

Gender, institutional structure and learning in an engineering college

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Abstract: This paper examines the implications of a college of engineering's institutional structure for men and women engineering students. The data for this paper is drawn from a large "person-centered ethnography" (Hollan & Wellenkamp, 1993), taking place at "Large Public University (LPU)" a flagship state university in the Pacific Northwest. We argue that the timing of admission, and students' beliefs about the process provide a lens through which women and men see their engineering peers both in school and beyond. These beliefs are not static, however and change over time, providing hope for an engineering field in which gender is not foregrounded, but rather one's capability of doing engineering work is.

Introduction

In the past three decades science, technology, engineering and mathematics (STEM) fields have been struggling to improve the number of women who complete STEM degrees. In particular, engineering has seen only marginal improvements in the number of women studying engineering as undergraduates despite significant resources devoted to programs designed to promote the field to women and girls and research designed to better understand the disparity in the number of women and men studying engineering.

As mentioned above much research has sought to understand why the number of women who study engineering is so small relative to men (Adelman, 1998; Blickenstaff, 2005; Conefry, 1997; Dryburgh, 1999; Eisenhart & Finkel, 1998; Felder, Felder, Mauney, Hamrin Jr., & Dietz, 1995; Henwood, 1996, 1998, 1999; Holland & Eisenhart, 1990; Margolis & Fisher, 2002; McLoughlin, 2005; Seymour & Hewitt, 1997; Stonyer, 2002; Tonso, 1997; Traweek, 1988). Until recently this work could largely be categorized in two ways—One category of research identifies or prescribes a remedy for a presumptively inherent difference between women and men that prevents women from entering STEM fields in numbers equal to their male counterparts (e.g., women do not have experience tinkering, like men do); A second category of research identifies the culture of STEM fields, or failures of programs designed to promote engineering to women as contributing to the disparity in numbers. Critics of this first strand of research link this research to "gender-difference research" and argue that it suggests that there is something "wrong" with women that needs to be fixed, by remediation, through special programs, mentoring, etc. (Eisenhart & Finkel, 1998; Tonso, 1997). In response to this first strand, researchers who objected to the removing of the person from the culture in which she is being educated insisted on bringing culture back into the picture as an explanation for the disparity in numbers and a third group of studies has sought to understand how the culture and the individual in practice may explain why engineering is unable to attract women to careers in engineering. (Eisenhart & Finkel, 1998; Holland & Eisenhart, 1990; Margolis & Fisher, 2002; Seymour & Hewitt, 1997; Tonso, 1997; Traweek, 1988).

The larger study from which this data is drawn follows these studies and provides a sustained, longitudinal look at the experiences of men and women as they become engineers. Practice theory, and in particular situated learning (Lave & Wenger, 1991) provide researchers a way to see the interplay of individual and culture (Eisenhart & Finkel, 1998; Holland & Eisenhart, 1990; Lave & Wenger, 1991; Nesper, 1994; Stevens & Sabin, 2006; Tonso, 1997; Traweek, 1988). Additionally, we employed an analytical framework set forth in "Becoming an Engineer" (Stevens, Garrison, Jocuns & Amos, in review) which takes into consideration three dimensions along which one changes as one becomes an engineer—identification, accountable disciplinary knowledge and navigation. The development and changes along three dimensions work together to either move one toward a career as an engineer or to move one away from a career as an engineer. These two theoretical frames and the longitudinal nature of the study will provide a fresh look at the phenomenon and attempt to provide possible reasons disparity in the number of women and men studying engineering by examining what it is like to become an engineer. In this paper we focus on the dimensions of identity and navigation. A perspective that learning is situated compels us to look at the access one has to the practices of the field or community as learning is viewed as "participation in the social world." (Lave & Wenger, 1991, p. 43)

Methods

The data for this study (ethnographic interview transcripts and ethnographic observations) are drawn from a larger, cross-institutional, longitudinal, ethnographic study of engineering education, the Academic Pathways Study (APS) (Sheppard et al., 2004). Through APS we hope to illuminate the myriad of pathways students follow and forge on their ways to becoming engineers. We are particularly interested in three aspects of

students' development—how they come to identify themselves (and how others come to identify them) as engineers, the disciplinary knowledge for which they are held (or not held) accountable in and outside of school, and how they navigate through their engineering education (Stevens, O'Connor, Garrison, Jocuns, & Amos, in review).

Research Setting

One of five U.S. institutions participating in the Academic Pathways Study, Large Public University (LPU) is in the Pacific Northwest in the United States. It is set in an urban area and attracts students from throughout the state, and the rest of the U.S. students are attracted to the strong academic reputation in a variety of fields. The engineering college, the focus of this study, is considered one of the nation's top 25 engineering schools by U.S. News and World Reports in their annual ranking of colleges and universities. Students generally apply for admission to the LPU Engineering College at the end of their sophomore years, after completing a full two years of pre-requisite courses that are primarily taught by colleges outside of the College of Engineering. Admission is highly competitive in most of the departments in the College of Engineering. As at most institutions of higher learning in the United States, one finds only about 20% of the students enrolled in engineering at LPU to be women.

Participants

The participants in APS at LPU are forty undergraduate students. The students were invited to participate in the study because they identified themselves as pre-engineering or engineering majors in their freshmen year at LPU. The study as a whole is seeking to better understand how people become engineers, with particular attention paid to students who are women and/or students of color, to this end recruiters for the study over-sampled for women and minorities. In the fall of 2003 in their freshmen year, the students who volunteered to participate were assigned to one of three groups, based on the level of participation with which they felt comfortable.

All forty students took part in bi-annual surveys and performed an annual engineering-related task. Twenty-four of the forty students (Group C) also participated in an annual structured interview, while the other sixteen students (eight men and eight women—Groups A and B) took part in an annual ethnographic interview. Finally, eight (four men and four women—Group A) of the sixteen participating in the ethnographic interviews were also observed on the campus of LPU. Group E, was comprised of people in Groups A, B and C who decided not to major in engineering, or who did not get into the engineering college. Group E students participated in an ethnographic exit interview. This paper draws primarily from the ethnographic interviews with two of the eight in group A, which has been supplemented, as necessary with field notes from the observations.

Data Collection & Analysis

Informal, ethnographic interviews were employed to get the participants' perspectives on the practices in which they were engaged as engineering students at LPU. These 2-hour-long interviews took place in the spring of each year for the first four years the students were at LPU and were used to capture deep reflections on the students' experiences (Cameron, 2000; Conefry, 1997; Henwood, 1996; Holland & Eisenhart, 1990; Wortham, 2000). The longitudinal nature of the study allowed for comparison of an individual's responses across the four years, and allowed us to see how ideas and reported beliefs changed over time. Interviews were audio-recorded and transcribed. To aid in identifying relevant passages and patterns in the data for the purposes of this paper, transcripts of the interviews were culled using Atlas.ti for talk that had been previously coded for either one or both of the topics of gender and admission. These excerpts were then analyzed with an eye to emergent patterns in the data. The cases chosen for this paper were chosen because they are representative of the notion being discussed. The purpose of this study is not to make generalizations about all of engineering education, but rather to identify and elaborate on a practice at LPU that has an impact on students. What is true at LPU may not be true at other schools, but we believe studies like ours can play a role in helping to set future research agendas.

Findings

We began with an assumption, as evidenced in the literature, that there might be something different in the experiences of men and women in engineering that could explain why women are underrepresented in the engineering workforce and engineering education community and asked all the participants over the course of the four years about their beliefs about whether or not there were differences in the experience of men and women.

There were several strongly-held beliefs about women in engineering that we became aware of over the course of this study. One was the notion that women go into engineering because they wanted to help society and use their work in the field make people's lives better. We found this explanation failed to address the fact

that engineering was attractive to both the men and women in the study for many other reasons, not the least of which was the attractive starting salary for people who get jobs in the field, which in the United States was roughly \$50,000—a figure much larger than one would command in most other fields. We found that both men and women were attracted to engineering for this reason, namely that they would have a comfortable material existence after they completed their degrees and were working in the field. The good salary, our data indicated (across four campuses), was seen by students as a reward for the hard work they were expected to do as undergraduates (Stevens, Amos, Jocuns, & Garrison, 2007)

We found that men and women largely told similar stories about the origins of their interest in engineering. These stories most often included a description of themselves as being good at mathematics and/or science. Some students talked about the influence of a summer internship program that provided them with the opportunity to work at government research labs or high-tech companies. There were a few students who talked about a relative, friend, or influential teacher who had gotten them interested in the field of engineering. The students, both men and women, regardless of the origins of their interest in the field, largely could not provide us with detailed accounts of what their day-to-day work as future engineers would look like, even after they had worked in the field as interns. Despite this cloudy understanding of future work, students were drawn to the field, and tackled the work of their first two years without the promise of even being admitted to their hoped-for majors in the College of Engineering.

During the first two years at LPU, as mentioned earlier, students took prerequisite classes that were outside the engineering college. Students at LPU referred to these classes as “weed-out” classes, designed to test their mettle and prove to the admissions committees that they were worthy of one of the coveted spots in the engineering college. Students talked at great length in their interviews about the status of their grade point averages (GPA) and how their GPAs compared with their peers. Based on conversations with peers and college advisors students could gauge their standing relative to others. If they felt their grades did not immediately qualify them for admission, most students sought to bolster their case for admission by participating in engineering-related activities (e.g., the human-powered submarine) or working on engineering research teams on campus. Most of the work during this portion of the curriculum was individual-based. Students were graded on their work on exams done on their own, on homework problems submitted as individuals, etc. The competition for spots in the college and the individual-based nature of the graded work of the first two years contributed to an environment in which collaboration was effectively (if not directly) discouraged. Certainly, students in the study formed study groups in the first two years, but these study groups were small, and were important to students only as long as they were useful to them (e.g., that they were getting something out of them that was beneficial in terms of mastering course content). In their interviews with us around the time they were applying to the college of engineering the students explained to us their chances of getting into the major. Some of the students were very confident they would be admitted to the major, and others were much less so. Those who were very confident had GPAs that were higher than the GPA the college had reported as the mean GPA that would qualify one for admission. Those who were less confident had GPAs that were close to the mean GPA. In the interviews these students presented views of the admission process that were much more complex than the confident students. They related that there were many factors considered by the college—things like activities in which one participated, prior work or research experience, one’s dedication to the field of engineering and even one’s gender could sway the committee to admit one.

We were surprised to learn the students believed that one’s gender could determine one’s admission—both men and women held this view. This view was expressed across the participants in the second year of the program, the year after which students would be applying to their majors. (Citation withheld for blind review) The way that gender could determine one’s admission was that women, it was believed, had different admission standards, or that even spots were “saved” by the department for women. These beliefs seemed to have implications for the women who participated in this study in a few significant ways. Furthermore, the very programs that the university had in place to serve as resources for women, like Women in Science and Engineering (WiSE) were cited by both men and women as evidence that women must have been less qualified, because women had such programs to help them. This phenomenon has been referred to as “spotlighting” (McLoughlin, 2005). Spotlighting can take several forms, and in this case it was programs in place to help women feel less isolated in the male-dominated STEM fields or to provide academic assistance that seem to have drawn attention to women in a negative way, which was clearly not the intent of the university or the programs. These beliefs had implications not only for the women in the study, but also the men. They expressed views that positioned the women as adversaries, who were unfairly competing for spots in the college that they had not earned.

For the women in the study the two years they spent within the major (junior and senior years) were full of anxiety, related to the perception that they might have had less stringent standards applied in their admissions to the college. Women talked about strategies they employed to avoid perpetuating the notion that women “didn’t know what was going on” in class. They related going to other women (when they could) to get

help on homework. In the junior and senior years students were expected to work in groups more frequently, and women actively sought other women with whom they could work rather than working with men.

In the next section we present two cases--of Erica and Simon—who illustrate the tensions at work in the lives of men and women as pre-engineering students and then as admitted engineering students.

Different standards?

The cases of Simon and Erica illustrate several important differences in the experiences between men and women at LPU, first is the difference in the perceptions of the standards used to judge men and women's applications to the College of Engineering. Second, is the notion that women felt the need to prove themselves worthy of being admitted after they had been accepted to their departments. Furthermore, we note that this feeling that women were held to different standards by the field extends in a very real way for someone women even beyond their experiences as college engineering students.

Simon and Erica both staked a great deal on their ultimate admission to their chosen programs. For Simon, studying engineering was all he had wanted to do, since he was a child and Erica moved far away from her home state to study engineering at LPU. Needless to say, with so much invested, both expressed concern about getting into their respective engineering majors.

Simon

Simon spent much time working on research projects in the Aero department, and got a job in one of the Aero labs on campus in his freshman year. He built an impressive resume for his application, and was able to go to his best friend's dad (a faculty member at LPU during his freshman year) for advice. We asked Simon to talk about his understanding of the admission process for Aeronautics and Astronautics (AA),

Simon: Um, I believe if you have like a 3.3 or a 3.4, they automatically accept you into the department...[if] you have like a 3.0 and whatever that line is, they look at your stuff, you know, they read your essay, see where you're placed and, depending upon that, if nothing stands out as negative, they'll let you in. And then below a 3.0, they really have to look at you and, um, so I mean, it's school. Grades are probably the most important factor. I would imagine.

Interviewer: Where are you at right now? Do you know?

Simon: Just above a 3.0. That's the main reason why I'm kinda worried is cause I don't have the grades that I want. I don't feel comfortable where I'm at. I've got a lot of things on the side that are helping me, and everybody I've talked to said I shouldn't be worried, but you know there's still that thought in my head. (Simon, sophomore year)

The "things on the side" and resume-building activities were important for Simon, given his understanding of the admission process the college's standards—if one has a GPA below a 3.3 or a 3.4 you are not automatically admitted and your application and all its parts will be scrutinized. With a GPA around a 3.0 Simon believed he'd have to prove himself in other ways, these activities and research with which he became involved early-on would aid him in his attempt to get into the program.

Simon spoke more about the admission process when he was asked how the experiences of a woman might be different from the experiences of a man in engineering,

It's easier for [a woman] to get in the department. I was talking with one of the advisors, they take a lot of women and it's interesting to note that a lot of the-90, 95% of the people that drop out of the classes after the first year are women because it's easier for them to get in to the department, therefore they don't have to work as hard their first two years. They get into the department, they realize, all of a sudden, they're just buried in work and they can't handle it and they drop out. Whereas us white guys, who have higher standards for getting in, because we're white males, we have to work harder and get a better GPA, and therefore the jump isn't nearly as great. (Simon, sophomore year)

Simon holds the view that it is "easier" for women to get in and presented statistics to back up his argument that applying lower standards is harmful to the women, because they are then unprepared for the difficult nature of the work. It is not clear where he has gotten those numbers, or if they are accurate, but what is clear is that Simon had a perception that women are "buried in work," "can't handle it," and ultimately "drop out." This happens, he said, because the women, who haven't had to "work as hard" in their freshmen and sophomore years as the men, are overwhelmed by the work they encounter after they get into their majors.

By Simon's junior year he was taking classes in his major and got a prestigious long-term government co-op in his field. His views about admission remained unchanged to some extent—he still believed the person in charge of admission for the program favored women's applications.

She's [the woman in charge of AA admission] gung-ho on trying to get women. Um, we get emails from her all the time, she's sending out to others, the AA class project, everybody in the junior class gets em, and we just get emails off-the-hook from her about women-in-

science-and-engineering scholarships, or women-in-science this, or women-in-science-that.

Not any minority stuff, but, it's--it's pretty easy to tell she favors. (Simon, junior year)

His views about women being as qualified as men once they got into the major seemed to change markedly from his sophomore to junior year, however. In explaining the small number of women who are in his department, despite the woman in charge of admission being "gung-ho on trying to get women" he says,

Simon: There's—not as many women apply to engineering. And it's not because they're not good enough, it's because they don't wanna do it. It's—from what I've understood, I mean there's things that women like to do, most women don't like to do engineering.

Interviewer: What about the girls, like in your AA classes, ((Simon: Uh huh.)) would you say that they're like different from=

Simon: =Not at all. (Simon, junior year)

It is not that women were any different, in Simon's view, than the men, it was just that women did not want to "do engineering." He explained the lack of women in his field in a way that it is a common folk-explanation--that there were things that women liked to do, and engineering did not fall into that category, and the ones who stayed in engineering must have been the women who liked it. In his senior year interview When he was asked if he thought there were differences in the experiences of men and women engineering students in his senior year, Simon's answer was different. He stated, "No, I don't. Not from what I've seen." (Simon senior year) His answer in his senior year changed from that of his sophomore year, which implies that Simon had learned something that caused him to change his mind at some point from his second year to his fourth year of college. While it is not clear what has convinced him to unseat this prior belief, what is clear is that Simon left school believing that men and women engineers were equally capable and not different at all.

Erica

Erica came to LPU because she wanted to be an engineer, and heard good things about it from a high school classmate. Erica and Simon led very different lives outside of class. Erica worked off campus in the service industry (until the summer after her junior year), lived in an apartment off-campus, and unlike Simon, was not involved in engineering-related research prior to admission. When asked about the application process, Erica described it in this way, "Well, the application's just an online form, you fill it out and write a personal statement and send it in and hopefully [they] pick you [laughing]." She was aware, thanks to a visit with an advisor (who was a woman) for chemical engineering, that her grades made her *not* "a borderline case."

Well, I talked to the advisor and she told me, right now I have a, like a 3.35 in my engineering classes, so she said that's right like around the range that they're looking for. But then I was like, "Oh you know, should I start working on my personal statement now?" but she said that I'm not a borderline case. (Erica, sophomore year)

Erica was asked about whether or not she thought a woman would have an advantage in the admission process.

I still think that it might be an advantage because I think, you know, they want to be, everybody wants to be more diverse, especially in the university setting, you know, like diversity's a really important part of it, so I think that there's still a slight advantage to being a woman, but in talking to the advisor, she didn't make it seem like I was any less or any more than anybody else, which was good, because I don't want to feel like I got in just because I'm a girl, like I want to feel like I got in because I worked hard and I got the grades... I think they still are gonna look at it and say, okay, well, you know, if I was exactly the same as a man, and it was either me or him, I think you know they might take me if they want more women in their program. (Erica, sophomore year)

Erica's explanation was that gender was a sort of tie-breaker for use by the department when two candidates were equally qualified for admission--a factor considered, but only after other factors were equal. Her version, unlike Simon's, did not depict the woman getting into engineering as being less qualified than the men. There is tension evident in Erica's talk--her use of the word "but" signals a contradiction with what she thought (that women have a slight advantage) and what she reported the advisor told her. Erica's explanation must reconcile two things, both the official information (from the advisor) as well as a stated belief that people think diversity is important "in the university setting", and specifically that in the case of the engineering college, increasing the number of women in the program translates to a more diverse student population.

Erica also related that she felt the need to prove herself to her peers, a consequence, one might argue of her awareness of the widely held belief that women got into the major more easily than their male counterparts. Erica, in her sophomore year interview expressed that there would be differences in the ways in which women and men (and their work) were accepted by their classmates. She described her way of coping with this problem--proving them wrong and working hard.

Erica: But as it goes on like, even if you expect it a little bit, um, you can prove em wrong and it won't hurt as bad [inaudible] hopefully.

Interviewer: So that will be your strategy ((Erica: laughs)) to prove them wrong?

Erica: Prove em wrong. I'll always work as hard as I can, you know (Erica, sophomore year)

In her junior year interview she related an experience with a male peer in which she felt that he was scrutinizing her work more than he was scrutinizing her teammates' (who were men) work. She concluded by telling us,

Well, because I'm a girl like, when I'm in a group of all guys and they're all like poo-pooing my ideas, you know, saying you don't know what your talking about. Like of course, it's natural to think 'Oh, it's because I'm a girl.' you know? Even though it might not be, like if a guy had the same ideas they might be like, you know, "what are you thinking?", you know. But when there are obvious differences, I think it's easier to blame those differences. (Erica, junior year)

Erica, then, found herself expecting the men she worked with to see her as not knowing "what she's doing", and then analyzed her interactions with them through this lens. She admitted, that if a man with whom she was working criticized her ideas, it could be that her ideas deserved to be criticized, or it could be that he was using a different standard to judge her work than he would to judge the work of men. For Erica, it was "natural," even "easier" to attribute someone "poo-pooing" her ideas to the fact that she is a woman. In other words, the attribution of the criticism to her gender enabled her to preserve her belief that the ideas that she had were of value.

In her senior year interview Erica discussed what she thought the differences between the experiences of men and women in engineering at LPU were. As a senior, a month or so away from graduation she had come to see her department as more familial than she had in her junior year. One thing seemed to trouble her about her department--she remarked on a lack of women role models in the college, citing a small number of women professors (two), and her awareness of only one woman who the college named a "distinguished alum" in the department.

In our building there's like this wall of distinguished alums. There's one female on the wall out of, like, at least 25 people and she is famous for, like, running a cosmetic company. And you know, it almost feels like we're breaking into this, like, good old boys club. Like, seriously, because you know, granted that's not the way people look at the world now. And then, now we have the same opportunity but we're still getting hired by people who are from back when, you know, women were secretaries and that's it. So I think that definitely kind of plays a role because women haven't, women are starting to establish their role in science and their role in engineering, but it hasn't been like a long-established thing. We can't look back in books and be like, 'oh look at this lady look what she did, you know'. So, um, maybe not as easy to relate to. (Erica, senior year)

She explained that the absence of women in her field made it harder for her to relate to the field. One possible reading of this is that Erica had to work to picture herself in the field, whereas men had the advantage of looking at the pictures of distinguished alums on the wall in the lobby of the Chemical Engineering building and seeing people who looked like they did. Men could more easily, one could argue, relate to the field, and see themselves as potential contribution-makers to the field.

During her senior year Erica attended several job fairs and was interviewed by many companies. She had a job lined up months before she graduated, and she talked very positively about the company she was going to work as a place where she felt comfortable. She contrasted this with her experience at interviews with other companies.

I interviewed with this [name of shipyard] and, like, I'm kind of, like, I'm not a girly girl, but I'm a lot girlier than the people that work at the [name of shipyard]. And so just kind of walking around there, 'oh do you want to leave your purse in the car', and just, like, little comments about the fact that I was a girl. I remember at one of the career fairs I talked to an oil company and they're like, 'well, you have to get dirty'. And I was like, 'would you say that to everyone or just the females that come up?' (Erica, senior year)

As she transitioned to a career as an engineer from a career as an engineering student Erica identified some experiences she had at interviews that seemed to affirm that even beyond school women were confronted with different expectations than their male counterparts because of their gender. In both the examples that Erica gave her gender, was in her mind foregrounded by the interviewers. Her last statement indicated an awareness that the interviewer would not have said, "you have to get dirty," had she been a man, thus, in her mind there were a separate set of expectations for women in the field. Although these two quotes do not address the effects of the perception that women get into the major more easily, they illuminate an important point--that women perceive that the field may continue to hold them to different standards than their male counterparts, even beyond their engineering education experiences.

Conclusions

In addition to concern about getting into their majors Simon and Erica also share a perception that it is easier for a woman to get into the engineering college than a man in their sophomore years. We have argued elsewhere (Garrison, Stevens, Sabin, & Jocuns, 2007) that this shared perception may mean the conditions for what Claude Steele (1997) has termed *stereotype threat* are present for women in the College of Engineering. Stereotype threat, according to Steele is “the social-psychological threat that arises when one is in a situation or doing something for which a negative stereotype about one’s group applies.” One of the examples that Steele presents is that of “math-identified women” (p. 614), women who think of themselves as being good at math. He found that the awareness of the negative stereotype that women are not good at math influenced the math-identified women’s performance on activities in their college math classes. Similarly, we contend that if Simon’s and Erica’s views are widely-held, and if women in the college are aware of this negative view of their group, then their individual performances in engineering-related activities might be impacted negatively in a long-term and sustained way. This is consequential for learning, from a practice perspective, as the women may view themselves as not being accepted by the field, and therefore the women may, in effect limit their own participation in the important practices in which those in the process of becoming an engineer should engage. In other words, although they may be recognized by administrators in the engineering college as engineers-in-training, worthy members of the community, the women, out of fear of presenting themselves as “not knowing what’s going on” will merely opt out of participating (a navigational choice) or only partially engage with the community (i.e., only with other women). Furthermore, if we are to consider that part of becoming an engineer is developing an identification with the field, and having others identify oneself as an engineer-in-the-making, then this partial feeling of acceptance would necessarily limit one’s ability to become a full member of the field.

It would seem admission to the college of engineering at LPU is rather mysterious and obscured to students. They can categorize people into groups. There are “no problem” students, and “borderline cases”, and the “they really have to look at you” students, but the boundaries between the categories are not known to them—it is in this sense, that it is mysterious. It is so significant to them that they attempt to demystify it—cobbling together their impressions of the admission process from bits and pieces of information they obtain from a number of sources, some reliable and others seemingly less so. And, if Erica’s disregard of the advisor telling her that gender was not a factor in admission decisions is any indication, it would seem that students place a great deal of weight on the information they obtain from the unofficial sources. Why they seem to privilege the information from the unofficial source is unclear, but given that educators are the dispensers of the official information (competing with this unofficial information), perhaps it makes sense to dispense official information about the admission process more widely and more often than is being done currently at LPU. We hope to extend this research to the other four campuses to determine if we see evidence of similar beliefs at engineering schools where students are admitted as freshmen.

In addition to adjustments to the manner in which students are admitted to the college of engineering, engineering educators might examine the programs like WiSE, which on the campus of LPU appear to be “spotlighting” the women engineering students. At LPU the program is open to both men and women, but there is a stigma attached to involvement in the program. What had been designed to be a resource (WiSE), may indeed have been viewed as a liability by the women on campus who could have benefited from its services. Promoting the organization as being open to all students might be a way to alleviate the stigma that appears to have been attached to the program. This is not to say that women in this study did not make use of the services, but there were a number of women in the study who did not ever take advantage of the tutoring and other programs. One has to wonder if it is related to the notion of women believing that they need to prove themselves—doing so might have, in their eyes, meant identifying themselves as being illegitimate, or less legitimate members of the engineering community.

In writing about this issue previously, we did not have four years of data across which to examine how the students’ beliefs evolved. Simon’s shift in belief makes one hopeful for the future of the field.

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