WOMEN IN ENGINEERING AT THE UNDERGRADUATE LEVEL

An Honors Fellow Thesis

by

NATASHA CHRISTINA LAGOUDAS

Submitted to the Office of Undergraduate Research
Texas A&M University
in partial fulfillment of the requirements for the designation as

HONORS UNDERGRADUATE RESEARCH FELLOW

December 2009

Major: Aerospace Engineering

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Approved by:

Research Advisor:	Joan Wolf
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ABSTRACT

Women in Engineering at the Undergraduate Level. (December 2009)

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Only 18.1 percent of engineering bachelor degrees in the nation are awarded to women, which represents a two percent increase over the past two decades. The purpose of this research is to explore the experiences of men and women in undergraduate engineering in attempt to explain the continuing gender gap. I held an in-depth interview with one male and one female senior student from selected departments of the Dwight College of Engineering at Texas A&M University. Participants discussed the far-reaching perception of engineering as masculine, which created a gendered undergraduate experience. Male and female participants were found to have similar high school preparation and reasons for studying engineering; however, women received significantly less support from peers. Both sexes cited the overload of work as the cause for many students leaving engineering, but women additionally complained about the impersonal attitude of professors and lack of practical examples in the classroom. Moreover, participants revealed experiences of sexist treatment by male professors and peers towards female students along with a more subtle form of sexism through gender

roles formed in engineering teams. These results, while specific to Texas A&M University and the departments of participating students, shed light on possible explanations of the gender gap and improvements to enhance the undergraduate engineering experience. Recommendations include a shift in marketing of engineering to be more compatible with women's interests, more interactive and application-focused teaching approach in classrooms, and training for professors on gender sensitivity to create an inclusive environment for enhancing the undergraduate engineering experience for both men and women.

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NOMENCLATURE

TAMU	Texas A&M University
WECE	Women's Experiences in College Engineering
EWEP	Extraordinary Women Engineering Project
SWE	Society of Women Engineers

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CHAPTER I

INTRODUCTION

> "On women's underrepresentation in science and engineering...there is reasonably strong evidence of taste differences between little girls and little boys that are not easy to attribute to socialization. The human mind has a tendency to grab to the socialization hypothesis...and it often turns out not to be true" (Summers, 2005).

These remarks come from then President of Harvard University, Dr. Lawrence Summers, during a 2005 national conference. Dr. Summers hypothesized that women are underrepresented in higher-level science and engineering occupations due to innate differences between men and women rather than effects of gendered socialization. He claimed that women are not as willing to make the time commitment required in demanding jobs at major research institutions (Summers, 2005). While these remarks ignited a public outcry, especially among female scientists and engineers, Summers' comments shed light on the controversial debate about why women are still a minority in the engineering and science fields.

Over the past decade, the consistently low representation of women in undergraduate engineering and in the engineering workforce has challenged universities, researchers, and policymakers to find explanations for the persisting gender gap. Women have made

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This thesis follows the style of the *Journal of Personality and Social Psychology*.

inroads into many traditionally masculine occupations in the last few decades, but engineering is not among them. Women are employed in biological and life sciences at a rate nearly equal to men, and nearly one-third of chemists are women (Hartman & Hartman, 2007). However, while women make up 56.8 percent of the total U.S. labor force, only 8.5 percent of engineering professionals are women (National Academy of Sciences, 2007). This low number is due at least in part to the relatively low enrollment rates and retention rates of women in undergraduate engineering programs. While women's enrollment in college steadily rose to 58 percent of all undergraduate students in 2007, women earned only 18.1 percent of bachelor degrees in engineering, the lowest rate since 1996 (Gibbons, 2007). Part of the problem is a gender gap in retention rates in undergraduate engineering with 62 percent of men completing a bachelor's degree in engineering compared to 42 percent of women (Goodman Research Group, Inc., 2002). Furthermore, a look at specific majors within engineering provides interesting insight into the gender gap. Women tend to congregate into five particular engineering disciplines: biological, biomedical, chemical, environmental, and industrial, but these majors only compromise 17 percent of all engineering bachelor's degrees awarded (Gibbons, 2007). In particular, over the past ten years, chemical engineering has been composed of over 33 percent women, and more recently, industrial and materials engineering have risen to over 30 percent female students (National Science Foundation, 1994). On the other hand, the four largest engineering majors—civil, computer, electrical, and mechanical engineering— are the most male dominated. Women earn

only 13.6 percent of these degrees (Gibbons, 2007). Clearly, women are a minority in engineering and concentrate in specific majors within undergraduate engineering.

At Texas A&M University (TAMU), in the Dwight Look College of Engineering, the participation of women resembles national numbers. From 1992-2007, the proportion of undergraduate engineering degrees awarded to women fluctuated between 17 and 19.3 percent, with a peak occurring in 1998. In 2007, engineering enrollment was 18.3 percent women, with 20 percent of undergraduate engineering degrees awarded to women. Looking at specific majors within engineering, the trends are similar to national statistics. Chemical engineering has the highest percentage of female students at 30 percent, which is followed by industrial and systems engineering at 23 percent. The least popular engineering majors for women were electrical (13 percent female), mechanical (14.8 percent), and aerospace (15 percent) (Engineering Student Services and Academic Programs, 2007). Overall, the TAMU engineering program continues to have a significant gender gap that reflects national trends.

Numerous studies have been conducted both nationally and at single institutions reporting the dearth of women in engineering and the possible barriers contributing to the shortage. In response, many universities have created Women in Engineering programs or contributed funds for studying and developing programs targeting the recruitment and retention of women in undergraduate engineering (Goodman Research Group Inc., 2002). While TAMU does not have a Women in Engineering program,

women are a targeted group for recruitment and various student organizations are available for female engineers. The purpose of this study is to take a closer at the specific undergraduate engineering experience at TAMU. Male and female senior engineering students were interviewed in the Dwight Look College of Engineering in order to examine the extent to which the students' experience in the engineering program is shaped by gender. These experiences are analyzed to provide recommendations for improvement of the undergraduate engineering experience at TAMU.

CHAPTER II

REVIEW OF LITERATURE

Numerous studies, especially during the last decade, have focused on understanding what contributes to the low enrollment and retention rates among women in undergraduate engineering (Goodman Research Group Inc., 2002). The majority of theories developed by researchers focus on personal and institutional factors that create a gendered experience for students in engineering—an experience that is not traditionally sympathetic to or aware of women's unique experiences. Several studies have also looked at biological differences to explain varying math and science ability between men and women, but no evidence exists that inherent differences can fully explain the persistent gender gap in engineering. Instead, four primary themes have been developed in previous research to explain the lack of women in engineering: lack of self-confidence and engineering self-efficacy, lack of pre-college experience and knowledge in engineering, climate in engineering education, and gender and societal issues (Goodman Research Group, Inc., 2002). The following review discusses literature supporting these four themes along with a look at research on biological differences contributing to the gender gap in undergraduate engineering.

Biological Differences

The view of biological differences attributes the gender gap in engineering to innate differences between men and women. One example of research in this area compared cognitive differences in the sexes in areas related to success in engineering (National Academy of Sciences, 2007). Cognition is defined as "the mental processes that underlie information processing, including object perception, learning memory, language acquisition, and problem solving" (Dawson & Medler, 1999). Researchers found an abundance of overlap in the cognitive abilities of men and women, and on general measures of intelligence, the sexes perform about equally (Hyde, 2005). However, a significant cognitive sex difference involves spatial ability—the ability to imagine an object in different orientations in space. One study found that boys and men are faster and more accurate at tasks involving this skill and proposed that spatial ability gives an advantage in science and technology fields (Pinker, 2002). However, this conclusion has been overturned by research showing that measures of spatial ability are less effective than verbal skills in predicting math and science success, and women generally outperform men in verbal skills testing (Humphreys, Lubinski & Yao, 1993; National Center for Education Statistics, 2004). The study on spatial ability is one of many in the research on biological differences and portrays the difficulty in showing direct relationships between innate differences of the sexes and lack of women in engineering. According to a National Academy of Sciences review, "studies of brain structure and function, of hormonal influences on cognitive performance, of psychological development in infancy, and of human evolution provide no clear evidence that men are

biologically advantaged in learning and performing mathematics and science" (National Academy of Sciences, 2007).

The strongest argument against a biological explanation is that the academic success of girls now equals that of boys (National Academy of Sciences, 2007). According to mathematical scores on the National Assessment of Engineering Progress examination, girls and boys in 4^{th}, 8^{th}, and 12^{th} grade performed at the same level between 1990-2003 (National Center for Educational Statistics, 2004). In addition, since 1998, high school boys and girls are taking advanced science and math classes at equal rates and performing at similar levels (National Science Board, 2004). A survey in 2005 found that girls were taking high school math and science courses at approximately the same rate as boys: 94 percent of girls and 91 percent of boys took biology, 64 percent of girls and 57 percent of boys took chemistry, 26 percent of girls and 32 percent of boys took physics, and 64 percent of girls and 60 percent of boys took algebra II (Extraordinary Women Engineers Coalition, 2005). However, proponents of the biological explanation point to the discrepancy between the sexes on the mathematics portion of the Scholastic Aptitude Test (SAT), where boys continue to outperform girls. The significance of this difference is unclear because the scores tend to underpredict the mathematics performance of college women relative to men (Gallagher & Kaufman, 2005). One possible explanation for the SAT gender gap is stereotype threat, which occurs when subjects worry their performance has the potential to confirm a negative stereotype about their social group. One study was able to attribute the entire gender gap in SAT test

scores to stereotype threat (Steele, Spencer, & Quinn, 1999). In summary, studies on biological differences provide no clear evidence that men have an innate advantage in engineering fields, and the simple fact that high school girls are taking equally challenging math and science courses and performing at equal levels in math and science begs for another explanation to the lower number of women in engineering.

Lack of Pre-College Experience

What is engineering? According to the Women's Experiences in College Engineering (WECE) Final Report in 2002, most of the public has only a vague concept of what engineers do. The report points to the absence of engineering from the K-12 curriculum where the vast majority of students do not study or participate in engineering projects in school (Goodman Research Group Inc., 2002). When deciding to pursue a certain college major, students' views on engineering are based on faint notions and stereotypes.

To gain a deeper understanding of the perceptions and gendered stereotypes surrounding engineering, a national survey was conducted by the Extraordinary Women Engineering Project (EWEP) in 2005 (Extraordinary Women Engineers Coalition, 2005). This study included high school girls, science and math teachers, and counselors. Girls were asked what words came to mind when they heard 'engineer,' and among the most common responses: "math and science, smart, nerdy, building, hard, complex, men, cars, engines, don't know, trains, bridges, Dilbert, too difficult, boring, [and] boys" (Extraordinary Women Engineers Coalition, 2005). Besides not having a clear idea of what engineering

entails, this collection of responses implies that engineering is perceived by high school girls to be just for boys. However, as mentioned previously, these girls were taking high school math and science courses at similar rates as boys along with actively participating in engineering-related activities such as robotics (Extraordinary Women Engineers Coalition, 2005). Despite this, these courses and activities did not translate into an interest for engineering: fewer than 10 percent of high school girls claimed interest in engineering, and nearly 70 percent "actively disagreed" that they were interested. Furthermore, teachers surveyed felt that both male and female students had a fundamental lack of awareness of engineering, and when counselors recommended engineering as a profession, girls quickly rejected the suggestion because engineering was too "nerdy" (Extraordinary Women Engineers Coalition, 2005). Consequently, even though high school girls are taking math and science courses and participating in engineering projects, their stereotype of engineering as a masculine career prevents them from choosing it as an undergraduate major.

Because of these perceptions, some researchers have argued that for women, engineering is more of an "academic" choice rather than a "natural" one (Anderson, 1995). Women enter engineering due to encouragement from family or teachers and on the basis of their strong math and science abilities instead of an intrinsic interest in engineering (Seymour & Hewitt, 1994; Anderson, 1995). However, EWEP showed that teachers were plagued with the same gendered stereotypes held by students, and many teachers believed that girls were more interested in socializing and working with people while boys were more

likely to prefer math and science fields (Extraordinary Women Engineers Coalition, 2005). If teachers believe only male students will pursue a math based career, they are more inclined to help develop those skills while focusing on preparing girls with a different set of skills. Teachers also portrayed engineering in terms of required technical skills without discussing any of the extrinsic values it has to offer. Discussing the societal impact of engineering may encourage more women to pursue this field, as studies have shown that women who enter engineering hold the social contributions of engineering in higher regard than men (Frehill, 1997). Additionally, the WECE survey found that female engineering students across the nation chose engineering because of the attraction to helping people and society, building and designing, and improving the environment (Goodman Research Group Inc., 2002). Therefore, the portrayal of engineering as incompatible with girl's interests and skills may contribute to the gender gap in engineering at the undergraduate level.

Lack of Self-Confidence and Self-Efficacy

Many studies attributed women's lower self-confidence in math and science skills compared to men as a significant factor in the lower number of women in engineering. The WECE survey found that confidence in engineering-related abilities was a crucial variable in determining students' persistence in the competitive environment of engineering schools (Goodman Research Group Inc., 2002). Self-confidence is linked with one's engineering self-efficacy or an engineering student's belief that he or she is capable of succeeding in engineering. Shelley Correll found that both high school girls

and boys stereotyped tasks related to mathematical ability as masculine, and this negatively affected girls' perception of their math competence. Correll asked boys and girls to rate their own math and science abilities, and when comparing students with the same score, the boys tended to overestimate their ability while the girls underestimated their skills. Correll concluded that:

> "widely shared cultural beliefs attached to various tasks affect not only how individuals are channeled into particular activities … but also how individuals 'self-select' into occupationally relevant activities. This implies that the gender-segregated labor force will be reproduced partially through the different and seemingly voluntary choices men and women make" (Correll, 2001).

Consequently, while high school girls take the same advanced math and science and perform at the same level as boys, girls continue to believe they are less talented in these areas. This trend continues into adulthood, as women who pursue engineering continue to have a lower self-confidence in math and science ability compared to men. One study of undergraduate engineering students found that even with a higher GPA, women rated their abilities in math and science lower than men. (Jackson, Gardner, & Sulivan, 1993). Clearly, girls develop a lower confidence level in math and science due to gendered stereotypes that may lead to women doubting their abilities to succeed in engineering.

Climate in Engineering Education

Another explanation explores the climate and focus of engineering institutions and courses. Critics of traditional engineering program claim that engineering education does not encourage a diversity of ideas and promotes a concept that engineering is a rigorous, competitive, and exclusive environment. Other researchers conclude that the interests,

socialization, and experiences of women are often at odds with traditional engineering structures.

According to a study of undergraduate engineering programs, students experience classes that focus on academic content without placing material in a larger context or portraying social aspects of engineering work (Adelman, 1998). According to the WECE report, "courses that neglect these interpersonal facets of engineering fail to contradict societal stereotypes and can contribute to the flight of female students" (Goodman Research Group Inc., 2002). This is reinforced when professors expect an absolute devotion to engineering and do not encourage outside interests, and many female students find this to be at odds with their interests to have a variety of hobbies (Tobias, 2000). Women tend to choose careers perceived to have a high level of interaction with people, to provide a benefit to society, and to allow for a balanced life (O'Hara, 1995). Without being exposed to the social aspects of engineering during school, women may falsely perceive engineering to be incompatible with personal interest and goals.

Additionally, women may be socialized in ways that make it difficult to function in a competitive environment and to learn from the impersonal manner of professors present in many engineering programs. According to Etzkowitz,

> "young women, who […] used their teacher's praise and encouragement as the basis for their self-esteem, become disoriented in college. [They lack] experience with the male culture of science and engineering majors, and do not know how to respond appropriately" (Etzkowitz, Kemlgor, & Uzzi, 2000).

Etzkowitz found that the engineering system was based on the model of a male student and included a fast-paced curriculum, hard teaching methods, and a competitive grading system. This is compared to a high school environment with a slower and more interactive curriculum, more personable teachers, and a focus on helping students succeed. When entering college, men adapt easier than women because the system is consistent with traditional male norms that are reinforced by parents, teachers, and peers alike (Etzkowitz, Kemelgor and Uzzi, 2000). In 1994, Seymour and Hewit found similar results; women rely on regular contact and encouragement by teachers in high school, but university professors discourage similar personal contact (Seymour and Hewitt, 1994). Therefore, due to gendered socialization, women struggle in an engineering environment that rewards conventionally male behavior. Accordingly, the traditional structure of engineering education that often lacks interpersonal aspects may discourage many female students from studying engineering.

Gender and Societal Issues

Another important aspect presented in the literature is the conflict between the social defintions of women and of engineering. For example, Etzkowitz finds that women experience being engineering students as inconsistent with "feminine" identity (Etzkowitz, Kemelgor and Uzzi, 2000). A woman's socialization is contradictory to the engineering stereotype, and as society tends to organize itself into strict masculine and feminine categories, Etzkowitz claims "the qualities that women feel they must demonstrate in order to win recognition for their 'right to belong' [in engineering] raise

the anxiety that such recognition can only be won at the expense of 'femininity'" (Etzkowitz, Kemelgor and Uzzi, 2000). The path to success in engineering encompasses values and attitudes that seem to conflict with the ways women have been socialized, and women do not have a sense of belonging in this male-dominated field. Etzkowitz and his colleagues report that women face a double-bind situation where they "can only win male acceptance, in academic terms, by losing it in personal terms" (Etzkowitz, Kemelgor and Uzzi 59). Women engineers are often caught between the contradictory expectations of the world of engineering and the world of womanhood.

Overall, a literature search reveals different explanations for the gender gap in undergraduate engineering. While an explanation based on biological differences is largely discounted by the fact that high school girls are taking similar math and science courses as boys and performing at equal levels, the literature presents several other explanations. These include an image of engineering that does not resonate with high school girls, lower self-confidence and engineering self-efficacy of women, a climate in engineering that discourages female students, and gendered expectations that push female students to pursue other careers.

CHAPTER III

METHODOLOGY

I conducted personal interviews of selected male and female engineering students. The sample included one male and one female graduating senior from three departments in the Dwight Look College of Engineering at TAMU: mechanical engineering, chemical engineering, and industrial and systems engineering. The two hour interview was based on pre-determined questions approved by the Texas A&M University Internal Review Board.

Procedure

The participants were recruited by word of mouth. They were informed of a study being conducted on engineering experiences at the undergraduate level, and if interested in participating, they were asked to contact me via email. An interview was then scheduled during the early part of the Spring 2009 semester and held in a conference room reserved at the HRBB Bright Engineering building. The participants were informed that the audio from the interview would be recorded for use in an academic research project and that all information would be kept confidential and seen only by the principal investigator.

Selection of Major

Students were selected from three majors to give the best representation of a general experience in engineering at TAMU. Mechanical engineering, with 14.8% female enrollment, represents the least attractive major to women (along with aerospace and electrical engineering). Chemical engineering, at 30% female enrollment, represents the most popular major for female engineers. Industrial and systems engineering has 23% female enrollment and falls between Chemical and Mechanical engineering. These fields can also be categorized by technical focus: mechanical engineering represents the physics-based majors, chemical engineering the chemistry and biology-based majors, and industrial and systems engineering the businesses and management side of engineering. Additionally, all participants were graduating seniors to capture the most complete picture of the undergraduate experience.

Selection of Questions

The interviews focused on three areas of interest: background, undergraduate experience, and social expectations. The background section included questions on careers and influence of parents, reasons for selecting engineering, reactions by parents and peers, and support and guidance from teachers and counselors. The undergraduate experience section focused on students' attitudes towards engineering, perceptions of engineering, professor and advisor treatment, and perception of differences in female

and male experiences. Finally, the section on social expectations focused on reactions from non-engineering peers on choice of major, stereotypes surrounding engineering, and effects of studying engineering on dating.

Limitations

A few limitations of this methodology should be noted. First, the survey sample is small (n=6) and variances amongst students have dramatic affects. Therefore, the results cannot be translated into generalizations of student engineering experience at TAMU as one student's response can greatly sway the results. However, the purpose of the research is to present case studies of select students in order to connect their answers to trends reported by national statistics and to gain a deeper understand of the students' experiences. Another limitation is when beginning the interview, I introduced myself as an Aerospace Engineer, and this may have affected student's responses. Being a female in engineering, they may have perceived me to be especially sensitive to the issue of women in engineering, and this may have affected how they answered questions about gendered experiences and opinions on the gender gap. Additionally, the participants were presented statistics on the continuing gender gap in engineering half way through the interview. The purpose was to educate participants on the continuing low rate of women in engineering and to collect a reaction. Many were surprised by these results, and the subsequent questions on their perception of women's experience in engineering may have been affected by the statistics. Another significant limitation is the ethnicity of participants. All male and female students were of Caucasian origin, and responses may

be different among students with different ethnicity and background. Finally, my personal experience as a female engineering student in the Aerospace Department is an influencing factor in the study. My interactions with professors and peers, experiences in the classroom, and opinions of women in engineering have an impact on my reactions and subsequent analysis of participant responses.

CHAPTER IV

RESULTS

Results are separated into the three categories focused in the interview: background, gendered undergraduate experience, and social expectations. General trends of the responses are noted as well as differences among participants. The focus is on gender differences, but discrepancies between specific engineering majors or other factors are presented where relevant.

Background

The students were asked several questions pertaining to their upbringing and experiences before entering college. The purpose was to reveal reasons for entering engineering, effects of engineering parents, and high school academic experience.

Reasons for choosing engineering

Participants had different reasons for choosing to pursue engineering. Both men and women attributed participation and success in advanced math and science classes in high school as a main factor, but key differences existed in how each described their technical abilities. Male participants attributed their skills in math and science as the main reason to pursue an engineering degree. One male participant described how “I always wanted

to be a mechanical engineer. I always assumed that is what I was going to do. I just assumed I was good at math and science." Male participants' high confidence in their abilities and the high grades they achieved in math and science courses made the transition into engineering seem "natural" to them. On the other hand, the women described how much they "enjoyed" their math and science classes and believed this would translate into enjoying engineering. They described how their classes would help them in engineering, but they did not express the same level of self-confidence that male students did. One female participant described how "I really liked my physics and other math and science classes, and I thought 'hey isn't that what engineers do?' I wasn't sure if I would be able to pull it off, but since I did take the advanced courses I thought I had a chance." Therefore, while men and women were enrolled in the same math and science courses in high school, they seemed to enter college with different confidence levels and expectations.

Another influence in the participants' decision was being raised by at least one engineering parent. Four out of the six students interviewed had one parent—always the father—who was a civil or mechanical engineer. For the other two participants, both women, one had a father in physics who often worked with engineers, while the other student's parents were teachers. For the students with engineering fathers, this helped shape their ideas of engineering and encouraged them to become an engineer from an early age as "they had been brought up surrounded with engineering." The female participant with an engineering father, never felt pushed by her family into engineering,

but once she made the choice, her father was very supportive: “my father was excited that I would be following in his footsteps. He’s a mechanical engineer.” The female participant with a father in physics had a similar experience: “my dad mentioned engineering when I was trying to figure out what to do. My dad works with engineers so he had a pretty good idea of what they do. When I chose that, he was very excited.” On the other hand, male students with a father in engineering felt expected to study engineering: “my dad was kind of pushing me and he wanted me to get a degree that would give me a good job and the same kind of degree he got. He was a civil engineer.” The choice for men was also described as more natural and in line with expectations of men: “I don’t think anyone was surprised that I would apply for engineering. My father and his father were mechanical engineers. It was something I always talked about and a very natural thing.” Interestingly, when participants discussed their family’s role and expectations surrounding their decision to pursue engineering, no one specifically discussed their mother. Both men and women only talked about the role their engineering father had in encouraging and supporting their decision, and there was no mention of their mother’s career or influence. This might be a result of how the interview questions were set-up to promote a discussion of a parent with an engineering background or perhaps their mothers had a more subtle influence on their decision. Nevertheless, for students with engineering fathers, their early exposure to engineering encouraged them to pursue engineering. However, male students felt strong family pressure to study engineering while fathers were surprised but excited by their daughter’s choice to purse engineering.

The only participant without a parent in engineering or sciences was a female industrial engineering student whose parents were middle school teachers. She did not grow up exposed to engineering, which may explain why she originally started in general studies. A year into her studies, she decided to switch to engineering: “I ended up in industrial and systems engineering because they took me halfway through the semester. I had no idea what it was, but it was engineering.” Even though she excelled in math and science in high school, she did not know what to study, and no one had talked to her about engineering. Once in college, she made friends with female engineers, who encouraged her to pursue a similar major. She grew more familiar with the field, and she recognized that her interests and abilities aligned with a career in engineering. Her family was supportive of her choice, but they knew little about engineering. Therefore, this participant’s experience suggests that even with a high aptitude in math and science, engineering parents seems to play an important role in encouraging students to pursue engineering.

While participants described their engineering parents as an influential factor, female participants also discussed engineering role models and high school teachers as important in their decision to pursue engineering. For example, one female participant had a positive experience in high school talking with a manager of a chemical plant: “she was cool and that was a good influence. It is hard to see successful women in the engineering field who still have a sense of pride in how they carry themselves.” The participant implied that her previous exposure to other engineering women had been a

negative experience and, she thought engineering women usually do not have a sense of pride. Another participant gave credit to a job-shadowing experience and the encouragement of her physics teacher for her decision:

> "I had two positive experiences with engineering that helped me. I job-shadowed a young female engineer at British Petroleum, and she convinced me that I would not regret majoring in chemical engineering. I also had a physics teacher who saw that I was excelling at making project designs, and he said that if I didn't know what I wanted to do that engineering was a good idea."

Both of these role models served an important role in this student's decision; the teacher helped her overcome any lack of confidence in her technical skills, and the engineer gave her a positive example of engineering beyond any stereotypes she might have. On the other hand, the third female participant did not have any role models motivating her: "I did not know anyone in engineering. Only in college did I give engineering any thought." Therefore, due to lack of exposure, she did not recognize that engineering was a good career choice that was compatible with her math and science skills. Clearly, these role models had a direct impact on the students, and for two of the female students, this was the push they needed to take their enjoyment of math and science and apply it to a career in engineering. On the other hand, none of the male participants mentioned a teacher or role model that influenced their decision to pursue engineering. However, this does not necessarily mean no such role models exist, but perhaps men with high confidence are unlikely to credit external forces for their decision. In either case, mentors and role models seem to be an important influence in women's decision to pursue engineering.

Support by family, teachers, and peers

The participants were also asked about the reactions and support received from friends in high school, and these were found to vary dramatically by gender. One male participant found his choice natural: “if you were good at math and science, people expected you to be an engineer.” Another male participant said, “no one really knew anything about it, but if you did calculus AP, people expected you to be an engineer.” Male students also had a large support group of other males wanting to study engineering: “my friends were mostly engineers in my high school, and my best friend is also in industrial and systems engineering. I had a support group, and we encouraged each other.” However, the assumption of a high aptitude of math and science leading to an engineering career was not present for female students. Women with similar enrollment in math and science courses instead received a negative reaction for wanting to pursue engineering. They were called “nerds” by their friends, and one participant had friends who tried to change her mind: “with my friends I got the ‘whoa that is really hard are you sure you want to do that?’ ” These reactions reflect gendered stereotypes and perceptions that engineering is incompatible with women’s skills and goals. In addition to negative reactions from peers, women also lacked a support group of other students interested in engineering. One participant discussed how her decision to pursue engineering isolated her from friends, “I was always good at math and science, and my friends knew I was smart, but they didn’t understand why I wanted to do engineering. No one else I knew chose it. It was such a foreign idea to them. I couldn’t really talk about it to them.” This statement shows a lack of understanding about engineering amongst high school peers and a

subsequent lack of support for women pursuing engineering based on perceptions of engineering as masculine. Overall, male participants experienced a more positive reception for their decision to study engineering along with a support group of like-minded friends. On the other hand, female students faced negative reactions from peers, and they felt isolated in their decision.

Additionally, most participants experienced minimal guidance from teachers and counselors in high school about engineering careers. The one exception was the female student with a physics teacher who "saw that [she] was excelling at making project designs, and he said that if [she] didn't know what [she] wanted to do that engineering was a good idea." However, the remaining participants, regardless of gender, found that "teachers and counselors were pretty useless [in discussing a career in engineering]." The teachers in their math and science courses had limited knowledge of engineering, and they were unable to help students make an informed decision about a career in engineering. One male participant explains, "teachers don't know much about engineering. Just that it's a lot of math and science. Teachers promoted college. They did not promote certain degrees like engineering. I went to a private school, where the graduate rate was over 90%, and they just wanted to keep that." A female participant had a similar experience where "high school teachers do not understand what engineering is. I only thought about engineering when I had to make a decision about college. I never got any background on it in school." Therefore, for most students, teachers did not play a major role in their decision to study engineering.

In summary, before entering college, participants faced gendered expectations in high school when deciding a career path. Men and women took similar math and science courses, and all but one participant had either an engineering or sciences father who exposed them to the idea of engineering at an early age. However, men had a higher confidence in their abilities compared to women and found engineering to be a more natural choice based on expectations from peers and parents. Women decided to pursue engineering because they enjoyed math and science courses, and they cited female engineering role models as a major factor in their decision. Furthermore, while men talked about a support group of friends pursuing engineering, women felt isolated from peers as they were alone amongst friends in choosing engineering. Clearly, before entering college, gendered expectations for students and gendered stereotypes surrounding engineering create an environment that encourages more males than females to pursue engineering.

Undergraduate Experience

After discussing high school experiences and reasons for choosing engineering, the participants were asked about their undergraduate experiences in engineering at TAMU. The questions focused on differences in professor treatment, peer interaction, and difficulty with subject matter and whether participants perceived themselves as having gendered experiences.

Men and women faced many similar challenges through their engineering undergraduate education. Students complained about the hard work and "time-consuming nature of engineering" that gave them little personal time compared to other majors: "the late nights, the fun stuff you have to give up, the stressful projects, and barely scraping by through classes---that is engineering." While both men and women expressed a sense of accomplishment from having overcome these difficulties, a difference in confidence level existed between genders. The male students found the classes to be "tough and challenging," but they felt "satisfaction knowing [they] could handle the challenge." Women felt less prepared and confident, but during each semester, they described how challenging classes increased their confidence: "once you finish a big project and do well on a test, you think: 'I can make it, I can finish this out!'" Therefore, both men and women found engineering challenging, but men felt confidence in their abilities to handle engineering while women seemed surprised with each success.

Professors and teaching style

In addition, men and women had similar feelings towards professors and styles of teaching. One of the female students described the best professors as those who can connect best with students:

> "Students relate to professors that they sense are excited about the field they teach, and they care that the students learn the stuff. They don't just spit out notes, but they go into examples. They steer away from theory and go for more of the practical sense. Any professor that was able to make a practical example out of a concept, they were the best."

This echoes a common complaint among participants that professors and courses focus too much on the theoretical part of engineering—equations and derivations of formulas—instead of giving more real-life examples similar to industry projects. The mechanical engineering male participant expresses this desire for more creativity in the classroom:

> "We learn the equations for how an engine works. I want to know what do to with those equations. When I go and work for Toyota, I might have to design a new and more efficient car, and this is an open ended question that needs creativity and group thinking, but in classes we are only taught standardized questions and formulas that require one way of thinking. We need more design problems and creative thinking."

Both male and female students desired a more real-world approach to engineering to both capture their interest and be more useful in their career. They felt that many professors taught the material in outdated methods that did not provide the best training for what industry would expect from them as engineers.

Additionally, participants felt that professors were insensitive and detached from students and created a competitive environment in the early undergraduate years. The first and second years in engineering were especially difficult, and both men and women felt the pressures of competing against each other to make it into upper level classes. One student described this environment:

> "It's hard, I mean, they don't tell you freshman year that only one third of the students will last. I was definitely borderline at one point, and it sucks to be there. In the end of the day, you either put in the extra effort or you don't. I did but I know others who didn't. I don't think they deserve to be there."

Acting like instructors at a boot camp, professors focused more on separating the students through "shear work volume" rather than spending time to teach the students. One student complained how this attitude leads to a tense environment in the classroom: "they didn't care about making it interesting; they just wanted to get people out that were not ready. I really felt that they were trying to weed us out." However, participants found that the professors' attitude shifted as the students progressed, and "in upper level, teachers seemed more accessible and just better." While some professors were "uncomfortable with teaching and didn't know how to convey their ideas," the atmosphere had changed to one of more interactive learning. One participant described this transition: "once you get through sophomore year, I really felt the professors were trying to get you to learn the material, besides just making a bad grade." Interestingly, while describing the difficulty of freshman and sophomore years, the participants called the instructors "professors," but when discussing the upper level classes, participants shifted to calling them "teachers." This might reflect a change in student attitude: during the first two years, students are intimidated and feel detached from instructors, while as upperclassmen, students experience "more of a high school style." Students described how the professors would "write on the board" and do more "explaining and teaching and not just lecturing." While all participants noted how much personable and more interactive the professors became during the upper level, women in particular noted that professors were "more sensitive to their needs" and "gave them more encouragement." Overall, both men and women described freshman and sophomore year professors as detached and creating a tense and competitive classroom environment, but as

upperclassmen, students experienced more open and caring professors in an encouraging environment.

Gendered treatment by professors

While all participants experienced a shift in professor attitude in later years, students also discussed instances of gendered treatment in classrooms. A male participant described that during a senior design class presentation the male professors were easier on the female presenters:

> "Some professors are a lot more apprehensive about criticizing what a girl presents. When you are in a design class, and a guy puts up something, a male professor is more apt to be harder on him and more critical of his suggestions. He takes it a little easier on the girls."

The men felt this easier treatment was beneficial to female students and a "show of respect"; however, the women did not feel the same way. One female student gave an example of how she felt when a professor treated her differently:

> "A professor was helping me during a lab, and when he heard that I knew what a washer was, he was like 'ooh wow.' He had already told the guys, and it was just really impressive to him that a girl knew. It's kind of cool because you earn some respect but it's sad because you shouldn't earn respect for knowing what a washer is. You should earn respect knowing a tough question in class. I didn't want that extra praise. It almost makes you feel stupid. Am I not supposed to know what that is?"

The female participant feels that her professor's lowered expectations led to a lowered self-confidence. When women believe that they are expected to get by with less knowledge, they feel discouraged and question their skills. As described by another female participant: "[As an engineer] you are going to doubt yourself. I know I doubted

myself and I think a lot of people did. Some people got kicked out for grades but a lot dropped out. You need to be mentally prepared. I think of the long run." Therefore, even though men believe women experience positive sexist treatment by professors, female participants explain that these lowered expectations lead to a lowered self-confidence in engineering.

On the other hand, participants gave examples of professors treating men better than women. The professor would ignore the female students and only focus on male students or give female students unwanted and inappropriate attention. One female student complained that in her classes "the professor wouldn't give [her] the time of day, and if a guy asked, he would help him." This made her feel "underappreciated and invisible," which is contrary to males' beliefs that being a minority make the females more visible to the professor. Additionally, female students sometimes received unwanted attention from professors. One female student recalls a senior-level class where she experienced an uncomfortable encounter with a professor:

> "One day in class, my professor, who is an older guy, brought a camera to help remember our faces. When it was my turn to get my picture taken, he was like 'ooh aren't you pretty! You are too pretty to be a chemical engineer.' I realized then that he was being overly nice to the girls in class and would call us 'sweetheart' and other pet names. I did not feel comfortable. But this was a rare case, and I didn't let it bother me too much."

Most participants believed that this type of behavior usually came from older professors who "had been around guys all their lives and always in a predominantly male field and did not know how to interact with females." Even the male students noticed sexist behavior: "I had one teacher that I know who is old and likes to hit on girls. It's a little

awkward. I mean not super weird. But older teachers are just kind of like that sometimes." Men accepted this sexist behavior as they believed it was uncommon and did not cause any harm. However, sexist behavior was not limited to older professors as one of the female participants reflects about her experience during a lab assignment:

> "I had an experience in a lab one time. I think maybe lab technicians are different than professors. But there were a lot of sexist comments. I guess I am not used to it, but I don't know, it didn't really bother me. A lot of our friends joke about it."

While both males and females admitted to this sexist and inappropriate treatment, the male students discounted it as natural behavior for older men that should be ignored and the female students did not "let it bother [them]." Students are clearly socialized to accept this negative sexism as part of the engineering culture. Women claimed these situations were "rare," but each female participant had at least one example, and two of the male participants noticed a gendered difference in treatment. This contradiction between belief of equality and examples of sexism may reflect women's attempt to appear strong and unaffected by biased treatment. Women want to be respected at an equal level as male peers, and perhaps they fear that peers might negatively view a woman who calls attention to sexism. Women may also want to believe they are truly being treated equally and choose to brush off any sexist treatment as uncommon. Nevertheless, the examples of negative and positive sexism reveal a gendered professor treatment that may have harmful consequences for females.

Academic Advisors

Participants had varying sentiments on the advisors of their respective departments. In mechanical and industrial and systems engineering, students had negative experiences. Both male and female mechanical engineers felt their advisor was "inadequate" because "she didn't know much about the courses as she wasn't an engineer." Participants in industrial and systems engineering described their adviser as "overworked" and while "nice to talk with," she was "not knowledgeable of their courses and could not help students make the most informed decisions about classes." On the other hand, the male and female chemical engineering majors had different experiences with their advisers. The male participant described how the advising office was "overworked and not particularly helpful" due to high influx of students leading to the hiring of "new and inexperienced advisors," while the female participant found her experience with an advisor to be "very helpful." She said of one particular advisor:

> "My advisor was very helpful and supportive. First of all, she is a female chemical engineer as well and wants other female chemical engineers to be successful. She also seems to genuinely care about her students and tried to help them graduate in any way she can."

As an engineer, this advisor was better equipped to help students make informed decisions about technical courses. As a woman, she acted as a role model for female students and provided positive support and encouragement. Therefore, while most students complained of inadequate advisors, one female participant reported a positive experience with a female advisor with an engineering background.

Interactions with peers

In addition to professor and advisor treatment, another integral aspect of the undergraduate engineering experience is interaction with classmates. Women found many of their male peers to be "helpful" and "nice," but they complained that many were also "anti-social" and "nerdy." One female student described the isolation felt from being in engineering: "I think it's easier for a female to feel isolated. This is not a social major. It is really hard to talk to people in class; everyone just sits there." Another woman describes how "some boys are just not socially where they should be. I mean some people are just not as easy to have a conversation with and not as mature as others." One male participant also observed this difficulty in interaction between the genders: "It's just that there is one girl in the class with twenty guys, and it's hard because she wants to interact with other people. Interaction is a good thing- [males] need to learn to do that more. But yet a lot of guys don't do it and that is a source of frustration [for female students]." The male participant generalized the men as anti-social and the women as in need of more interaction, but he did not discuss his personal feelings for this lack of interaction. He saw the gendered divide within the classroom as having more of a negative effect on female students, but he did not find it as having a direct effect on himself. This reflects the general trend for both men and women to brush off the significance of gendered behavior.

Beyond frustrations with the social awkwardness of some male students, female participants also experienced negative sexism by threatened men. One female student describes an interaction with a male peer who looks down upon women in engineering:

> "I have one person in my classes who has said girls shouldn't be in engineering, end of story. I was in a group with him last semester. I was working on a project, and he came over and was getting frustrated because I guess I was going too slow for him or something, but I just like to be thorough. So he just grabs the mouse and is like 'obviously you have no idea what you are doing, you are just a girl.' There were a couple of instances of that, and I was just like, whatever."

Similar to the common reaction to sexist professor treatment, the female student ignored the behavior and dismissed it as "uncommon." She never reported the incident, and this perhaps reflects women's attempt to appear resilient to any sexist treatment. Another reason may be that students do not know where to report such incidents or feel a report would be useless because no action will be taken. Women may also fear a report would bring more negative consequences to themselves than the offender because of a potential negative response from peers. Furthermore, these incidents are not anomalies as another female participant complained that male peers often undermined her success in engineering with joking and sexist comments:

> "Many of my male friends cannot accept the fact that I am smart and can be just as successful as them. One time I got accepted to an internship, and they said, 'Oh you just got that because you are a girl.' When I make higher grades, they joke around about how the professor gave me extra help or must like me more. I never say anything."

The third female student also experienced sexist attitudes but described it as more subtle: "I am sure boys think stuff, but they don't say it out loud. You can just tell from the way they act." Clearly, women feel that the isolation they experience from male peers cannot

be explained solely by socially awkward male peers, but may partially result from an underlying resistance to female engineers by male peers.

Women also describe a more subtle way that male students are able to maintain their dominance in engineering. Even though female students have the same training and background as peers, male students stereotype women to gender specific roles within engineering. This is most prevalent in team projects, as one female participant describes, "In group projects, everyone just wants to be on the girl's team for random stuff like good handwriting! Guys often stereotype women with stuff like that." Women complain that men usually do "hands-on work," "computer work," and "programming or other technical stuff," while they are expected to do the "write-up" or "make the graphs looks pretty." Some of these gendered roles are maintained by female students who believe that males have an advantage in engineering due to extra experience outside of the classroom. One woman describes how she interacts with men during lab activities:

> "It's intimidating sometimes. If you get paired up with a guy in the lab who is a lot are more technically advanced, you just have to get over that. It's like well you took apart a radio before and I didn't. I will figure out the circuit, and I will get it. It might take me longer, but I will get it. When we were younger maybe we didn't do stuff with our fathers. These guys fixed a car with their dad or random pieces of electronics. So when you learn circuits, they are already aware of it. [Women] have to be able to be relaxed and don't care if a guy thinks we are stupid or smart and cannot let it affect how we perform."

This participant believes that male students have an advantage in engineering, which may lead to allowing male students to take over the more technically difficult parts of group work. Consequently, both men and women are actively participating in the

formation of gendered roles on teams. Even though women have broken gendered stereotypes and chosen to pursue the traditionally masculine field of engineering, they are still subjected to stereotypically female roles by perceptions that males have an advantage in engineering.

Overall, both male and female participants described a gendered experience in the undergraduate level of engineering. One aspect was a gendered professor treatment that included both positive and negative sexism. Both men and women believed that professors would often treat women "better" by asking them easier questions and being stricter on men. However, female participants found this positive sexism lowered their self-confidence as they were expected to have less knowledge than fellow male peers. In addition, participants gave several examples of negative sexist professor treatment towards the female students, including making sexist comments and paying more attention to the male students. Sexist comments also came from male peers in the classroom in an attempt to undermine a woman's success in engineering. Despite multiple examples, in all cases of sexist treatment by both professors and peers, female participants claimed these instances were rare and insignificant. This perhaps reflects women's attempt to appear strong and unaffected by biased treatment as well as fearing a negative backlash by peers if they report sexist incidents. Another possibility is that women want to believe they are truly being evaluated on the basis of their skills like men and consequently ignore any sexist behavior. Moreover, even though men and women participated in the same rigorous curriculum, women still faced gendered roles within

team projects. Men wanted to work with women for their "nice handwriting" and made them responsible for writing the reports, while the male students had the more technical, engineering work. Some female students followed these gendered roles because they believed males had an advantage due to a gendered socialization that exposed them to engineering at a younger age. In summary, participants portrayed a gendered undergraduate experience based on gendered stereotypes and the minority status of women in engineering.

Socialization and Social Experiences

Participants' experience in undergraduate engineering was also shaped by interactions with non-engineering peers who held certain stereotypes for male and female engineers. These stereotypes, which carried over from socialization during childhood, are how the participants explained the continuing gender gap in engineering. These stereotypes also affected participants' dating experiences, which provide an insight into perceptions of engineering by non-engineering peers.

Reactions by non-engineering peers

Participants faced gendered reactions to their major by non-engineering peers. When male participants tell peers their major, they are "fairly impressed," but engineering is seen as a normal choice in major for males. For women, however, non-engineering peers are "shocked" and "caught off guard." One woman describes a typical response:

> "I actually like telling people my major and watching their face. They are like 'whoa you are an engineer?' But for guys it's like oh that is cool. If they were a guy in education, it would be like 'whoa what are you doing in that?' Males are expected to be in a technical major like engineering, but it seems to catch people off guard when it is a female in engineering."

While this female participant enjoyed telling others her major, the other two women felt "kind of embarrassed" and "didn't like to draw attention to it." One woman said, "it almost feels like bragging, and I am not doing this major for the attention." These women wanted to hide their major from non-engineering peers in order to avoid unwanted attention, but the first female participant found this attention to be an "added bonus for being a girl in engineering." Male participants agreed that females had more surprised responses from peers, but one male participant pointed out that since women are in the minority, "they face the same negative stereotypes as males but they are more drastic." According to the participants, typical stereotypes of engineers include "nerdy" and "anti-social," but "females seem nerdier because they are more uncommon." Both male and female participants said that women also faced the negative stereotype of being "ugly" by non-engineering peers, which was never mentioned for male engineers. The exaggerated stereotypes and the stereotype of "ugly" reflect society's belief that engineering is unfeminine, and women who pursue this masculine career path must lack traditionally feminine traits.

Gendered socialization

Participants pointed to gendered stereotypes as an explanation for the continuing gender gap in undergraduate engineering. Through socialization, different gendered

expectations lead to gendered interests that are "built into you since you were a kid." Participants talked about how boys "tinker around with Legos" and "play with tools," which leads to hobbies such "fixing cars." One male participant explained how these gendered interests may lead more men into engineering:

> "Guys fix cars or do other mechanical things, often with their dads. This is what got me interested in engineering—I was always messing around with equipment on the farm, and I decided it would be cool to be an engineer. So I paid attention in math and science classes in high school and that helped me stay focused on engineering. But girls just don't do that kind of thing. They are expected to be more social, and since they aren't exposed to engineering things like fixing a car then why would they think to major in it?"

Another male participant described how math and science are more socially accepted for men, and female students who like these classes felt isolated:

> "Maybe at the high school level, a guy wanting to do math and physics may not be as cool as the football players but socially it doesn't look bad. Not saying it looks bad on a girl—it's just looked at differently. Also, for example, many guys like video games and many guys naturally just like math and physics. So they hang out together because they can relate to each other. Pressures at a young age for girls are different, and it's not cool to be in math and physics. It's also just not as common that girls are into video games so there is a difference in what they like, and even if they like math and science, it is harder for them to find a group with just guys to pick from, which discourages them."

Female participants agree that they are generally not as exposed to engineering as males, and as discussed previously, they felt isolated in high school when they decided to pursue engineering. One female participant described why many of her friends did not choose engineering:

> "They just had this preconceived notion of engineering and that is what guys do. I didn't know any other girls going into engineering. No one around them was pushing them to take the harder math and science classes or telling them about engineering. My dad was an engineer so I got a special look into what

> engineering was about that most girls don't get. I even tried convincing them, but they thought it was strange. Lots of guys go into engineering not because their parents are doing it but because it seems like a masculine job."

Women who choose engineering feel they are different from other women and recognize they are challenging traditional gender stereotypes. The male students also recognize the masculine stereotypes surrounding engineering, and both genders agree that these stereotypes are based on childhood socialization that helps form gendered interests.

Participants' solutions for the gender gap

Participants felt more could be done to overcome gendered stereotypes and encourage women to pursue engineering. Participants believed that "there was no reason a female couldn't do engineering" and that men had no natural advantage over women. Several students believed it was a "marketing problem" because engineering was not presented in a way that girls and women could relate to. One female participant, who had switched into engineering after entering college, discussed how she never knew about all the applications of engineering in high school:

> "I have a lot more respect for engineering now. I know what engineers do. I never thought of systems as engineering. And all the different types—biomedical and aerospace—I didn't know anything about them. There is just so much cool stuff about engineering, but I never heard about any of it in high school."

Other students believed that having more female engineering role models that are visible to younger women would help encourage them to take an interest in engineering. One female participant felt that many girls pursue careers that are familiar to them: "Their mothers, teachers, girlfriends aren't pushing them so much to do it. They have all these businesswomen and interior decorators so they go to that. They are thinking of the

professions that they know other women are in." Another female participant discussed how teachers can play a role in encouraging students towards engineering: "Why can't we bring in engineers from industry or other female engineering students like myself into high schools and show them what we actually do. Show them girls are in it too!" Overall, participants believed that more expressive and visible role models might help alleviate the gendered stereotypes surrounding engineering that pose as a barrier to females pursuing engineering.

Dating life

Attitudes towards dating also reflect important gendered experiences. Participants were asked about people they typically date and the perceptions non-engineering majors had towards male and female engineering majors as potential partners. The overwhelming trend was that female engineering majors tend to date other engineers while male engineering majors tend to date outside of engineering. As there are fewer women in engineering, most men are obligated to seek elsewhere for dating. However, while women may find more options for dating engineering males, the participants also blamed negative stereotypes that make them "intimidating" to non-engineering peers. One female explained this barrier:

> "I think female engineers typically date only engineers. I haven't dated a single non-engineer since I've been in college. I think I am intimidating but I'm not sure if that is because I am an engineer or not or my personality. I think it might have something to do with it. Some guys are a little standoffish. They are like 'whoa you are way too smart.' And they are kind of scared of that. I think it can be intimidating."

On the other hand, male engineers get the opposite reaction from non-engineering women. Engineering men are "the good ones to get for some girls," and many women go after male engineers because "they think he will become successful and make a lot of money." Furthermore, both male and female participants discussed how many engineering males pursue education major females. One man believed this was due to future plans of marriage, and the engineering males know "their job will be moving around and with a lot of guys they see the education major as making sense because everyone needs teachers, and that is a plus." However, one female participant discussed how this trend was based on more superficial reasons:

> "Definitely true that guys go for education majors. There are all these comments made like 'oh I need to find me an education major.' It's almost like a joke really, but it comes from somewhere. I think it's about how they look. It's really shallow. They want the ideal education personality. I see them as way bubbly and really cute and sweet. The ideal girl for them. I guess they think, they can't find that in an engineering female."

Female participants believed that engineering male peers looked elsewhere for potential dates because female engineering students were not thought to possess the same feminine traits males expected from education majors. One male participant commented on the barriers for female engineers: "I think it is a positive thing for a guy to be an engineer, but for a girl to be an engineer, it depends on the guy. Maybe the guy will feel intimidated if he isn't an engineer and she is." Therefore, women faced negative stereotypes as engineers from non-engineering majors, while men faced positive stereotypes.

Engineering and marriage

Additionally, female participants spoke of gendered expectations surrounding marriage. One female participant described how social expectations of women are incompatible with engineering:

> "Whenever I talk to people, they are always so surprised to find out I am in engineering. I think it's just a mindset that girls aren't supposed to be so technical with things. They should be the homemakers, the wives, and that's just a big part of it. I think it is a stereotype on both guys and girls. Guys always think they need to be the main provider, and girls always think they will be provided for, so they think they can go into something a little bit easier."

Engineering is considered a "difficult major" that is only for those who are "dedicated and do not mind giving up their free time or social life." Therefore, engineering would not be suitable for women going to college to find a husband, and "engineering is not worth the difficulty if they plan to leave their career for children." Another female participant described this trend:

> "Women stereotypically don't want to put in so much work. And I know a ton of people who came to school, and they all wanted to get married. They came to school to meet someone, which I think is a really bad trend. You are wasting a ton of money and a lot of talent because a lot of women can pursue engineering."

The third female participant was frustrated with the stereotype that engineering is incompatible with marriage:

> "I mean I don't want to be single and childless for the rest of my life! It still can be done [as an engineer], and I plan to work for it. I don't know how long it will take people to realize it. It's the 21st century. There are two income families now, jump on the bandwagon!"

None of the male participants discussed marriage expectations, which suggests that social pressures about marriage and family are placed only on women and found to be

incompatible with the expectations of engineering. However, female participants pursued engineering in defiance of this stereotype, and they planned to fulfill both their career ambitions and social expectations of marriage.

Overall, participants believed the continuing gender gap in engineering to be caused by gendered socialization and stereotypes that engineering is masculine. Men's transition into engineering was seen as more natural while women felt isolated in their decision to study engineering. However, students did not believe biological differences were the reason for the gap, and they felt that changes could be made to help overcome the stereotypes surrounding engineering. Some participants believed that changing the marketing of engineering in a way that made it more relatable to women as well as creating more visible role models would help recruit more female students. In addition, female participants discussed how women faced extra social pressures concerning marriage and family, which are perceived to be incompatible with engineering. In short, the interviews revealed a far-reaching perception that engineering is masculine, which creates a gendered socialization and a gendered undergraduate experience that may explain the continuing gender gap in engineering.

CHAPTER IV

ANALYSIS

The interviews provide insight into the extent that gender affects the undergraduate engineering experience at TAMU. Male and female participants discussed gendered expectations surrounding their decision to enter into undergraduate engineering and how these gendered stereotypes followed them into their undergraduate studies. Their responses reveal the ways gender affects student's experience through interaction with peers, treatment by professors, perception of success in engineering classes, and formation of gendered roles in group projects. Overall, these gendered differences appear to negatively affect female students and lead to a lower confidence in engineering skills compared to men.

Before entering college, men and women are faced with different academic expectations, with engineering perceived as a masculine career path. Male participants had a high level of confidence in their math and science skills and found engineering to be a "natural" choice in accordance with expectations from parents and peers. Female participants, however, were more hesitant with their decision to enter engineering. They did not express the same self-confidence as males in math and science courses and did not feel prepared for tough engineering courses, even though they were excelling in their advanced high school math and science courses. This difference in self-confidence can perhaps be explained by gendered expectations. One study in the literature showed that

stereotypes affect a student's evaluation of his/her performance. Even with similar scores, men tended to overestimate their math ability whereas women underestimated (Correll, 2001). In addition, gendered expectations lead to female participants feeling isolated with their choice to pursue engineering. Unlike men who had a support group of other males pursuing engineering, female participants were alone in their decision and faced surprised and confused reactions from friends who held stereotypes of engineering that seemed incompatible with expectations of women. These reactions are similar to results of the Extraordinary Women Engineering Project, which found that even though high school girls are taking and enjoying engineering related courses such as robotics, they believe engineering to be "too nerdy" and "masculine" (Extraordinary Women Engineers Coalition, 2005). Participants agreed a "marketing problem" existed with engineering that led to a continuing gender gap. Participants believe high school students do not understand the full scope of engineering, and they base their decision of studying engineering on stereotypes that tend to fit with social expectations of men. An inconsistency exists between how students perceive engineering and the reality of engineering applications. Overall, based on participants' discussions of their background previous to an undergraduate education, an image of engineering appears to exist that does not resonate with high school girls along with gendered expectations that lead to a lower self-confidence for women in math and science.

Reflecting on their experiences during undergraduate engineering studies, participants had similar complaints of the engineering program, but women continued to have a

lower confidence level compared to men. Both sexes complained of the "time-consuming" and "stressful" nature of engineering, and they disliked the impersonal nature of professors and the overwhelming focus on theory instead of application in courses. However, men felt confident they would succeed and found satisfaction "knowing they could take the challenge." Consistent with their early hesitancy to pursue engineering, women continued to lack a similar confidence in their abilities, especially in the early undergraduate years. They felt "surprised" with each accomplishment, which is in accordance with the stereotype that math and science is more difficult for women. The gendered socialization women received before entering college made it difficult to improve self-confidence in math and science skills. As female participants continued to succeed year after year in engineering, their interviews revealed a lowered self-confidence in abilities compared to men experienced even at the end of their senior year.

Another explanation for the continuing lowered self-confidence is a gendered experience in undergraduate engineering. The interviews revealed that participants experienced sexist professor and peer treatment throughout their education. For example, both men and women believed that professors would often treat women "better" by asking easier questions and being stricter on men. This tendency of professors to treat women easier reinforces the belief that men have an advantage in math and science skills either due to gendered socialization or biological differences. Female participants therefore find they are expected to get through engineering with less knowledge than male peers, which in turn lowers their self-confidence in the classroom. On the other hand, participants also

gave examples of negative sexist treatment of women by professors. Women complained of sexist comments such as “you are too pretty to be a chemical engineer” or sexist jokes made by lab technicians. Female participants also complained that professors would sometimes pay more attention to the male students and ignore the female students in classrooms. The sexist comments and negative treatment by professors reinforce the societal view that engineering is incompatible with expectations of women and perpetrate the idea that engineering is a masculine domain where women do not belong. These views were also reinforced by male peers who attempted to undermine a woman’s success in engineering. When a female student got an internship, her male peers said it was “just because you are a girl.” When a female student received better grades, her male peers joked that it was “just because the professor likes you more.” Female students internalizing these experiences may feel inadequate as an engineer and uncomfortable in an environment that continually undermines their success while promoting an image of engineering as masculine.

While both male and female participants reported several instances of sexist treatment of female students by professors and peers, they claimed these to be rare and insignificant. Male students described inappropriate and “awkward” behavior by a few older male professors, but they discounted it as “natural” behavior that should be ignored. Perhaps the male students felt that these professors were part of an older generation that was not accustomed to women in engineering, and from the sexist remarks they witnessed, the behavior seemed harmless. In the men’s point of view, female students recognized that

other male peers and professors did not hold these sexist ideas about women and should ignore them. Women agreed that this sexist behavior was rare and did not bother them. Interestingly, in the beginning of each interview, when the women were asked if they experienced any biased professor treatment, their immediate response was "no." Only after more dialogue on their classroom experiences did the female students reveal examples of sexist treatment. However, even with multiple examples, women insisted the situation was uncommon and unimportant. The female participants did not "feel comfortable" with certain professor behavior, but they insisted it "did not bother them." One participant complained of "a lot of sexist comments" during a lab, but she disregarded this as something "[she] guessed [she] was not used to" as her friends found it amusing and "joked about it." Clearly, women are reluctant to discuss any sexist treatment by professors or peers and attempt to brush them off in an effort to prevent them from affecting their success in engineering. Perhaps women want to appear strong and unaffected by this treatment or they want to believe they are truly being evaluated on the basis of their skills like men. Overall, even with repeated examples of sexist behavior and comments from all participants, both men and women claim no significant gendered treatment exists in the undergraduate engineering program.

In addition, participants described another aspect of a gendered experience through gendered roles on engineering teams. As a more subtle form of sexism revealed through participants' discussion of their interaction with peers, this aspect was not discussed in the literature. Female participants described how men wanted to work with them for

their “nice handwriting” and made them responsible for writing the reports and “making the graphs look pretty.” Male students, however, usually did the engineering “hands-on” work such “programming or other technical stuff.” Even though male and female students are in the same classes and performing at equal levels, these gendered roles clearly show how gendered stereotypes facing students seem to override any equality in technical ability and knowledge. Male participants claimed that women did not have any inherent disadvantage in regards to engineering; however, these gendered roles in teams indicate that men are still clinging to gendered stereotypes that claim engineering to be a masculine career. Male participants claim to have accepted women in the same classroom, but when women are working with them in teams and their work affects the team’s grade, men are uncomfortable with giving women equal responsibility in technical work. On the other hand, even though women complained about the gender divide of work in co-ed groups, some of female participants recognized they willingly followed these gendered roles. These female participants felt “intimidated” working with men because of the belief that men had an advantage due to a gendered socialization that exposed them to engineering at a younger age. These perceptions led the women to allow men to take over the more technically difficult aspects of the group work thereby promoting gendered stereotypes. Therefore, both men and women promote gendered roles in engineering teams that are based on gendered stereotypes instead of actual technical skills and classroom performance.

While a gendered experience in engineering is apparent through the interviews, participants were uncomfortable with addressing these issues. They acknowledged the gendered stereotypes surrounding engineering, but they did not want to claim these had any effect on women's experiences in engineering. When asked for their opinion on the continuing gender gap in engineering, participants, especially men, at first reacted with surprise and claimed they had never given the problem any thought. Male participants blamed gendered socialization that led to men having childhood interests and hobbies more aligned with engineering. Female participants claimed it was due to a "marketing problem" that presented engineering in a way that seemed incompatible with women. However, participants did not address the gendered treatment in the undergraduate level as having any effect on this gap, even in terms of a lower retention rate of women in engineering. As mentioned, women did not feel their examples of sexist comments were significant, and the gendered roles on teams were often promoted by women. While women might want to appear unaffected by biased treatment and cling to the belief they receive equal treatment, they may also fear a negative backlash by peers if they report such incidents. Male participants considered any sexist behaviors they observed to be inconsequential; consequently, women may fear that if they complained about sexist incidents, male students would think they were just using an excuse to get ahead. This is evident when male students undermine women's achievements by attributing it to "just because you are a girl" thereby having an advantage as the minority. On the other hand, other women might also resist the reporting of incidents in order to perpetuate the idea of equality in the classroom. Before entering college, women already feel isolated for

choosing engineering, and they want to prove they can handle a stereotypically masculine career path. They face each sexist comment as a challenge to be overcome, and they feel reporting incidents would be counterproductive to the image they want to create of women in engineering. However, such attitudes come at a great cost to women in engineering. Ignoring these incidents enables the professor or male peer to continue their beliefs without resistance. Furthermore, without an open dialogue about gender, women internalize these sexist comments and believe others have the same sexist attitude. One female participant who experienced negative treatment by a male peer thought that "boys think stuff, but they don't say it out load. You can just tell." These thoughts can lead to the belief that professors and male peers do not have the same respect for women in engineering, which can create a negative and discouraging environment for women.

Moreover, the gendered team roles that women help to uphold are further detrimental to women's engineering experience. This gendered divide prevents students from seeing beyond gendered stereotypes and treating each other as engineering peers with equal technical skills. By allowing men to perform the engineering aspects of projects, women further decrease their self-confidence and rob themselves of the opportunity to learn these skills. The purpose of a team project is to learn and help one another, and even with the stereotype that men have prior exposure to technical work, women do not take the opportunity to learn from them. Female students may feel intimidated by male peers or believe a project can be more efficiently completed if these gendered roles are

maintained. They fail to realize that students come from diverse backgrounds and exposures to engineering and clinging to gendered stereotypes is counterproductive. Professors are most likely unaware of these gendered roles as teams often turn in a group report that does not show the division of work. Furthermore, even though men and women interact in the classroom and are often aware of each other's performances, participants complained that the classroom work was overly theoretical and not an accurate representation of real engineering work. The closest experiences were in the team projects; therefore, even though male peers may see women getting high grades in the classroom, the gendered divides in team projects may reinforce the idea that women are not as capable at the hands-on aspects of engineering. Clearly, gendered roles in team projects are detrimental to promoting women in engineering.

In conclusion, a gendered experience exists at TAMU that results in negative consequences for female students. Participants provided examples of the gendered treatment by professors and male peers and the gendered roles in team projects. However, both men and women insisted on the rarity of such treatment and were unaware of any negative effects of a gendered experience. Men claimed to accept women as equal peers in the classroom, and they did not attribute the engineering gap to any inherent differences. However, they clung to gendered stereotypes in team projects and were reluctant to allow women to perform any technical parts. Women felt they were judged solely on their skills as engineers like men and discounted any sexist treatment as insignificant. Nevertheless, women are marginalized as soon as they choose

engineering as a career, and they internalize all sexist treatment to prove they can succeed. This internalization continues to lower their self-confidence and appears in the upholding of gendered roles that counter the image they want to promote of women being just as capable as men in engineering. Therefore, an effort needs to be made to open a dialogue on gender in engineering for students and professors to recognize this gendered experience that exists in engineering. Men and women need to understand that their gendered stereotypes are baseless as countless evidence points to the equal ability of women to succeed in engineering. Both professors and students need to recognize their internalized stereotypes created from socialization and realize this behavior is unacceptable and detrimental to the advancement of women in engineering.

CHAPTER V

RECOMMENDATIONS AND CONCLUSION

Recommendations

Participants revealed several problems during the interviews that may explain the gender gap in engineering. These include pre-college experiences that discourage girls from pursuing engineering and a gendered experience in the undergraduate level that negatively affects female students. While TAMU has a few programs to help with these issues, more steps need to be taken to help make the environment more appealing to female students.

In order to decrease the gender gap in engineering, universities need to put more effort in outreach activities. A disconnect exists between interests of students and portrayal of engineering that calls for a fundamental shift in the way engineering is portrayed to make it a more desirable career option for academically prepared female students. Girls are faced with a masculine portrayal of engineering that does not fit with their interests, and universities are in the position to help with this "marketing problem." As engineering is not taught in the K-12 curriculum, training opportunities and resources should be made available to high school teachers and counselors to promote engineering education to both high school girls and their parents. Brochures, videos, and websites can be made available on engineering careers and applications that highlight the

extrinsic values of engineering. This media should also include pictures or descriptions of female engineers to help break the gendered stereotypes surrounding engineering. Universities can also provide classroom tools for teachers to have engineering demonstrations or projects that excite students about the possibilities of engineering. This can be expanded into academic engineering competitions that show other aspects of engineering such as creativity, teamwork, communication, and leadership skills. Furthermore, universities can send students involved in different engineering research or design projects to classrooms to present their work and give students a better understanding of engineering. By getting the opportunity to interact with university students, high school students discover the wide range of engineering applications and hopefully become more motivated by peers only a few years older. Other ideas are to hold engineering fairs targeting high school students or engineering camps promoting women in engineering. Overall, universities should make an effort to reach out to high school students and faculty to promote an image of engineering that resonates with both male and female students.

One program at TAMU promoting women in engineering at the undergraduate level is a student-run chapter of the national Society for Women in Engineering (SWE). Their purpose is to promote women in engineering through outreach activities, establishing a social network for female students, and connecting female students with female engineering professionals and faculty members to provide a set of role models to help motivate struggling students. While SWE successfully conducts several outreach

activities such as an annual high school conference and a summer camp of middle school girls, the society does not effectively help the majority of undergraduate female engineering students (Society of Women Engineers, 2008). The university has hundreds of female students in engineering, but SWE is about 50 members making their impact limited to the willingness of female students to participate in the programs. The main problem is the society is focused on social events and service projects that are similar to many other organizations, and they do not separate themselves as an advocate of women in engineering. Also, by representing all the departments in engineering, the scope may be too large to be effective. Students in each of the departments have different classes and experiences with professors and peers; therefore, having individual societies in each department, such as the Aerospace Women's Society, may be more beneficial. Smaller and more focused societies may bring in more women who are taking similar courses and help connect students with professionals in their specific field. Another possible program to promote women in engineering is for SWE to host a conference at the university level that brings together faculty and students to discuss various gendered experiences and problems in engineering. Overall, SWE should take steps to establish itself beyond a social organization into one that promotes the experiences of women in undergraduate engineering.

Additionally, engineering departments need to make efforts to retain students in engineering. Most students leave engineering during the freshmen year, and this is before they are admitted into the regular departmental courses (Engineering Student

Services and Academic Programs, 2007). They are lost in large "weed-out" classes that include physics, calculus, and generic engineering courses. Therefore, they are leaving engineering without an exposure to their engineering field and are discouraged with the heavy load of theoretical math and science courses. As discussed by the participants, one solution is to provide more classroom examples that highlight applications and problem solving and demonstrate how engineering improves lives. Another idea is for engineering departments to make a greater effort to reach out to new students. They need to provide orientations and department sponsored activities such as talks and socials for students to become involved in engineering projects, interact with faculty and peers, and to stay motivated to pursue engineering. Departments should also monitor the performances of students and provide a helpful advising staff and tutoring services to support students. Mentoring programs can also be setup between incoming students and upper level undergraduates to ease the transition into the university by sharing advice on classes, study skills, time management, and to provide a social outlet. This is also a good opportunity to pair female students together to provide a role model for freshmen women. By providing resources and support to students, this may help counteract the isolation and impersonal manners of professors that female students particularly complain about and encourage women to stay in engineering.

Furthermore, TAMU needs to address the various forms of sexist treatment in the classroom experienced by the participants. Without any dialogue from the university about gendered treatment, sexist behavior is not discussed amongst faculty and students,

and women feel their experiences are isolated and rare. Also, students do not know where to report problems and what the department will do about the situation. One solution is to have advisors or department heads emphasize to students during orientations that gendered treatment by professors and peers is unacceptable, and they should provide details on where to report any problems. Moreoever, departments should educate faculty and stuff on gender equity and creating more inclusive environments. These training sessions can overturn the myth that female students leave engineering because of lower grades and educate professors on the reasons women are interested in engineering. They can educate professors on the different learning styles of students and promote including practical applications, problem solving, and design problems in the classroom to motivate students. Professors can also attempt to be more aware of sexist comments made by male students and reprimand students for such behavior. While difficult to completely eradicate the sexist treatment women receive from male peers and professors, creating a dialogue of gender equality will help women feel more empowered to stand up to such treatment.

Another problem the university needs to address is gendered roles on engineering teams. Professors usually assign a design project or lab to a group of several students, and allow the students to divide the tasks amongst themselves. Based on the interviews, women usually end up writing the reports and presentations while the male students do the technical or hands-on work. One approach to avoid this gendered separation is to assign students specific tasks within projects to ensure all students have a hand in the technical

aspects of the project. Professors can also assign individual assignments based on the group project to ensure all students understand the tasks. Another solution is to prevent female students from being dispersed on different teams and instead having groups of all female students or a majority of female students. This may be especially important freshman and sophomore years when women have the lowest self-confidence and are most likely to leave engineering. By helping female students overcome a lower self-confidence in technical abilities to take an active role in engineering projects, professors can boost women's engineering self-efficacy and motivate them to stay in engineering.

Additionally, setting up a Women in Engineering (WIE) program is an important step for promoting the interests of women in engineering. As mentioned, SWE is a student run organization, and they do not have any administrative power. The focus of SWE is a social network for female students, but another organization run by the College of Engineering is needed to provide advocacy for women in engineering. As the university is interested in increasing retention rates and several universities across the country have seen much success by establishing such programs, the creation of WIE is a logical step to enhance the engineering college (Goodman Research Group Inc., 2002). An important aspect is to establish an administrator position to oversee the program and coordinate WIE events. The center can work with SWE and other student organizations to provide advocacy for women, meeting places for students, mentors, internships, social and academic activities, and general resources for women. The purpose of the program is to provide female students with awareness, understanding, and support to help navigate the

engineering path. The center can also coordinate outreach activities to high schools, and implement training for faculty and staff on gender sensitivity and creating an inclusive environment. They can also help the university by doing data keeping and analysis through brief questionnaires to students, longitudinally tracking individual students in engineering departments, and integrating data with mentoring programs. If the university wants to improve the experiences of all students in the engineering program, an important step is to create a WIE program on campus.

Clearly, several steps can be taken by TAMU to improve the experiences of both men and women in undergraduate engineering. Hosting outreach activities, creating social outlets and mentoring programs for female engineering students, promoting gender equality in the classroom, making engineering education more applicable to students' interests, and overcoming gendered roles in team projects are all important steps for improving the image of engineering and helping both men and women fulfill their potential in engineering.

Conclusion

Given that the United States' economy relies on the skills of its labor force, the stagnant low number of women in engineering is a subject of concern. A large number of women are continually entering the job market, where they make up 46% of the total labor force, but only consist of 8.5% of engineers (National Academy of Sciences, 2007). The interviews provided a closer look at the gendered undergraduate experience and reasons

for the continuing gender gap. Participants experienced gendered stereotypes surrounding engineering that were often incompatible with expectations of women. The interviews also revealed a gendered experience through instances of sexist professor and male peer treatment towards women as well as more subtle forms of sexism through gendered roles on engineering teams. This gendered treatment reinforces gendered stereotypes that engineering is masculine and may explain how women's representation decreases at each step along the engineering academic and career path. Further studies need to be conducted to get a better understanding of why women do not report sexist incidents by professors and peers as well as a closer look at the gendered roles on teams. These can provide insight into the gendered undergraduate experience and how universities can promote a more inclusive environment. Women are unable to fulfill their potential, and the limiting of women's access to engineering fields is another example of their denied economic and social power. Furthermore, for the United States to maintain its scientific and engineering leadership in an increasing globalized world, an effort to tap into *all* human capital is imperative. This means finding the best and most innovative engineers and scientists to keep a competitive edge in the global market no matter their gender.

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APPENDIX

INTERVEW QUESTIONS

These questions represent the basic structure of each interview. After the listed question was asked, participants were free to ask for clarification, and the interviewer would ask follow-up questions based on the participant's response.

Background

Name, Age, Ethnicity, Year of Study, Major

1. How old were you when you first became interested in engineering?
2. Describe the moment/period when you made the decision to enroll in engineering. What influenced your decision to enter the engineering field of study?
3. How did others (peers, teachers, parents) react to your decision to major in engineering?
4. Was there ever a time you were discouraged from pursuing engineering? Explain.
5. Do you have a parent/guardian who works or has worked in a science-related field?
6. Growing up, did you know anyone else interested in engineering? If yes, did this person play a role in your decision to study engineering?
7. How did you find out about engineering in high school? Who did you ask for advice/information?

Undergraduate Experience

1. Are you planning to become an engineer after you graduate? Why or why not?
2. Where do you see yourself in 5 years?
3. What do you think are the most rewarding things about studying engineering?
4. What do you think are the most difficult things about studying engineering? Did these ever make you want to switch majors?
5. Overall, did you feel that the engineering professors were supportive and provided a good learning experience? Why or why not?
6. Overall, did you feel that your advisor was helpful and supportive? How so?
7. Were your engineering classmates supportive and friendly? Explain.
8. Did you know anyone who switched out of engineering? What were his/her reasons for doing so?
9. Do you view engineering in the same way as before you entered the university? Why or why not?
10. If you were to give advice to a young person (high school student) interested in engineering, what would you tell them?

Gendered Segregation

1. In 2007, women received 18% of engineering bachelors degrees at Texas A&M University. Why do you think women are still a minority in undergraduate engineering?

2. What do you think could make the field of engineering more attractive to female students?
3. Do you believe that more women should pursue engineering? Why or why not?
4. Do you believe engineering professors treat female and male students differently? If so, in what way?
5. Do you believe that female students experience greater difficulties in engineering compared to male students? Explain.
6. Do you feel that female students are isolated within engineering? If yes, explain.
7. Have you experienced or witnessed any animosity or tension between male and female classmates?
8. Did you participate in study groups? If so, where they all male or all female?

Internship - Have you participated in an internship? If yes...

1. Where was your internship?
2. What were your responsibilities?
3. What was the approximate percentage of women engineers working in your area?
4. Do you think female engineers were treated differently by managers?
5. Did you notice any difference in responsibilities between female and male engineers? If yes, explain.
6. Did you witness any animosity between male and female coworkers?

Social Expectations

1. How do you feel when you tell non-engineering peers your major?
2. How do they normally react? Do you think male/female engineering students get different reactions? Why?
3. What are the negative stereotypes surrounding engineering students? Are these different for male and female engineering students?
4. Do you believe that being an engineering affect the type of people you date? Is being an engineer seen as a positive or negative to potential dates? Why do you think that is?

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