Feature Book Review

Discipline-Based Education Research: Preaching to Converts Who Are Learning to Sing in the Choir

Review of: *Discipline-Based Education Research: A Scientist's Guide*, by Stephanie J. Slater, Timothy F. Slater, and Janelle M. Bailey; 2010; 110 pp; W.H. Freeman (New York); ISBN-13: 978-1-4292-6586-7

Reviewed by Mary Lee Ledbetter, National Science Foundation, Arlington, VA 22230; and Erin L. Dolan, Virginia Tech, Blacksburg, VA 24061

Scientists are becoming increasingly aware of the need to approach their teaching with the same expectations for evidence that they use in their science. They are coming to recognize that, just as in science research, research on undergraduate science education has a literature as well as standards for practice. I (M.L.L.) am a recent convert to this way of thinking. I taught for 30 years using mostly a lecture style and believed myself quite revolutionary when I used projected images to make cell biological points in class. I now teach using the results of discipline-based education research (DBER) and do my best to use instructional strategies that are demonstrated to improve student learning.

As this pool of converts grows, so too grows the number of individuals who are formally trained as scientists but are interested in using research-based approaches to teaching or in contributing to the literature of DBER themselves. *Discipline-Based Education Research: A Scientist's Guide* was written with both audiences in mind. It does not “preach to the choir.” Rather, it opens the door to admit the convert, providing a guide to the purposes, findings, and practices of DBER, which are often elusive and opaque to scientists.

Given the title and content of the book, we were surprised not to find a clearly stated definition of DBER. Although the authors identified themselves as discipline-based education researchers (astronomy education researchers, in particular), they did not articulate how DBER differs from science education research or education research in general. We expect that

this is because the field has yet to reach consensus on a definition. From my (E.D.) perspective, discipline-based education researchers have deep understanding of a scientific domain and proficiency with education research methodologies that make them uniquely prepared to study science teaching and learning, especially at the undergraduate and graduate levels. We approached our review of the book with this definition in mind.

AUDIENCE

From the title to the references, this book is clearly written for scientists who want to study teaching and learning in the

DOI: 10.1187/cbe.11-03-0026

Address correspondence to: Mary Lee Ledbetter (msledbet@nsf.gov).

© 2011 M. L. Ledbetter and E. L. Dolan. CBE—Life Sciences Education © 2011 The American Society for Cell Biology. This article is distributed by The American Society for Cell Biology under license from the author(s). It is available to the public under an Attribution-Noncommercial-Share Alike 3.0 Unported Creative Commons License (<http://creativecommons.org/licenses/by-nc-sa/3.0>).

“ASCB®” and “The American Society for Cell Biology®” are registered trademarks of The American Society for Cell Biology.

sciences. In some respects, the text is reminiscent of *Scientific Research in Education* (Shavelson and Towne, 2002), which the authors themselves cite as a key reference. Yet Slater and colleagues adopt a conversational tone, repeatedly recognize scientific viewpoints, and use analogies to science research in ways that make this book much more approachable to an audience of scientists. Jargon is minimized, and key terms and ideas are defined in ways that make them comprehensible to those with developing expertise in DBER. Even though the text is mostly instructional in nature, the authors' use of humor and self-deprecation helps them avoid coming across as condescending or elitist.

KEY FEATURES

The book is sufficiently structured for readers to flip straight to the topics of most interest, yet it is also engaging enough to read cover to cover. The authors start with some practical advice about how readers can find the information that is of greatest interest to them. Subsequent chapters follow a logical progression for thinking about research: becoming familiar with what is already known, identifying a research question, settling on a research design, utilizing quantitative or qualitative methods, and publishing the results.

Each chapter is full of timely and pragmatic advice. Practicality is clearly a priority for the authors, from their advice to engage in research that is "actionable" (i.e., directly leading to creative changes in practice for instructors) to their inclusion of immediately usable information. For example, key references, which readers can explore for in-depth treatment of particular topics, are highlighted in callout boxes. Methodologies common to education research, such as calculating gain scores and effect sizes, are described, evaluated, and demonstrated. Key ideas and recommendations are exemplified throughout. For example, two of the appendices are "ready-to-go assessment instruments" related to astronomy education. The third is a brief but useful description of the process of preparing proposals to institutional review boards for human subjects research. The authors even point out a series of "great journals scientists might be caught reading," including *CBE—Life Sciences Education*, and other "great journals that scientists probably would NOT be caught reading . . . but should," such as the *Journal of Research in Science Teaching*, the *Journal of Learning Sciences*, and *Science Education* (p. 67).

The authors not only make clear and concise recommendations for how to go about DBER; they also point out common pitfalls and offer advice on how to avoid them. For example, the authors make efforts to dispel myths, especially about qualitative research (e.g., that all studies that utilize nonnumerical data are qualitative and that all qualitative research is about measuring subjective outcomes like attitudes or interests), without sounding patronizing or sanctimonious. In addition, the authors draw important distinctions between theoretically driven education research, action research, and program evaluation, while illustrating how evaluation results can spawn fruitful research projects (p. 70).

One shortcoming of the text is underreferencing. For example, the authors point out a series of effects that might jeopardize the interpretability of quantitative and statistical studies, but no references are offered for readers to explore these ideas further. It is likely that references are not included because many of these ideas are common knowledge for individuals with relevant, formal training. The strategic, rather than comprehensive, inclusion of references clearly indicates the importance of particular references and contributes to the book's commendable succinctness. Because the book is intended to meet the needs of a less savvy audience, inclusion of a few more citations would have been helpful.

Another concern is that there is little if any mention of the breadth of disciplinary perspectives that impinge on education research. For example, the authors mention several science education research journals that are worthy of attention but do not point out the value of exploring the literature and approaches from the domains of cognitive, organizational, social, or educational psychology. The authors also could have been more explicit about the kinds of questions that each of these perspectives aims to understand, including other relevant perspectives such as cultural anthropology and sociology.

Even though the book's hallmark is its approachability, a few topics seem a bit obscure. For example, the four approaches to analyzing data from a grounded theory perspective are defined (p. 57), but it is not clear how one is selected over the others and what the advantages or disadvantages of each might be. One last pet peeve: the use of multiple nouns as modifiers, rather than properly hyphenated compound adjectives, creates disconcerting mouthfuls such as "Analyzing Multiple-Choice Content Knowledge Test Scores" (p. 29).

CLOSING THOUGHTS

From our perspective, this book can be used for multiple purposes. It can be read cover to cover by those engaged in DBER. It can be communicated piecemeal to colleagues who are interested in learning from DBER. Finally, the take-home messages can be summarized and shared with others to illustrate the worth of DBER in general and the merits of particular methods and approaches unique to this type of research. In fact, the text is succinct and pithy enough (not to mention inexpensive at \$18.95!) to distribute as part of faculty professional development efforts, which is what we plan to do. The choir of scientist-educators is growing, and a text framed with this audience in mind is both needed and welcomed.

REFERENCE

Shavelson RJ, Towne L (eds.) (2002). *Scientific Research in Education*. Washington, DC: National Academies Press.