citations in the last 15–20 years have begun to focus on areas such as curriculum design, design of learning environments, and focus on the problem-solving processes of students. This underscores how the theoretical work of Barrows has generated such widespread influence and research questions within and across disciplines. Once again, this complements the chapters discussed in Sections 2 and 3.

In addition, I believe Section 4 is important because it provides multiple approaches to synthesizing the PBL research, including meta-analyses (Chapters 17 and 18) and a meta-synthesis (Chapter 19). Interestingly, the meta-analyses in Chapters 17 and 18 elucidate PBL variables related to discipline, problem-types, and implementation-types. Once again, these articles come full circle from the theoretical foundations described by the authors in earlier sections. Overall, the findings in the article suggest positive results regarding the efficacy of PBL, but also highlight how additional research is needed to be done in terms of its scope. These articles also highlight how variations in implementations might impact the field's understanding of PBL, including discipline (e.g., medical or pre-service teacher education), age group, and other variables. Furthermore, the research section incites to reader to contemplate additional questions the field has yet to answer and opportunities for new directions.

In conclusion, this book is an excellent resource for practitioners, researchers, and educators interested in PBL. As the title suggests, the book achieves its goal by providing an assimilation of the important articles that help frame the debate regarding PBL. By dividing the book into distinct yet complementary sections, the text delineates the appropriate theoretical constructs and empirical validation related to PBL. While other books may focus on specific subtopics such as online learning and medical education, this book is beneficial for both novices and experts because of its comprehensive approach to PBL. For the novice researcher, the book establishes a broad yet thorough overview of the discourse regarding PBL. For the experienced researcher, the book serves as a resource of empirical research and questions that the field has yet to answer.

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