



TUEE Transforming Undergraduate Education in Engineering **Phase III: Voices on Women's Participation and Retention**

Pre-Workshop Survey Summary Report

The *Voices on Women's Participation and Retention* workshop represents Phase III of the Transforming Undergraduate Education in Engineering (TUEE) initiative. This phase proposes to address the chronic problem of low female participation and success in U.S. engineering undergraduate programs. In preparation for the workshop, all attendees were asked to complete an online registration survey that provided the opportunity to offer open-ended feedback about (1) what they perceive as primary barriers to women's participation in engineering; (2) what they have done (or can do) to address and overcome such barriers; (3) what type of institutions are best equipped to address these barriers; and (4) personal experiences of gender-related challenges in engineering. This report presents a summary of the 38 responses that were submitted.

Primary Barriers to Women's Participation in Engineering (n=38)

Survey participants expressed the view that there is no single barrier to women's participation in engineering, but rather a mix of factors that contribute to such barriers. Among the most prevalent and pressing factors cited were biased social perceptions, the lack of an inclusive culture and environment for women in engineering in a broad sense, and a narrow, technically focused engineering curriculum. An environment of cultural conditioning directs women away from engineering careers at an early age. The pattern persists as a result of inadequate academic preparation and counseling, from middle school through high school and into college. One participant summarized the situation with an excerpt from a white paper in process:

"Women have made significant progress in education and the workplace over the past 50 years. And yet, their growing participation in STEM is occurring at a slower rate than in medicine, law, and business (Hill, Corbett & Rose, 2010). Further exacerbating the drive toward equity is the under-representation of women of color in engineering and technology, and African American women in particular. A growing number of studies have proffered reasons why so few women pursue and remain in engineering and science, including conflicting societal beliefs about women in technology; unsupportive social and structural environments; mindsets, including a lack of confidence; unconscious and conscious biases; and the lack of female mentors and role models, among others (Fouad, Singh, Fitzpatrick & Liu, 2011; Hill, Corbett, & Rose, 2010; Ohland, Brawner, Camacho, Layton, Long, Lord & Wasburn, 2011). In the past few years researchers have also noted the 'double bind' experienced by women of color (Ong, Wright, Espinosa, & Orfield, 2011) who encounter the dual-negative constraints of their gender and racial or ethnic status in a technical culture that elevates white males and 'inculcates preferred forms of gender, race and sexuality.' (Tonso, 2014)."

There is an accumulation of subtle, complex, multi-factored and systemic challenges for women in engineering that are typically not recognized, often denied, or written off as unchangeable – either because they are not a priority or because of lack of knowledge about strategies for change.

Culture, Environment, and Societal Perceptions (n=20)

Gender roles and expectations are endemic in our society and inculcated in children almost from birth. There are widespread beliefs about what kinds of things boys and men do and what kinds of things girls and women do, as well as a human desire to be seen as fitting in socially. Internalization of these beliefs by men and boys, women and girls, leads them to believe that there are negative repercussions for those who don't perform mainstream gender roles. There is a diffuse and unconscious societal bias that both men and women have in favor of men and against women across the educational spectrum and into the engineering profession. This bias acts in many ways, from the encouragement/discouragement we give children at home to the encouragement/discouragement students receive at school. It extends to the subtle messages students receive from their peers and from media sources about who engineers are and are not, and to the public's perception of what engineering really is. The messages boys and men receive from peers and the media don't always teach them to value a smart, technically competent woman as a potential mate. Naturally, girls and women who perceive this may not choose such a path because they fear it will hinder their ability to attract a mate. Young girls are not necessarily encouraged to consider fields such as engineering. The images of women they see don't support it and academic environments often fail to illustrate aspects of engineering that interest girls. Society, culture, and the profession itself too often reinforce, subtly or overtly, the male ideal of an engineer. This happens at every level, feeding a tendency to overvalue men's contributions and undervalue those of women. Feeling like outsiders, women leave engineering – and other STEM academic programs and occupations – at a higher rate than do men. The dominant image of white men as successful engineers remains a key challenge to women's participation and marginalizes the diverse contributors needed to address the challenges of the 21st century.

STEM Education in K-12 (n=9)

Early education and the K-12 system do little to inspire young girls about STEM as a creative, innovative, human-oriented field or to encourage their pursuit of science, math, and other educational paths to engineering. There is a little bit of an engineer in every girl, but it's hard for kids to recognize. Adult influencers in their lives often do not recognize it either. Parents, students, and even teachers have misconceptions about engineering – who does it, to what end, and what it is that engineers do. A 2006 consumer research project titled *Engineer Your Life* found that the only “fact” about engineering that most girls and their parents, teachers, and guidance counselors could point to was that “engineers must love math and science.” While a lack of awareness and understanding is not the only barrier to women's participation and retention, it is often the first barrier. In addition, in schools that offer engineering programs, girls are not required to participate. They miss out on proper preparation and are not exposed to engineering as a career option. Rarely does an institution require that entering students have any background in engineering or computing. Still, without the right math and science courses in grades 1-12, women will not be prepared to major in engineering without additional coursework. The mix of cultural conditioning that directs women away from engineering careers at an early age, and insufficient academic preparation and counseling at the middle school and high school levels, presents a big obstacle to attracting, involving, and retaining young women in engineering and engineering

education. The K-12 community needs to make deliberate efforts to spark interest in math and science at an early age (as early as first grade), and to improve the image of engineering, showcasing for girls and the general public what engineering is and how it is making a positive difference in people's lives.

Higher Education (n=7)

Participation of women in engineering education is hindered by the restrictive culture and institutional practices of engineering programs. Male faculty members, who constitute the majority and the dominant group in engineering education, need to become aware of the ways that they, consciously and unconsciously, create barriers to women. They must be intentional in their efforts to improve practices around diversity and recruitment and retention of women. Post-secondary institutions need a diverse, approachable, and encouraging engineering faculty.

Admissions policies may be excluding women unnecessarily. Even if a school does not require students to have studied engineering, female applicants who lack that background may compare unfavorably with men. Schools often fail to take into account such attributes as prior leadership experience, which could predict success in an engineering degree program. Women's persistence may also be affected by a narrow first-year curriculum that silos students in majors instead of exposing them to the broad applications of engineering in meeting important societal and global needs.

Role Models (n=4)

Being underrepresented and undervalued in engineering and engineering education means that women who surmount the hurdles and persist in engineering majors find fewer role models and mentors and, because of their low numbers, less peer support. This only compounds a systemic problem. There are still some faculty members who do not embrace diversity in engineering. Engineering academia has not invested sufficiently in leadership development and organizational know-how when it comes to representation of women. Female students who graduate with an engineering degree will likely face a similar lack of role models, support and respect on the job or in graduate school. For some women, the additional pressure of having to be a caregiver to children and/or a mate, in addition to meeting the demands of a challenging course of study or a job, may be more than they can or want to bear.

Industry Practices (n=3)

Beyond K-12 and academia, industries themselves suffer from an unwelcoming culture toward women on many fronts. The climate is still very traditional and male dominated, one in which women's participation and contribution is ignored or undervalued. Unequal pay remains a major issue. Furthermore, even within industry, engineering is not necessarily perceived as a "helping" profession serving society. Rather, it is articulated as an activity devoid of social impact. The emphasis is on the knowledge required to participate in engineering rather than the diverse and rewarding opportunities that a degree in engineering can facilitate. Women want to be more than a cog in a wheel. They want to identify with a career that will have an impact and make a difference, to be respected, and to be treated and paid equally.

Efforts to engage women in the engineering workforce have mostly focused on recruitment, not on retention and career advancement. There will be more female leaders in engineering when industry starts to emphasize mid-career retention and advancing women into senior positions. There is a glass ceiling and a lack of opportunity for female engineers at the workplace. Furthermore, too often career

pathways do not provide “off ramps” or “rest stations” for women (and men) who are talented yet have personal obligations that they are not willing to ignore. Importantly, women should not have to fear being isolated or not supported if they decide to have a family. Sidelining mothers is unfortunate not only for the affected individuals but also for society, since we need leaders who bring varied professional and personal experiences to the way they approach problems and seek solutions.

Strategies and Best Practices to Address Barriers to Women’s Participation (n=38)

Awareness Raising & Advocacy (n=21)

When asked what they do personally to address the identified barriers to women in engineering, many respondents mentioned engaging in awareness-raising and advocacy on their campuses or within organizations, as well as externally with industry and other partners. They do that through lecturing, conducting meetings, publishing, and presenting research, blogging, advising, and mentoring to principals (faculty, students, administrators, and employers) to promote broader-gendered participation. Raising awareness of gender bias, especially implicit bias, is one of the keys to addressing the barriers to women. It is a long, slow process, but it must be done to change the culture and climate of engineering for women (and other under-represented/marginalized groups). It involves becoming active and supportive in gender initiatives on campus or within one’s organization, conducting research on gender stereotypes, sharing this research not only at conferences but also through forums on campus and across organizations.

Research in particular was frequently mentioned as a means to investigate, explain, and address both problems and solutions surrounding inclusion and retention of women in engineering. Some respondents confided that they even use a “stealth approach,” embedding gender issues in an otherwise “normal” article in the hope that men will read it. However, for the research to have the desired effect, it must be translated into applicable practices and published in short, readable, persuasive formats with appealing graphic design and broad dissemination.

Several respondents reported that they chose to work directly with pre-college students to help change their perceptions of engineering and engineers. For instance, the National Academy of Engineering, through its website *EngineerGirl!* (www.engineergirl.org) is engaging middle school and high school girls in understanding how engineering and other technical fields can provide them the tools to pursue rewarding careers and make a tremendous difference in their communities. Many of students at this age opt out of math and science electives without understanding the enormous range of careers that they have discarded through their choice of classes. The website hosts a gallery of women engineers who share advice through an “Ask an Engineer” column and provide students an opportunity to discover how the stories of these women and their engineering careers echo many of the students’ own dreams and ambitions. The web site has over 30,000 unique visitors a month and is a top-rated site for young women and engineering. Some others helped develop an innovative first-year program that was more inclusive of different perspectives and social attributes. Reaching out to parents to demystify careers in the STEM field was also mentioned as an important and effective practice. One participant also reported working with the National Science Foundation as a subject matter expert in broadening participation at

a number of Engineering Research Centers, striving to contribute to healthy, inclusive environments for women and minorities.

One person shared a personal approach to breaking gender stereotypes: First and foremost, it's important to lead by example: Once having interacted with a highly competent woman, a subconsciously biased person is less likely to devalue the next woman encountered. Second, it's important to remain positive, so others will remember a woman's technical contributions and not her complaint. Third, every time a sector where women are underrepresented is identified, it's important to try to build credentials to enter that sector and promote awareness and advocacy for women. Fourth, it helps to talk openly about gender biases with men in the room, and to initiate conversations with men based on the assumption that they have the best of intentions to change the climate.

A respondent working at the United Nations Educational, Scientific and Cultural Organization (UNESCO) described its development of hands-on programs to introduce young women to what STEM careers and engineering are all about. The first UNESCO Engineering Week in Africa in 2014 exposed youth, especially young women, to careers in engineering.

Training & Mentoring (12)

Several people reported that they serve as mentors, counselors, sponsors, and role models for younger women and minorities in STEM undergraduate and graduate education, with one person having reached 5,000 students to-date. They run substantial mentoring programs, career and professional development workshops, academic support, and tutoring sessions for undergraduates. Others conduct regular training for male faculty (particularly in STEM) interested in becoming allies for gender equity. During such sessions, trainers and trainees discuss institutional data, barriers and disparities, climate, and the literature addressing gender discrimination and bias in academia. They also cover unconscious bias, male-preference gender bias, unearned advantage, and male privilege. The training concludes with the introduction of individual actions for allies and beginning skills development through scenarios.

Creating Environment and Opportunities (n=7)

An academic and workplace culture for students, employees, and faculty that promotes inclusion and diversity is critical, and everyone can contribute. Several people described dedicated efforts to create a more inclusive environment for women in engineering. WEPAN (Women in Engineering ProActive Network), for instance, is entirely focused on gender equity in engineering. It is driven by a conviction that the profession must fully embrace diversity and inclusion to meet the demands of today's innovation- and performance-driven business culture, according to its executive director. The organization mobilizes research on gender, diversity, and inclusion and practical, targeted initiatives to achieve sustainable, systems-level improvement in the higher education-to-workplace pathway. Others have created professional development and leadership support groups to empower and create opportunities for women within their organizations. Male allies for gender equality said they consider encouragement of senior women on their teams to be the single best driver of change. They also try to promote a culture that listens and collaborates better.

Youth and K-12 Initiatives (n=5)

Many survey respondents have been involved in various initiatives to bridge the gender gap at the K-12 level. Examples were many and varied:

- Created a national messaging campaign like Engineering Your Life designed to change the way girls think about engineering and how engineers talk about engineering;
- Co-created a national television show, Design Squad, to show middle school students what engineering is all about and how they can use the engineering design process to tackle various challenges;
- Launched a social media campaign around the idea that there's a little bit of engineer in year girl and it's our job to #BringItOut. The campaign showcases how engineers are curious, creative, team-oriented professionals who work to make a difference in our lives;
- Oversaw an engineering competition, Future City, that engages 40,000 middle school students each year (50 percent of them girls) to explore engineering as they create a city 100 years in the future;
- Continued to look for new ways to share with girls and their adult influencers how engineering makes the world a better place;
- One university engineering department established FIRST Lego League teams at all the elementary and middle schools in surrounding districts;
- Developed summer engineering and robotics camps to have more girls experience engineering at a young age and see how engineering helps people;
- A university professor taught students in grades 6-9 in the Youth, Engineering and Science (YES) program, which introduces students to engineering while improving their math and science skills;
- Created and supported opportunities to cultivate the self-efficacy of women and young girls in technical subjects and careers (mastery experiences, role models, and mentors);
- Offered summer engineering experiences at MIT and the National Society of Black Engineers (NSBE) to provide positive experiences for girls as early as the third grade (8 years old);
- Counseled parents on how to choose schools and co-curricular opportunities for their young girls (and boys).

Recruitment & Retention at Engineering Colleges (n=4)

An example of efforts to improve recruitment and retention was offered by the president of a community college. Working closely with Texas A&M University, the community college developed an Engineering Academy – a living-learning environment that aims both to broaden diversity within the student population and to offer more opportunities and pathways to four-year institutions and eventual careers in engineering. The community college has also engaged with NASA to add a former Director of Mission Operations to the faculty as a way of stimulating critical thinking among students. In another example, an engineering college has abolished its traditional and ineffective Women in Engineering and Multicultural Engineering programs and launched an entirely new, nontraditional diversity-focused organization. The results have been dramatic in terms of access, performance and retention of women and under-represented minority engineering students.

At another university, the College of Engineering actively recruits women through overnight visits by high school students hosted by the Society of Women Engineers and through strategic outreach and communication. The admissions process has been reevaluated to ensure that all women with the

potential to succeed in engineering program are being captured. Throughout the recruitment period, all admitted female applicants receive a hand-written card and several phone calls from a current female engineering student. The message, presentations, and printed materials focus on the NAE Grand Challenges to contextualize what engineers do and how they help people. Marketing materials intentionally include women. Women represent 52 percent of the school's Engineering Ambassadors, who stage events and tours for prospective students and their families. The first year has been flexibly designed in an effort to draw more women. Students can enroll as "Undecided Engineering" for the first year to allow for open exploration. A living-learning community that supports first-year female engineering students through shared classes and engagement opportunities, and the curriculum includes team-based projects. , and for a living-learning community that supports first-year female engineering students through shared classes and engagement opportunities.

Stakeholders Responsible to Address Barriers to Women's Participation in Engineering (n=38)

A common theme in the responses was that no single entity is responsible for this barrier or for removing it. The issues that women face in engineering represent, rather, a systemic problem that needs to be tackled from all angles and involve women and allies from all spheres of engineering. The perception of engineering as "male" is deeply and subconsciously wired into most everyone except women who want to be engineers. In order to effect change, everyone has to accept responsibility for including more women. First, academia, industry, government and professional societies all need to deeply reflect on and study their own culture and make changes to mitigate gender bias and promote inclusion of women in engineering. They must all work together to send the message that engineers dream of creative, practical solutions and work with teams of smart, inspiring people to invent, design, and create things that matter. As we all change the way we talk about engineering, we will make a tremendous difference in people's understanding of the profession. Once perceptions and the rhetoric have been addressed, academia, industry, government, and professional societies should also put forward actionable items, such as financial support, human capital, policies, and incentives, to promote and facilitate the inclusion of women.

All stakeholders should break boundaries and stereotypes, and work together locally, regionally, and nationally in ways that include influencers at every level and that leverage work they already do, getting everybody on the same page with the message and with actions. A very important factor is persistent, high-level leadership across sectors and organizations that activates and pursues a range of integrated strategies with a high potential for impact. For example, both ABET and industry stand in a unique position to dictate and model what inclusive environments in engineering should look like. Whether it's working to get inclusive practices into ABET criteria or requiring that industry do a better job of retaining women, the pipeline must be addressed by these two entities in order to tackle the issues. Similarly, academia and industry need to work together actively to change the career planning tools on the market, which are currently not all that adequate. Achieving full gender inclusion in engineering presents multifaceted challenges that will likely require many actions by many people across many sectors. Last but not least, more federal and state money could help expand the engineering pipeline.

Academia (n=18)

In academia, it is important to raise awareness through self-education and open dialogue. This takes training; engineering faculty need to work closely with social scientists to understand how best to approach these topics. Academia needs to acknowledge that it is part of an existing system that is failing and work to redefine the system in constructive ways that break down the cultural and social barriers to entry and advancement. For instance, academia can become more vigilant about monitoring women's representation and adjusting its own climate. This may necessitate hard conversations and new practices within the faculty and administration in order to change the language and culture around gender and diversity, as well as incentives to push faculty members out of their comfort zones and into a more receptive and inclusive mindset that nurtures and supports female students all along the path to degree completion. Faculty and graduate students could also be trained on ways to create more inclusive classrooms and structures that can be instituted to reduce bias. Post-secondary institutions also need to have a counseling and student support-services team that is fully staffed, offers non-traditional hours, is trained in up-to-date, effective career counseling techniques, and is willing to implement non-traditional counseling and support modalities such as online counseling and support groups. There has to be a support system in place to ensure academic success and retention of the student.

Faculty

Faculty members in particular were often perceived as the biggest hurdle to gender equity in engineering education. Respondents suggested a variety of measures that engineering colleges can take to facilitate that and initiate change:

- Hold faculty accountable and ensure that workloads and resources are distributed equitably;
- Include diversity efforts as a component of faculty appraisals;
- Insist on diverse applicant pools in faculty searches;
- Financially support diversity efforts such as invited lectures that address gender;
- Ensure that service obligations, large-section lecture classes, and other time-consuming assignments are not given disproportionately to women;
- Increase the share of female math and science faculty to serve as role models and mentors who can inspire young women by their presence, their words, and their work;
- Adopt family-friendly policies.

Yet, one respondent suggested that it is important to recognize the power of the distributed leadership model of the faculty governance culture and invest in the leadership capacity of all faculty. Gender diversity is a complex problem that engineering schools need to address, but not in a manner that seeks to tell faculty what to do. Academia should give faculty a problem to solve that has meaning to them, and the skills and resources to solve it.

Curriculum

Engineering colleges need to revamp and modernize their curricula to make it more interesting to women, more connected to the challenges they face, and better geared towards real social impact. That means shifting slightly away from the narrow focus on science and math, and including more multidisciplinary studies outside of engineering such as business, humanities, arts, and social sciences. It is also very important to implement practical hands-on experience in the curriculum, in addition to the theory fundamentals, so students can connect the dots. In that sense, universities should partner more

closely with industry to provide practical opportunities for students. This would also allow for academia and industry to share promising strategies for shifting norms and expectations in both classrooms and organizations, and to design course experiences that support marginalized students and create environments in which diverse students can establish a sense of belonging.

Industry (n=10)

Leaders in industry should make it clear that they want more women in technical roles, and should create environments that welcome and support women. They can do more to hire, retain, and promote women into senior positions. This can lead to many benefits, such as cultural change, role models, and mentoring. A conscious effort and a real desire to make things different are required to attract and keep female leaders. Industry can implement policies that serve to counteract institutional biases as well, while simultaneously working on individual awareness and behavioral changes and cultural shifts. Furthermore, industry can commit more resources to programs like YES for women and minorities from K-12 to college. Programs like Black Girls Code, COMPUGirls, and NSBE's all-girls Summer Engineering Experience for Kids (SEEK) camps in Jackson, Miss. and Atlanta, Ga. should be replicated elsewhere to encourage more girls' engineering aspirations.

Youth and K-12 (n=7)

Engineering colleges also need to work more closely with K-12 partnerships to develop a pipeline of students continuing on to higher education, and to make STEM and engineering in particular a priority for women and minorities. If enough resources and attention are put into building a child's math and science skills at a young age, that child will not only flourish but excel. Attracting and retaining women in engineering needs to start at the secondary education level. It is at this level that students need to become exposed to various fields of study and possible career paths. After K-12, research training and preparatory classes in math and science must be offered at community colleges to advance females' critical thinking skills. Government can also help by establishing research and innovation centers that develop quality resources for elementary and secondary school teachers so they can better represent engineering as a unique profession that can appeal to young women.

Professional Societies (n=2)

Professional societies should address barriers to women by identifying more opportunities. Moreover, the various engineering technical and professional societies would be well advised to consolidate overlapping outreach programs directed toward pre-college women students and their teachers. There is a lot of overlap in these efforts (and probably inefficiency too). A common message ought to be one of aspiration and preparation for technical careers, rather than trying to sell a particular subfield. A rising tide will lift all boats.

Media (n=2)

The media represent a powerful stakeholder that could steer the conversation and affect the outcome, in respondents' view. While public television now provides examples of girls solving engineering problems (e.g., SciGirls), such programs need to incorporate more diverse subjects and be pushed out to channels that reach broader audiences. Mainstream shows like CSI do a lot to change the subconscious biases that many of us have. They would do more to change attitudes than single-sex camps that

attempt to “fix” the girls. Media could be very effective in displaying positive images that encourage females to discover and embrace their potential to excel in engineering and other STEM fields. Those images would also encourage males to value women for their intelligence.

First-Hand Experiences Highlighting Challenges to Women in Engineering (n=17)

Participants provided numerous first-hand accounts of the barriers women face in engineering:

- Hearing countless testimonials by women engineering undergraduates who left engineering due to social pressures and outright hostility from faculty and peers. The common denominator is being alone or one of a very few, i.e., the lack of a critical mass, in a class or a major. Recognizing this as a problem for engineering, and not for student admission, is imperative for any change to occur.
- When I began as an engineering professor, I assigned my few female students to different laboratory groups with the good intention of increasing group diversity. It was not until a female colleague spoke to me that I recognized that this policy just further isolated an already marginalized group, likely impeded the success of these female students, and could actually reduce long-term gender diversity in my department. This is a simple example where intention did not align with outcome, and helps illustrate the need to engage men early in education and skills development.
- Data show that women commercialize their academic research at a much lower rate than men. Therefore, as a faculty member, I joined a program intended to accelerate women in this regard. My all-women team has had a number of large successes (1 patent pending, 5 proposals funded including NSF STTR and NSF PFI). However, at networking events my female business partner and I find that we stand alone unless we initiate conversations with others. For the STTR proposal, we brought my husband onto the team to complete a technical subtask. When he attends networking events with us, the dynamics change entirely. After initial introductions, others will seek him out to ask questions about the technology/product, while my female business partner and I are still not being approached. He, of course, doesn't know the answers and so he'll direct the person to me. He serves as the lure and in this stage of the business; this has been essential for our business to move forward.
- High schools and colleges are increasingly using career planning software tools to help students figure out majors in college. These tools may contain biases that direct students away from engineering. At my institution, we have voluntary opt-in women-in-engineering learning communities that include social support aspects (co-location in dorms, etc.) as well as academic curricula. One of the instructors of one of the freshman academic planning WiE classes noticed an alarming trend while reviewing student results from the MyPlan tool. In a class of about 35 students who have declared engineering as their major and expressed a strong interest in science and math, the most common career suggestion from this tool was nursing. Engineering did not even appear on many of their reports.
- A former advisee and mentee, a female Civil Engineering graduate chose to enter the workforce in the restaurant construction business for a major national construction firm. She repeatedly spoke about the hostility of having to function and thrive in a male-dominated environment, amidst cat calls and other visible signs of disrespect. Despite her experiences, she thrived and led several successful projects, forming a tough skin in the process, only to eventually leave the field to earn a law degree.
- From my research, I have collected several accounts of women students being marginalized in male-dominated classes. A common complaint was that professors dismissed their questions and treated

them as inferior to the men in the class. This was a common perception among the women students and thus is a real motivation for leaving the program and the field.

- My position requires making many decisions every day that are often challenged by my male counterparts. It takes critical thinking skills and self-confidence, not arrogance, to continue along the path that makes the right decision. This has often been challenging through my social and education process, as well as in my career decisions, as I have always been in a male-dominated environment. It took longer hours and more commitment to outcomes for me to accomplish the same as my male peers.
- In my previous position, I was passed over for promotion into a higher-level administrative position. I was told that the reason was that I was not a tenured faculty member. However, there had been men in the past who had held similar positions who did not hold tenure. When I chose to leave the institution, applied for and landed a higher-level administrative position at another institution (in the same location as my partner), the Associate Dean that I worked with shared with the Dean's Cabinet and the Department Chairs in my college that there was nothing he could do to retain me (despite their urging) because I was leaving to "reunite my family." No attempt was made to retain me. Nobody discussed with me my motivation for leaving. It was all based on gendered assumptions.
- As a new college engineering grad hired at a major corporation, I initially worked the night shift with a group of technicians and was sexually harassed. After speaking with my family and brothers, I found the courage to report it and it was resolved.
- My knowledge of research on gender bias gives me great insight into my own academic experiences. I now understand that the opportunities for a career in science that did not come my way were in some part due to systemic biases about women in science. Consider this quote from a major engineering college from the 1950s, "Our engineering program is officially coeducational, but doesn't welcome women, since admitting too many will waste faculty time, distract serious male classmates, and undermine our professional reputation." The ways I have encountered bias in STEM educational and career settings have been subtle, diffuse and continual over time - nearly imperceptible unnoticeable unless one is well-informed about micro-messages. The personal adjustments I made to fit in with other students are a testament to my intention to succeed. It turns out that being able to cuss like a sailor, smoke cigars, and order 100 beers can be helpful in many career and life settings. All these personal experiences inform my commitment to increasing the number and advancing the prominence of women in engineering.
- Women's voices are still not heard enough. The gender bias at our engineering college is disgusting. For instance, while establishing an important college-wide committee recently, I was encouraged by our dean to invite the prior Chair of our top-ranked department (a man) to serve on the committee ("because we need someone who is respected and has influence"), rather than the current Chair, a woman who was unanimously elected Chair by her department and earned engineering degrees from Stanford and MIT. Apparently her accomplishments and credentials were not significant enough to balance her chromosomes. This not-so-subtle, but incredibly damaging, gender bias pervades our engineering college.
- As a young engineer working in a laboratory with all men, listening to their male-dominated conversations was extremely difficult.
- Technical interviews can often be intimidating.
- My sister was an engineer and she inspired me to become one. She married and five years into her career she had twins and decided to leave the workforce to raise her children. I was angry with her decision at first, but I had to try to understand how she felt. This was her personal decision, but a dilemma I'm sure is faced by many women in engineering.

- While an undergraduate student, I had a male professor who would treat me in a disrespectful manner. He would call me someone else's (another minority female's) name and when I would inform him that was not me he would say it was "close enough." On more than one occasion he implied that I was a lesser student. Conversely he would shower attention on certain white males in the class and it was clear he was interested in their success. He treated women in a condescending manner. I know a number of women who were all treated the same way by him. Unfortunately, none of us felt like we had anyone to turn to – even if we had banded together as a group. I left graduated with a vow not to provide any financial support to the Engineering department until that professor was gone (which I figured would happen through retirement). I support my university and my degree has provided wonderful career opportunities. However, I felt like I was an outsider and had to figure things out on my own if I was to survive.
- While working as an engineer, my project manager called me "sweetheart" at a meeting in front of our client.
- In the mining industry, many women engineers do not have bathrooms available to them and have to walk miles, back to the secretary block to use the restrooms whereas the men have toilets right outside their offices.
- Many women don't have access to roles or opportunities that their male counterparts have unless they have a sponsor. Unfortunately, I have seen many capable women passed over due to the lack of exposure and image. As an engineering student, I was one of three women in the program. There was a lack of support and resources from the male students and faculty members. I was excluded during most of my undergraduate program. This type of isolation was difficult to deal with and was reflected in my grades. I was able to finish my degree because of the strong support I had from family and friends. I knew I was the first and needed to see it through. This is why I am dedicated to helping and supporting students.