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Book Review

Richard M. Felder and Rebecca Brent, Teaching and Learning STEM: A Practical Guide, Jossey-Bass, 2016

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Many of us have been lucky enough to attend one or two of Richard Felder and Rebecca Brent's engaging workshops and learnt not only from the content of the workshop but the practices used to deliver it. The last series of workshops at our institution were instantly sold out and so successful that the cohort grew throughout the day as attendees surreptitiously texted their colleagues to drop what they were doing and come along. I witnessed died-in-the-wool professors rethink class design and delivery, and scribble notes frantically on the margins of the workshop handouts.

The question for me therefore, upon being given the task of reviewing Richard and Rebecca's new book, was whether they could capture the magic of their workshops in printed form. And let me cut to the chase here, and answer with a resounding 'Yes'. Now let me explain why.

To begin, the reader is given clear instruction on how to use the book: 'Instead of reading the book like a novel, treat it more like a reference work.' (p. 30) and told to dip into it before, during, and after a course to find ideas, tips, and reassurance. The authors explain that emphasis of the book is the 'nuts and bolts of the practice—what the methods are, how to implement them, and pitfalls to avoid' (p. 15) from the pedagogical framework of learner-centered teaching. You might be thinking that this is a big ask and, as a STEM practitioner, conjuring up a 3D matrix with the dimensions of learner-centered teaching on one axis (i.e. how students learn, what they need to learn, and what they should be able to do), the stages of teaching on another (i.e. design, delivery, and evaluation), and the third axis representing educational research and practice/experience.

The authors have very successfully used different sections and different voices to present this matrix of requirements. For example, to understand how students learn requires an understanding of cognitive science, and where it is important that the reader gains an insight into this discipline, sections titled 'Brainwave' have been introduced. If the reader needs to look at something from a student's perspective, conversations have been transcribed and we are invited to 'Meet [our] students'. There are also repeating sections entitled 'Ideas to take away', 'Try this in your course', and 'Thought question'. In short, as the reader travels through the various aspects of teaching and learning in STEM, they are provided with processes and frameworks for learner-centered design of courses and curriculum, questions for deepening their understanding of what they can achieve, and examples to help get kick started. I am a particular fan of the thought questions (e.g. 'What might you do to persuade the students that what you will be teaching is relevant to their interests and goals and likely to be needed in their careers?', p. 109) as they push the reader beyond the research and experience presented in the book, and into development of their own practice. This brings me back to the authors' workshops where they model great teaching, in that by getting the reader to contemplate these sometimes gnarly questions, they're demonstrating a great way of getting our students to think at a different level. Similarly, the inclusion of references to the literature serves a number of purposes: it provides supporting evidence of success, it allows the reader to delve deeper into the pedagogy, and it provides a springboard for new (and established) academics to enhance their scholarship of teaching and learning. Educational research, as with all research, begins with looking at what has gone before and this book showcases excellent literature that can be used to underpin innovations and their subsequent documentation.

Teaching in higher education can be overwhelming and it is difficult to truly appreciate the systems approach that is necessary to do a good job. Richard and Rebecca have found a way to show the big picture by using graphic organisers (p. 28, 33, 130, and 244) that show how the topics that they cover link with respect to teaching and learning, and how they are presented in the text. It's a great way to navigate your way around the book and it allows the reader to be able to use the book in the way in which it's intended.

Underpinning the wealth of information, you can hear the reassurances of Richard and Rebecca. Their pre-emptive support and assistance is peppered throughout the tome. For example: 'You're not going to win them all, and you don't have to' (p. 23), 'You will frequently hear STEM students complaining bitterly that they don't see what many of their courses have to do with "the real world,"...'

(p. 86), and ' . . . if you use a teaching method that makes students take more responsibility for their own learning than they're used to, some of them may not be too enthusiastic about it.' (p. 312). As an educator, you need to hear that things will go wrong, that students will push back, and that this is a common experience. The authors let you know that it doesn't matter as long as you keep evaluating what you are doing and improving your skills.

Lastly, I'd like to say that because there are so many textbooks in engineering and there is ubiquitous information on the internet, I do not specify textbooks for my students. There is one exception to this: Elementary Principles of Chemical Processes (Felder and Rousseau, 2005). I mandate this text for second year chemical engineering students as it covers fundamental information in an innovative way requiring students to read, practise, and think at different levels. Teaching and Learning STEM: A Practical Guide is a book that has swelled the number of texts that I will mandate to two; I will be purchasing copies for all new academics that start in my faculty (and perhaps also some of the older ones).