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Book and Media Review

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Review of *Teaching and Learning STEM: A Practical Guide*

Sarah B. Boesdorfer*

Department of Chemistry, Illinois State University, Normal, Illinois 61790, United States

Supporting Information

Teaching and Learning STEM: A Practical Guide, Richard M. Felder and Rebecca Brent. Jossey-Bass—A Wiley Brand: San Francisco, CA, 2016. ISBN: 978-1-118-92581-2 (hardcover). $45.00.

Teaching and Learning STEM: A Practical Guide by Felder and Brent is, as it is billed, a guide for STEM (science, technology, engineering, and mathematics) instructors. In its purpose and content, the book is very similar to books such as *What the Best College Teachers Do?*,[1] but with a STEM focus and with a more comprehensive discussion of details required to teach a collegiate course. The book provides guidance for almost every issue faced by instructors, including overall course design, class session design, grading, group work, even cheating, and much more. The authors' goal is "to describe some proven teaching methods—most relatively easy ones that don't require major preparation time and a few that present greater challenges—and to prepare you to implement those methods" (p 9); they achieve this goal. The immense number of topics they discuss does not allow them to provide much information on the learning theory or research supporting their suggestions, though they try with very quick summaries of the research and citation lists. The reader must trust the authors or research the ideas behind the suggestions further on their own, but Felder and Brent are experienced in their field, providing ideas well supported by research literature.

I appreciate that the book practices what it preaches. Felder and Brent suggest that you "make your learning objectives and main points clear", which they do by starting each chapter with questions the chapter will address along with ending each chapter with "Ideas to Take Away." Not only is this helpful for learning the material in the chapter, it makes the book a great reference text that you can refer to for ideas. They also suggest using multiple representations of the content to help students "see" the connections between the ideas being taught. They use graphic organizers and have great tables that summarize and connect their content. One final example of Felder and Brent using the practices they want their readers to use: They discuss the idea that students learn better when the information to be learned has meaning for the students, relating to their interests or past experiences. Prior to each chapter there are "Interludes", stories of situations with hypothetical students or faculty most instructors will find familiar and which relate to the content of the upcoming chapter. The authors use the Interludes to make the connections to their audiences' prior experiences to improve the learning.

The strength of the book is the first two sections. Section three discusses the teaching of professional skills, such as problem-solving, creativity thinking, teamwork, and communication skills. It is a generic discussion, and their suggestions will only teach the professional skills minimally. The weakness of this section results from limited cited research studies and learning theories. Topics in this section would relate significantly to cognitive development and education psychology yet few, if any, of these sources are cited. The main citations in this section are to the authors' publications, many of which are found in the *Journal of Engineering Education*. The teamwork chapter cites more of the literature, and it is the strongest part of this section with the best suggestions for classroom practice.

The citations are, in fact, the main problem I have with the book.[2] Not surprisingly, as the first author is a chemical engineer, a large number of the references are engineering education references, and the authors self-cite frequently. Many of the cited engineering education articles are reviews of or include citations to the wider educational-research literature, but if the book is supposed to be for all STEM instructors, I would have appreciated citations from across the STEM education research fields. However, this issue is not significant enough for me to discredit the ideas and recommendations in the book, because they are for the most part research-supported across the disciplines. Be sure to search beyond their references if you want more details about ideas they describe.

In conclusion, this book would be a great congratulations gift for someone about to start a faculty position, a useful resource if you are looking for ideas to change or improve your teaching—I collected some ideas to adapt and use in my classes immediately—or a valuable discussion piece for teaching and learning circles. It is a solid starting point for continued improvement in STEM teaching.

■ ASSOCIATED CONTENT

Supporting Information

The Supporting Information is available on the ACS Publications website at DOI: 10.1021/acs.jchemed.6b00454.

Cover image of *Teaching and Learning STEM: A Practical Guide* (ZIP)

■ AUTHOR INFORMATION

Corresponding Author

*E-mail: sbboesd@ilstu.edu.

Notes

The author declares no competing financial interest.

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REFERENCES

(1) Bai, K. *What the Best College Teachers Do*; Harvard University Press: Cambridge, MA, 2004.

(2) There are two very brief comments about the "native ability" of some students that I find a bit dangerous because they might provide some instructors with an excuse to write off capable students. However, the comments are quick, are not the main focus of the statements, and the authors do a great job throughout the book discussing the diversity of students and the need to value and embrace the diversity so I am choosing to only make note of it here.

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J. Chem. Educ. XXXX, XXX, XXX−XXX