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Surmounting barriers in engineering education

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An unexpected pathway to engineering education

When I was an undergraduate in 1974, there were some at Texas Tech who were able to convince me that it would be okay to major in engineering. A number of faculty actually went out of their way to say that even kids who did not know much about engineering—and certainly that included a lot of women—would be welcome. In the context of engineering education at that time, one unique thing for many undergraduate women (including myself) is living in a dorm surrounded by other women who were studying education. When I looked around at my classmates and dorm mates, I was hearing a lot of conversations about what they were learning about pedagogy in their education classes. Some of their influence seeped in.

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After graduate school, I had fully intended to go back to industry. In my last semester in the electrical engineering Ph.D. program, I was the instructor for a senior elective EE course and had a great time. I decided that I would actually interview with some schools for academic positions. My initial intent was to spend three or four more years in the academic arena, before I went ahead and took another industry or consulting job. But when I got to Texas A&M, I really, really did like teaching. Once I had the opportunity to teach, I decided to be faculty. And being faculty, I decided that I really cared about how effective I was.

Some specific people within the Institute of Electrical and Electronics Engineers (IEEE), like Pat Daniels from Seattle University, worked to get me involved in engineering education conferences like the American Society for Engineering Education's (ASEE) annual meeting and Frontiers in Education. Through those mechanisms, I met even more people who were involved in engineering education. Because I had this involvement, when my institution started getting involved in some large projects and grants in engineering education, I was recruited as well. If I had not shown an interest in learning how to be more effective as a teacher, I am not sure any of that would have happened. Pat Daniels was at the National Science Foundation (NSF) early in my career, and she worked to get me on a review panel that was for a program that was to fund curricular innovations. She made sure there were a lot of women on the review

panel—not a majority, just a lot, considering it was electrical engineering. She worked hard to look across the U.S. for various electrical engineering women faculty who were at the late assistant professor or early associate professor level and invited us all at once. There were about ten of us on this particular panel. At the time, we could name the sixty women in the country in electrical engineering who were in tenure-track faculty positions.

Pushing boundaries

There are all kinds of challenges in engineering work. No matter how technically prepared you are, there are always trade-offs and contingencies that you have to be able to handle. You try to be both deep enough to understand details and broad enough to be able to handle a multitude of contingencies. That was always a fun challenge to me, but a challenge.

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From time to time, I was challenged as well by being a woman in engineering. As a consultant, I went to one particular site, had a great conversation with the client, and could not figure out why we did not proceed with the meeting. Finally they pointed out they were waiting for the engineer. They could not imagine, and they even said, "We've never seen a girl engineer before." I did not take that as a slam, but it was an illustration of how I was not automatically given credibility and had to work to earn it a little bit differently. That was a challenge. I think a lot of young people would say that this is a kind of challenge they have faced, so it is not unique, but I think I had a little bit extra challenge there.

There were also a lot of things that made it prudent to not make engineering education your main research area. It made it very hard, and I still think it is challenging, because there is still that mindset here. I think it's gotten better, but it is still a challenge for somebody who wants to specialize in engineering education to figure out if they can find a niche in enough places where they are going to be able to do that and be valued for doing it.

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Don't confuse love for teaching with being a scholar. If you really want to succeed, especially in an academic career, you need to combine both of those. You can be a great teacher without being a scholar in the area, you

can be a scholar and not be a really great teacher, but if you really want to be a leader in the field, you really need to combine both of those.

I think in general for most people who got involved in the time frame when I got involved in engineering education, there were not the same publishing outlets or even the scrutiny of conferences. Some of the technical conferences had a 10 to 15 percent acceptance rate for papers. With the ASEE acceptance rate being more like 90 percent, it was not considered prestigious. There were not a lot of grant dollars you could get, and you did not have Ph.D. students helping you publish in engineering education.

One of the things that had to happen and has been happening is the quality of journals and conferences had to get better...and they have. Often we were not able to distinguish between the trade conferences and real intellectual innovation conferences, but we're much better at that now.

Fostering change through conversations and mentoring

My influence has been more on the translation and integration of scholarship into practice. I hope to be remembered as a person with great work ethic who cared deeply about people. I hope to be remembered as somebody who helped broaden the understanding that there is both a value to and a skillset for being a scholar in education innovation, in education assessment and evaluation. I helped professional societies focus on engineering and engineering education, as well as helping schools figure out how to use that scholarship better. For example, when ABET was having its discussions in the early 1990s about Engineering Criteria 2000 and looking a lot more at learning outcomes, I was able to talk at a lot of those conferences to my campus leaders, but also at ABET and various ABET groups about why this was the way we needed to really focus on learning outcomes. I never presumed I was a leader in that conversation, but I was an informed conversant. I was familiar because of some of the projects I'd been on and the literature I'd worked on and even some of the experiential things that I had done with trying to assess and evaluate student learning outcomes.

On my own campus, I think that in large projects, whether it had to do with framing objectives or pedagogical styles, I got to participate and then start leading conversations about why these innovations could help a curriculum, why we could require less but do more, etc. Those opportunities to lead efforts on my own campus then opened doors for me with places like NSF and ASEE to present on how we were getting people to listen and to change their behavior and pedagogy.

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When I think about legacy, I think about it with human beings more than being remembered for any particular task. One of the people I would point to is Stephanie

Adams, who is currently the department chair of Engineering Education at Virginia Tech. But all of them—I think over a cycle of several years, I usually find out what they're doing and how they're doing. Also, I often run into students at various conferences or events, and they say I'm their grandmother.

Managing change from within

When I was a regular volunteer with ABET, it was easier than when I became an officer. But I would tell you the same is true as provost at the institution. Before I became provost, it was easier to debate with people about what some of the issues and answers are. As a president of an organization or a provost, what you can do is make sure the questions are posed, but you don't get to engage as much in the debate.

Power is not a title. Not all titles are with positions where you have influence, so you get to have more say about what is on the agenda and at what time and what meeting. You get to put resources in certain places, so on the one hand, what you have is the opportunity to influence what the debate will be. What you give up is that you can't really be at the core of the debate when you do that. That doesn't mean you don't have a lot of influence on what the debate is. So it is a trade-off, like we engineers make all the time.

Finding the right fit

I always consider, wherever I am, it is today's adventure. I'm not sure if I would tell a whole lot of people that this is what they should do, but it's worked out really well in my life. I always have thought that there is another place I can get a job if this one doesn't work out. I know I fit somewhere, and if it's not this place, that's okay. This attitude allowed me to persevere and do enough that I felt both happy and rewarded, but also valued. If I were a person that had to get an A plus in every arena, this would have been a bad strategy for me. But if I'm a person that mostly has to feel not trapped, and valued and rewarded in what I am spending my time on, then I can be above average here and average there and really excel there, and it works out just fine for me.

Make sure you understand what your motivations are, and don't expect an institution to change around you, to fit you. Find the institution that fits you.

I understand some of those challenges in hindsight better than I did going into them. One of them is that you need to pick the kind of organization to work for that fits your aspirations and your desires. I have a colleague who has taught his entire career at a community college, and I would classify him as one of the most successful people I know. He's not famous, but he's successful. He's had impacts on lots of students, he's doing something that he loves, and he's got it balanced with all the other things he wanted to do in his life. Make sure you understand what your motivations are, and don't expect an institution to change around you, to fit you. Find the institution that fits you.

This profile was authored by Micah Lande, Arizona State University, based on his 2014 interview with Dr. Watson.