

Q&A: The educator and chemical engineer who are tackling STEM teaching*

Rebecca Brent and Richard Felder, authors of *Teaching and Learning STEM*, want university leaders and faculty members to take the educating part of their jobs more seriously.

Melinda Baldwin



Richard Felder and Rebecca Brent. Credit: Felder/Brent

One of the most time-consuming responsibilities that come with a university faculty position is teaching. Instructors have to write lectures, construct problem sets and exams, and oversee grading, often with little guidance on how to make their courses effective and engaging for students.

In *Teaching and Learning STEM: A Practical Guide* (Jossey-Bass, 2016), Rebecca Brent and Richard Felder offer a helping hand to newly minted assistant professors who want to be good teachers. In the May issue of *Physics Today*, [reviewer Stephanie Chasteen](#) writes that the book “combines the wisdom of experienced teachers with expertise in education research” and “belongs on the desk of new and experienced faculty alike.”

Brent and Felder are longtime professional collaborators who happen to be married. Theirs is an interdisciplinary partnership: Brent has a doctorate in education, and Felder has a doctorate in chemical engineering. *Physics Today* recently caught up with them to talk about challenges for new professors, how departments and universities can support better teaching, and what it’s like to write a book with your spouse.

* *Physics Today*, May 16, 2017. Retrieved from <http://physicstoday.scitation.org/doi/10.1063/PT.6.4.20170516a/full/>.

PT: As you point out in your book, STEM PhD programs rarely offer guidance on how to become effective classroom instructors. What do you think are the most common challenges new faculty members face when they start teaching?

BRENT: It's not just PhD candidates who get no training—meaningful guidance on teaching isn't generally given to faculty members either. A couple of hours in a campus-wide orientation workshop for new faculty only goes so far. Figuring out how to do just about everything teachers do in their jobs consequently poses a long string of challenges to the new faculty.

One of the toughest challenges is understanding your students—what they know and don't know, and what motivates them to learn what you are teaching. Most new teachers have unrealistically high expectations for their undergraduate students. Grading that first exam can be a cold bath!

Another common new faculty mistake is seriously overpreparing lecture notes, trying to include everything known about the subject. New profs end up cramming far too much material into their courses, and the only way they can get through it all is to firehose the students with nonstop information.

FELDER: The list of challenges is almost endless. New faculty members have to learn to plan courses, lecture effectively, get students actively engaged in class; make up assignments and tests that are both rigorous and fair; and deal with classroom disturbances, cheating, students with emotional problems, and on and on. And that's just the teaching part of the job—there are also the other major challenges of starting and building a research program; learning about campus resources and campus politics; and juggling the competing time demands of teaching, research, and having a life. That's a lot to expect someone to learn by trial and error, but that's what we do. It makes no sense! College teaching is arguably the only skilled profession that doesn't routinely provide training to its practitioners.

PT: How can departments or universities support effective STEM teaching?

FELDER: Offer guidance in addressing those challenges. For example, provide a STEM-based new faculty orientation that covers how to teach effectively and how to start and build a successful research program. Offer STEM-based teaching workshops and learning communities for all current and future faculty members. Give all faculty members, including adjuncts, incentives to participate in those programs, and give meaningful recognition and rewards for teaching excellence comparable to what we routinely give for research achievement. Create mentoring programs in which excellent teachers work closely with new faculty members in their first semester of teaching. We don't have to provide all those things to have a significant impact on teaching, but the more the better.

BRENT: Rich's suggestions would have a significant effect on the quality of an institution's teaching program, but there are also things individual departments can do to provide a supportive environment for instruction. Simple steps like including something about teaching in every faculty meeting—a teaching tip or resource from a faculty member, or a discussion of a topic of concern—can go a long way. Publications, grants, and honors related to teaching should be widely publicized and applauded with the same vigor as research accomplishments usually are.

A particularly useful activity is a session at the end of each semester in which the faculty review each course in the program curriculum and talk about what has been going well and what changes might be beneficial. Doing that can both strengthen the curriculum and motivate faculty members to work on their teaching.

PT: How did you approach your collaboration on *Teaching and Learning STEM*?

BRENT: After presenting several hundred workshops together since 1993, we've gotten pretty good at working together. Rich was usually the first drafter of text and did most of the research on the cognitive science behind the teaching strategies we recommended. I was more of the big-picture person, spotting and fixing problems with organization and tone while also doing research on individual topics. We passed each draft back and forth so many times that at this point we have no idea which of us was responsible for what.

FELDER: To give a little historical perspective, I've been interested in effective teaching methods since I joined the NC State faculty in 1969. I tried the learner-centered teaching methods I was reading about and found that some of them worked beautifully in my engineering classes. I began to write articles and give workshops about them, first at NC State and then at other universities and at professional conferences. Then I married Rebecca. Since she had three degrees in education and years of in-service training and I was just picking stuff up on the fly, I suggested that she and I start collaborating on workshops and publications, which we did. The book was the logical culmination of that arrangement.

I should add that spouses collaborating on a massive undertaking like a book is not necessarily a prescription for a long, happy marriage. It worked wonderfully well for us, but a relationship that's shaky coming in probably wouldn't survive a week of book writing.

PT: You've been writing the "Random Thoughts" column in *Chemical Engineering Education* since the 1980s. [You can find them all [here](#).] What have been some of your favorite or most memorable columns?

FELDER: I started writing the column in 1988, and in another step in our growing collaboration, Rebecca began coauthoring them in 1995. My very favorite may be the first one I wrote, which was about the impostor phenomenon [fear of being exposed as an intellectual fraud despite one's achievements]. It led to many comments from both faculty members and students telling me that I was writing about them. My other favorites include several "Meet Your Students" columns that use biographies of hypothetical students to illustrate attributes of learners.

BRENT: My favorite is Rich's impostor column as well! I've enjoyed coauthoring columns with him, including our take on David Letterman's top 10 lists—a two-column series called "The top ten worst teaching mistakes." While we don't do quite as well as Dave at leaving them laughing, many readers have found things they do in the list and have responded well to our cautions.

PT: What are you reading right now?

BRENT: I just finished *A Whole New Engineer: The Coming Revolution in Engineering Education* by David Goldberg and Mark Somerville. It's loaded with inspirational ideas. Now I'm into *Less: Accomplishing More by Doing Less* by Marc Lesser. It's about mindfulness, a topic I seem to come back to regularly.

FELDER: On the professional side, I'm reading *Mindshift* by Barbara Oakley and *Thinking, Fast and Slow* by Daniel Kahneman, and in the just-for-fun category I've got *Musicophilia* by Oliver Sacks and *Dreaming Spies* by Laurie King. Also, every morning I read the day's entry in the Dave Barry desk calendar, which helps inoculate me from that day's news headlines.

PT: What is your next project?

FELDER: We're thinking about publishing an updated collection of the columns at some point. After working on *Teaching and Learning STEM* for the past 15 years—intensely for the last five—I can't even begin to contemplate starting another book right now.

BRENT: Besides my collaborations with Rich, I'm a certified program evaluator. I'm working on a research study of graduate students being trained across disciplinary lines: material sciences and engineering, statistics, math, and physics. Projects like this one enable me to form new collegial connections and learn lots of new things, which I always enjoy.

Learn more about [Teaching and Learning STEM: A Practical Guide](#)

Go to [Richard Felder's home page](#)