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Through his innovative teaching workshops, Richard Felder is improving engineering education around the world.



*Dr. Richard Felder and his wife, Dr. Rebecca Brent, have given professional-development workshops to engineering and science faculty all over the world. The locations are plotted on this [map](#).*



Dr. Richard Felder didn't look tired. But he should have.

He was back in his Centennial Campus office a day after completing a 28-hour journey that hop-scotched from Bangkok to Tokyo to New York to Raleigh. Felder and his wife, Dr. Rebecca Brent, had been leading one of their engineering education sessions in Thailand, part of an international "workshopping" schedule that keeps them on the road about 85 days per year.

"It leaves us a little bit of time to come back and do our laundry between trips," he said with a grin.

Felder, a venerable figure in chemical engineering who co-authored one of the field's seminal textbooks, has spent more than two decades improving the way colleges and universities teach engineering and science. His efforts to encourage professors to understand different learning styles and engage students in class — a teaching model called "active

learning” — have influenced thousands of instructors around the world.

“College teaching is the only skilled profession that no one trains you for,” said Felder, the Hoechst Celanese Professor Emeritus of Chemical Engineering at NC State. “You’re not given five seconds on how do you do this before they throw you in front of the students in the class.”

Felder and Brent’s whirlwind workshop schedule has taken them to six continents and all but a handful of U.S. states. Participants everywhere tend to rate them highly — 80 percent give the sessions a rating of “Excellent” — and no matter where the workshops are held, the instructors find the same enthusiasm and curiosity from groups of very different people.

“There are cultural differences, sure, but in general it’s the same stuff everywhere,” Felder said. “We’re getting the same questions, the same interest, the same problems that they’re raising.”

Felder didn’t set out to be a pioneer in engineering education. When he began teaching at NC State in 1969, he was teaching the same way he was taught, and the same way his peers were teaching their students. He filled his classes with long, detailed lectures that provided plenty of fodder for good note-takers. He received high marks from students and won a teaching award his first year.

His success extended to the publishing world with the release of “Elementary Principles of Chemical Processes,” a chemical engineering textbook he co-wrote with fellow professor Ronald Rousseau. The book was a hit with chemical engineering faculty, he said, and it has since been translated into several different languages and been used as the introductory chemical engineering text by roughly 90 percent of American universities. (The book was named to the list of “Groundbreaking Chemical Engineering Books” by the American Institute of Chemical Engineers in 2008.)

But even with all that success, Felder had a nagging feeling that he was letting his students down in class. He was solving the problems his students should have been solving, so the students weren’t really learning. He turned to the education literature for answers.

“We actually know a whole lot about learning and what makes it happen,” he said. “And it wasn’t what I was doing and it wasn’t what my colleagues were doing.”

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*Felder is also the co-author of "Elementary Principles of Chemical Processes," one of chemical engineering's seminal textbooks.*

What he found changed the way he taught. Instead of holding forth with long lectures, he broke his classes into short snippets in which students solved problems in groups. Some students understood the information right away. Others took a little longer, but they eventually found the answer themselves — rather than Felder finding it for them.

"You remember about 10 times more of what you say and do than what you see and hear," he said.

Felder began sharing his methods at professional society conferences and in education journal articles and soon began to get some attention. In 1986, he held a workshop for NC State engineering faculty that incorporated what he'd learned. The workshop was so well-received that he was asked to give it again the following year. Soon, faculty at other universities began to take notice of his articles, and before long he was getting invitations to conduct workshops at campuses around the country.

A significant turning point came in 1990 when he married Brent, who had been an education professor at East Carolina University, and they started doing their workshops together. She brought to the sessions a deep knowledge of pedagogy,

and he had the technical background to translate that knowledge into examples that engineers and scientists could relate to.

In 1991, Felder helped start the National Effective Teaching Institute, a three-day workshop held just prior to the annual meeting of the American Society for Engineering Education. The high-profile event has drawn nearly 1,000 participants over the years, and demand for Felder and Brent's services has grown as a result of those sessions.

The domestic interest in the workshops has stayed steady over the years, but international requests have “gone through the roof” over the last five years, Felder said. Now the couple schedule international workshops one or two years in advance.

Despite all the travel, the rewards are huge. In May 2008, for example, Felder and Brent gave a workshop for 100 engineering faculty in India. The faculty came from the second tier of Indian engineering schools, many of which struggle to put out the high-quality engineers needed to support a fast-growing country with 1.1 billion people. After Felder and Brent returned home, they started hearing from faculty members who were trying their methods with great success. Some of those faculty are passing those methods along to their peers.

“We're seeing more of a tangible effect from our India workshop than from anything else we've ever done,” he said.

Felder acknowledges that he has pursued an unconventional academic career path, and he continues to be grateful to the NC State administrators who encouraged him to take it years ago.

“Most department heads and deans would have told me to stick to my research and forget about this education stuff,” he said. “But people like my first department head, Jim Ferrell, and former deans Larry Monteith and Nino Masnari encouraged and supported me. Those guys deserve a lot of the credit for whatever Rebecca and I have contributed to improving engineering education.” ■

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