

Understanding the Gender Differences in Factors Affecting the Decision to Study Engineering at MIT

by

Kirsten Beatrice Lim

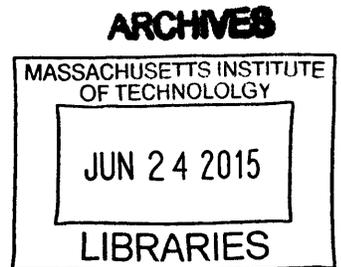
Submitted to the Department of Mechanical Engineering in partial fulfillment of the requirements for the degree of

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Abstract

The National Science Foundation has found that the percentage of women studying engineering has stabilized, indicating a need to find methods to encourage women to become engineers. The purpose of this study is to identify factors that women who choose engineering indicate were important to their choice and determine which factors are more appealing to women than men. In order to identify these factors, an electronic survey was developed to collect information from the current MIT student population. Analysis of the survey data identified a series of factors ranging from mentorship to academic confidence that differed between women more than men. By identifying and understanding the implications of these factors, we hope to help establish new programs to encourage more women to study engineering.

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1. Introduction

The National Science Foundation has found that as of its last survey in 2012, the overall number of women going into engineering is increasing, but the relative percentage of women in engineering has remained steady at around 20% (National Center for Science and Engineering Statistics, 2015). As a result of these findings, there has been an increased awareness among educational institutions of the need to get more women interested in Science, Technology, Engineering, and Mathematics (STEM). This study aims to contribute to the research surrounding the understanding of what factors women are influenced by when deciding to study engineering and how men and women differ when deciding to study engineering. By determining factors which were more influential to women who chose engineering than men who chose engineering, this study hopes to better tailor current methods of women's recruitment into engineering.

1.1 Research Questions

The research was structured around the analysis and understanding of research questions spanning different categories. These questions were established using a combination of understanding from current research as well as the author's own personal experiences as a woman studying engineering.

Self-identified Factors:

What are the factors that students who study engineering use to pick their college major? Do men and women use the same factors in their selection process? We expect that men and women will tend to use different factors to select their major.

This study pays special attention to two factors that have been noted in other studies. The first is the potential social impact of a major. Recent press has pointed out that women in particular are motivated to engage in activities that can directly improve the lives of others, such as individuals in the developing world. This belief suggests the value of presenting engineering as a major that can teach students to create tools and systems to help others (Nilsson, 2014). In terms of this present study, this question is posed as: Are women who choose to study engineering more likely to identify the potential to have social impact once they graduate as a factor behind their major decision? We expect that women are more likely to pick and rank potential social impact as an important factor when choosing a college major.

Another article in the popular press has noted that women tend to be less confident in men in a number of contexts, though not necessarily in engineering (Kay & Shipman, 2014). By extension, are women more likely to pick engineering based on their confidence in their academic abilities? We expect that women are more likely to use their areas of academic confidence to determine their major as a result of the confidence differences between men and women.

Influential Experiences:

The second set of factors is the formative, pre-college experiences and influences a student can have.

Do men and women who go into engineering participate in a STEM summer programs or activity that encouraged them to go into engineering? Are women who study engineering more likely to participate in an influential program than men? We anticipate that both women and men attend an influential summer activities. However, we expect that women are more likely than men to attend a program that encouraged them to go into engineering.

What kinds of activities do women who choose to study engineering participate in during high school? Is there a common type of activity? We expect that women who choose to study engineering typically participate in some kind of STEM-related activity such as FIRST robotics or science competitions.

Are women who pick engineering more likely to have an experience in college (an introduction class, activity, event, etc.) that was influential in their decision to study engineering? We expect that women are more likely to have an experience in college that influenced their decision to study engineering.

Friends, Family, & Mentors:

This study also considers the potential influence of friends and family members on a student's decision to study engineering.

Does the gender of the majority of a participant's high school friends affect his or her choice of major? We expect that women who choose to go into engineering are more likely to have a majority of their high school friends of the opposite gender (male).

Does the relationship between a participant and a college friend affect their major choice? We expect that women and men are influenced by college friends who live in the same community. We anticipate that women who choose engineering are influenced most by other members of their living community.

Do women who choose to study engineering have mentors? What are the genders of the mentors? We expect that women who choose to study engineering are more likely to have mentors. We expect that women's mentors are more likely to be female.

Do women who choose engineering have a family member who was influential in the choice of major? Which family member? We expect that women who choose engineering are more likely to have a family member in engineering, likely the father.

Understanding of the Gender Gap:

The last question of this study is higher level and considers awareness of the gender gap in engineering. When women and men enter college, what is their understanding of the gender gap? How does this influence their choice of major? We expect that women entering college are more likely to know about the gender gap. However, we believe that women

who go into engineering are less affected by the gender gap (did not notice the gender gap, or did not feel uncomfortable about the gender gap).

2. Background

2.1 Motivation & Self Efficacy

In order to make a decision about whether to study engineering, students need to know what engineering entails and what opportunities are available in the field. As of 2004, engineering as a field was not well understood by the majority of the American population (Tietjen, 2004). This fact, combined with research that women were less likely to know what they wanted to get out of college than men (Seymour, 1999), may affect their decision to study engineering.

A variety of studies have probed into what motivates engineering students. Some studies do not consider the gender gap. One such study found that engineering students need to have an attainment value, or a value that indicated a sense of self, to feel compelled to study and continue studying engineering (Matusovich, Streveler, & Miller, 2010). Other studies considering the gender gap focus on what factors specifically motivate women to go into engineering. This research varies in the specific aspect of an engineering career that it tackles (choice of engineering, retention in program, career choice after graduating), but the findings were still relevant to understanding potential trends. Seymour found that women were more likely to switch careers if they felt that the work tied to some kind of humanitarian goal (Seymour, 1999). Women also need to place high value on the outcome of becoming an engineer to feel motivated to study engineering (Blaisdell, 2000; Smith, 2012).

Self-efficacy was commonly identified as an important factor to women who chose to go into engineering. Studies have found that women in engineering need to perceive that they are capable of succeeding at the math and physics required in engineering at the time of the declaration of their major (Brainard & Carlin, 1997; Smith, 2012).

2.2 Friends, Family, and Mentors

Socialization with others provides additional information by which women can make decisions about their choice of major. Seymour notes that “the degree to which any woman depends on significant others for her sense of achievement varies... according to the mix of cultural influences that have been part of her socialization experience” but that most women are encouraged from a young age to seek the approval of others (1999). As a result, women tend to indicate that influence from others such as parents or teachers was an important factor when choosing engineering as an area of study (Seymour, 1999; Zafar, 2013). Indeed, among American parents, the number one encouraged profession was an engineer as determined by a Harris Poll sent out in 2014 (The Harris Poll, 2014). Previous research conducted on the choice of engineering as a major has also found that women who study engineering had some kind of influence from another individual which cause them to consider engineering initially (Smith, 2012).

Within the family, studies have found that women are more likely to study engineering if their father is a scientist or engineer (Anderson, 1995). Outside of the family, mentorship can play a role in determining whether students decide to study engineering. The gender of the mentor can matter, as studies have found that participants who interacted with a female engineer or role model were likely to see engineering as appealing and that age may affect a student's perception of engineering (Baylor, Rosenberg-Kima, & Plant, 2006).

2.3 Influential Experiences

Experiences in high school as extracurricular activities and classes that encourage women such to become an engineer can have a significant impact. A study by Blaisdell found that women who know they want to become an engineer in high school are more likely to study engineering in college (Blaisdell, 2000). Women who study engineering also tend to mention having a positive experience in mathematics and science classes prior to making their college decision (Smith, 2012). Summer programs can also help with recruitment into engineering. A study of YESTexas, a summer engineering program, found that the majority of the students expressed interest in studying engineering after attending the program (Yilmaz, Ren, Custer, & Coleman, 2010).

Gender differences can be observed in participation of extracurricular activities. Women tend to report higher participation in more extracurricular activities than men (Chachra, Chen, Kilgore, & Sheppard, 2009). Women also tended to take on leadership roles instead of the "hands on" activities like designing when participating in an engineering extracurricular activity (Chachra et al., 2009). Extracurricular involvement has an influence on the interest level in different areas of science. A study of the extracurricular activities of middle and high school girls found that activities which encouraged problem solving, creativity, and design tended to correlate with higher interest in engineering (Cooper & Heaverlo, 2013).

2.4 Understanding of the Gender Gap

Stereotype threat, or the threat associated with the negative stereotype about engineering, is one way in which the gender gap has been studied in engineering. Multiple studies have referenced negative societal impressions of engineers (Sasser, Lineberry, & Scheff, 2004; Smith, 2012). Studies have found that even when individuals do not believe that the stereotype is applicable to them, they can still be affected by stereotype threat in unpredictable manners. A study conducted in 1999 found that describing that a math test illustrated gender differences cause women to perform poorly, but that when the test was described as unable to illustrate gender differences, women did as well as men (Spencer, Steele, & Quinn, 1999). A similar study was conducted in 2003 with similar results, with the suggestion that providing supportive engineering environments may help women succeed in engineering environments (Bell, Spencer, Iserman, & Logel, 2003).

2.5 Filling in the Gap

Based on the review of the literature, this study aims to fill the gap in surveying among students who attend universities that are geared towards science and engineering education and research pick engineering as a major. These types of technologically-focused universities are interesting to study because of the students and the unique environment. The students that attend these universities have a deep passion for STEM fields in general, so it is interesting to survey their values and experiences to understand what might be conducive to cultivating deeper interests in these areas. Additionally, some technologically-focused universities have been active in trying to develop an engineering environment where the divide is closer to 50-50 between women and men. Studying unique environments like these may help us to better understand how creating a more balanced or welcoming environment can change affect a student's choice to go into engineering. Lastly, this study aims to focus on finding statistical differences that between men and women regarding important factors leading up to the choice of a major. Many studies on gender differences and engineering only survey women, which provides no population to compare the data against. By collecting data from both genders, trends that more specifically appeal to women can be isolated.

3. Methods

An electronic survey was developed to collect data about the factors that MIT students utilized when picking their major. Because this research would involve human subjects, a proposal of the research and a copy of the survey was submitted to the MIT Committee on the Use of Human as Experimental Subjects (COUHES) for exempt status and granted approval. Once approval was obtained, this survey was sent out through a variety of email lists to recruit participants. As an incentive to participate in the survey, participants were entered into a raffle for a \$100 Amazon gift card. After collecting responses for two weeks, the survey was closed.

3.1 Participants

For this study, participants were recruited through email lists at MIT. MIT was chosen because the population consists predominantly of students who have already indicated an interest in STEM since MIT is geared towards science and engineering education and research. Additionally, MIT is a particularly interesting environment to study because the gender composition of the students in engineering is much closer to 50-50 than in many other comparable institutions. The latest statistic provided by the MIT Office of the Registrar states that of the 5,635 students in the School of Engineering, 34% (1,928) are female. In the undergraduate population, the percentage is higher at 43% (MIT Office of the Registrar, 2014). Because the MIT's percentage of women is higher than the national average of 20% (National Center for Science and Engineering Statistics, 2015), MIT women may be less susceptible to Stereotype Threat, leading to an environment where more women succeed and persist (Bell et al., 2003). As a result, studying the student population may lead to a better understanding of the factors that result in a heightened interest and retention in engineering.

Unlike much of the research that has been conducted in this area, this study surveyed both men and women who studied engineering. By studying both men and women, this research hoped to determine trends affecting major choice that may differ between the two genders and specifically identify factors that were more important to women.

Over the course of two weeks, the survey was sent out to MIT students via multiple email lists. These mailing lists spanned a variety of current student mailing lists across different majors. A couple of the mailing lists were associated with current students in the mechanical engineering department. Additionally, this survey was advertised in the Margaret Cheney Room, a lounge exclusively for women students at MIT. 330 individuals, all of whom were affiliated with MIT, started the survey.

3.2 Survey

The survey was developed utilizing literature around the topics of gender and its impact on the selection of a major as discussed in Chapter 2 of this thesis. The survey was 40 questions long and took participants between average of fifteen to thirty minutes to complete depending on their length of their responses. This survey asked a variety of

questions targeting different areas: demographics, current university experience, and high school experiences. These questions were tailored towards answering the proposed research questions from Chapter 1.1 and to see if trends found in previous studies of the factors affecting the choice of major were mirrored in MIT's population. A full copy survey can be found in Appendix A: Qualtrics Survey.

3.3 Data Processing & Analysis

Only complete survey responses were utilized for this study in order to study correlations between the responses from different questions. Of these completed surveys, the responses from the students in the school of engineering were selected as the major data set. From this set, women and men's responses were separated for easier analysis.

Many of the survey questions asked students to provide answers to a multiple choice question, but explain their choice. These written, qualitative responses were tagged to place them in different categories for analysis.

Question 13 of the survey asked participants to explain how they selected and ranked the factors that were most important when deciding on a major. Each response, if provided, was given a "tag" in a column in Excel to allow for easy counting of frequencies. These tags, which typically corresponded with a survey response, were given to a response if they included the keywords mentioned in Table 1. Responses could be given multiple tags if a participant's response included multiple keywords. Because the survey response of "Other" could correspond to a variety of different rationales, this response was not tagged. Additionally, tags not corresponding to any of the provided response choices were created if a similar theme was common throughout the responses. Many students indicated a course prior to college helped them determine their choice of major, so a tag of "Class" was added. Additionally, many students commented on how broad and applicable their major was so a tag of "Broad" was added for this response.

As an example of the categorization process, one student responded: "I was interested in applied physics in high school and did well in math. I think being encouraged by my parents for a long time to be an engineer was a contributing factor, but hearing from undergrads definitely [sic] helped me make the decision to choose engineering. I like how MechE was very broad and would prepare me for whatever I'd like to pursue after college." This response was tagged with interest, academic, encourage, and broad because their response included "interested," "did well," "encourage," and "broad" respectively.

Tag	Corresponding Survey Response	Keywords/Phrases
Activity	Positive experience in a related extracurricular activity prior to college	Specific high school activity mentioned, club, activity
Career	Career opportunities in the field	Jobs, opportunities
Interest	Personal interest	Interested, love, enjoy, passion, invested
Academic	Academic strength in relevant areas	Did well in class/course
Encourage	Encouragement from someone else	Encourage, mentor
Impact	Potential social impact	Impact, protect, world, help, make a difference, productive
Class	Not asked in survey- Mentioned a specific class taken prior to college	Expose, took class, introduction/intro, favorite class
Broad	Not asked in survey- Mentioned the ability to do a variety of different things with major	Broad, multi-disciplinary, different/many fields/areas, not narrow, flexible
No Response	No written response provided or not enough information provided to be able to categorize	N/A

Table 1: Categories for responses on how factors were selected and ranked. Many categories corresponded with the choices given on a survey. "Class" and "Broad" were added as categories after surveying the responses.

Question 13 responses were also categorized by time to understand the time at which participants remembered that they established these factors for determining their major. The earliest time mentioned in the written response was tagged because this was the time of first exposure to the field of engineering. The tags that were utilized for this survey were: Childhood, High School, College, and Not Specified.

The written responses for question 14, which asked participants to explain how and when they determined what their major entailed, were also characterized for analysis. Table 2 explains the categories by which the responses were sorted.

Tag	Meaning	Keywords/Phrases
Activity	Participant mentioned some kind of club or activity in which they came to understand what engineering entailed	Club/activity name
Research	Participant mentioned that researched about what engineering entailed	Research
Work	Participant mentioned their experience working helped them to understand what engineering entailed	Internship, work
Talk- Family	Participant talked with family members about engineering or had an engineer as a family member	Family member
Talk- Student	Participant talked with students to understand what they would work on in engineering	Upperclassmen, student, friend
Class	Participant took a class which helped them determine that engineering was	Class, course
No Response	No written response provided or not enough information provided to be able to categorize	N/A

Table 2: Categories for responses on how participants determined what engineering entailed

Responses to question 14 were also categorized based off the earliest time mentioned in the response. The categories were: Middle School, High School, College, Freshman, Sophomore, Junior, Unknown.

Participants were all asked to elaborate on their understanding of the gender gap in high school (question 31). These responses were categorized to determine how the participant came to understand the gender gap and whether they felt that their understanding of the gap affected their choice of major. The categories for responses on how the participant came to understand the gender gap are specified in Table 3. If a participant's response included the keywords for the statistic tag, but indicated a more specific context in which they knew about the gap, the more specific context was chosen as a tag. For example, one participant noted "in my AP physics and Calc courses I was one of only a few girls." For this response, the tag "class" would be applied because the participant noted a specific instance.

Tag	Meaning	Keywords/Phrases
Statistic	Has an understanding that there tends to be more men than women in engineering	More men/guys/boys than women/girls, few Girls/women
Class	Noticed gender gap in class	Class, course
Activity	Noticed gender gap in other activity	Team, club, activity
Work	Notice gender gap in internship or work	Work, internship
Family	Family member told participant about the gender gap	Mom/dad/family member told me about the gap
Mentor	Had a mentor who told participant about the gender gap	Mentor told me about the gap
Did not notice	Did not notice the gender gap	"I had no idea", "I didn't notice"
Not specified	Did not write a response or did not provide enough information to be able to categorize.	N/A

Table 3: Categories of responses for how participant came to understand the gender gap in engineering

The effect that a participant's understanding had on their choice of major was important to this research, so the responses were also categorized according to the information in Table 4. Generally the understanding of the gap encouraged, discouraged, or had no effect on participants. If not enough information was provided to understand the effect, the response was categorized as unknown.

Tag	Meaning	Keywords/Phrases
Encouraged	Participant felt that knowing about the gender gap encouraged them to go into their major	Prove, better than a guy/male, against stereotype, encourage
Discouraged	Participant felt that knowing about the gender gap discouraged them to go into their major; Participant felt discouraged about some aspect of the major	Intimidated, discouraged, uncomfortable
No effect	Participant did not feel that the gap affected their choice of major	Did not affect, did not doubt
Unknown	Not enough information provided	N/A

Table 4: Categories of response for the effect that the gender gap had on the participant's choice of major

The last responses categorized were the summer programs and high school activities that survey participants recorded. The tags and associated meanings for these responses are provided in Table 5. Each program and activity recorded by the student was researched to determine which tag(s) was applicable to the activity.

Tag	Meaning
Class	Instructional course or program structured around learning in a classroom environment
STEM	Program focused on Science, Technology Engineering, and/or Mathematics
Internship	Opportunity to work for a company or conduct research in lab; technical work
Work	Working for a company doing non-technical work
Volunteer	Program focused around volunteering and charitable actions; tutoring
Art	Program focused around visual arts, dance, or music
Sport	Program focused on a sport
Conference	Gathering of professionals to discuss information around a focus topic
Liberal Arts	Program/activity focused around literature, history, or social sciences
Women	Program recruiting women
Minority	Program recruiting students who are underrepresented in a field
High School	Program targeting high school students
College	Program/activity for college students
Not Specified	No information provided or not enough information provided to identify activity

Table 5: Categorization of summer programs and high school activities

Once the written responses were categorized, the quantitative data for rankings had to be processed. To analyze the order of ranking for the factors that participants indicated influenced their choice of major (question 12), a Borda count was utilized. A Borda count was sufficient for this analysis because men and women voted for an average of 2.8 factors. In a Borda count, the number one ranked factor is given a total number of points n , which is equal to the number of choices. For this count, n was equal to 7 because the number of factors available was 7. The number of points could be calculated using the formula found in Equation 1, where rank is equal to the rank the participant assigned that factor during the survey.

$$\text{Points} = n - (\text{rank} - 1)$$

Equation 1: Calculation of Borda point value

To evaluate a participant's perceived academic confidence in STEM fields, the STEM confidence score was calculated by summing the participant's confidence rating for math, physics, biology, and chemistry. Participants rated their confidence on Likert scale from 1 to 5, where 1 indicated that they had no confidence in their abilities in this area and 5 indicated that they had complete confidence in their ability.

Once the data had been processed, the analysis continued in Excel. Instances of different responses were counted, and the frequencies of different responses were calculated. Additionally, chi-squared tests were conducted to see if there were statistically significant difference between the men and women who had had different experiences leading up to their choice of major. Chi-squared tests were only conducted between men and women if the subset of the populations that could be placed in each category was higher than 5, which is a required assumption when conducting a chi-squared test.

4. Results

4.1 Demographics of Participants

Of these 230 individuals who completed the entire survey, 180 of these participants were students in the School of Engineering. 97 participants were women, and 83 participants were men. The percentage of women and men student participants can be seen in Figure 1. The majority of the participants in this survey were undergraduates (75% of women and 54% of men). A small percentage of the responses were from alumni, but their responses were included in this study as they were recent graduates from MIT. A majority of the participants who were graduate students were male, although this may be because there are more male graduate students than female students at MIT.

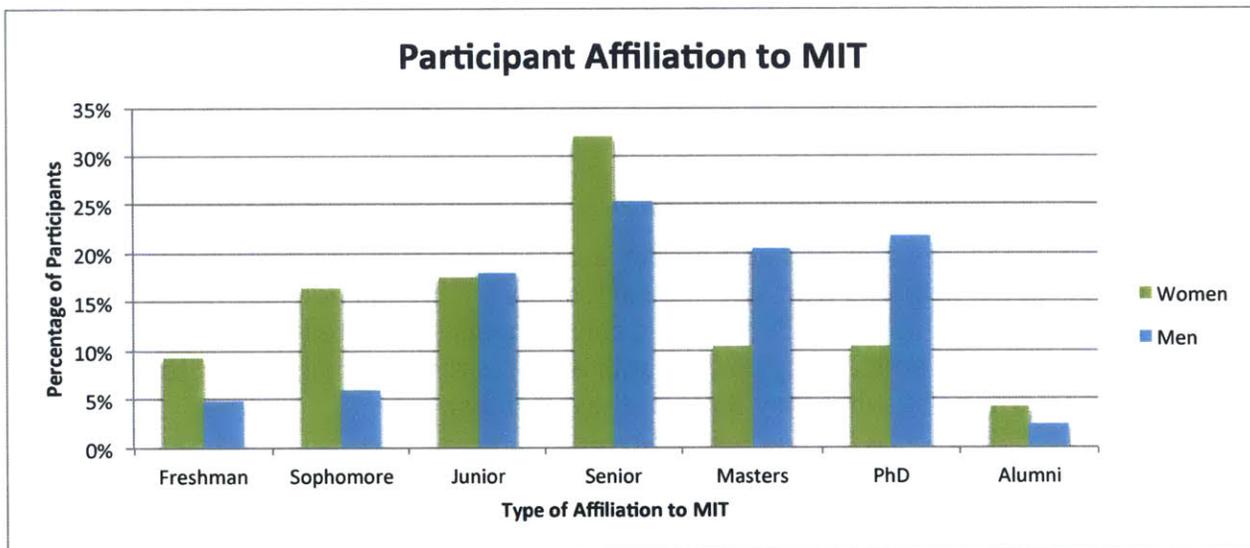


Figure 1: Participant's affiliations to MIT broken down by gender. Most of the participants were current undergraduates. There were more male graduate students than female.

The survey was sent via email to a variety of different mailing lists on campus. The breakdown of the students among the different engineering majors can be seen in Figure 2. There was heavy participation among students in the Mechanical Engineering department.

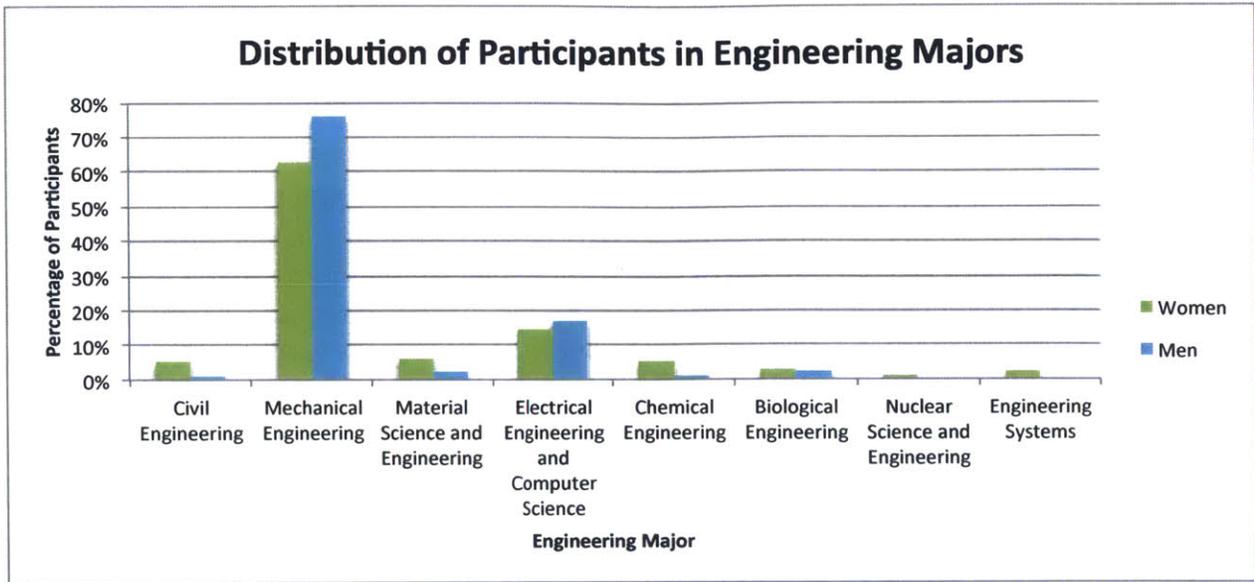


Figure 2: Distribution of participants among various engineering majors. A large majority of the participants were in the Mechanical Engineering department.

4.2 Factors Influencing Choice of Major

Participants were asked to select all the factors that influenced their choice of major. The percentage of participants who selected each of the factors did not vary much between men and women as seen in Figure 3. The most common factor selected among men and women was personal interest. Many participants wrote in their responses that their choice of major was determined by what they thought they would enjoy.

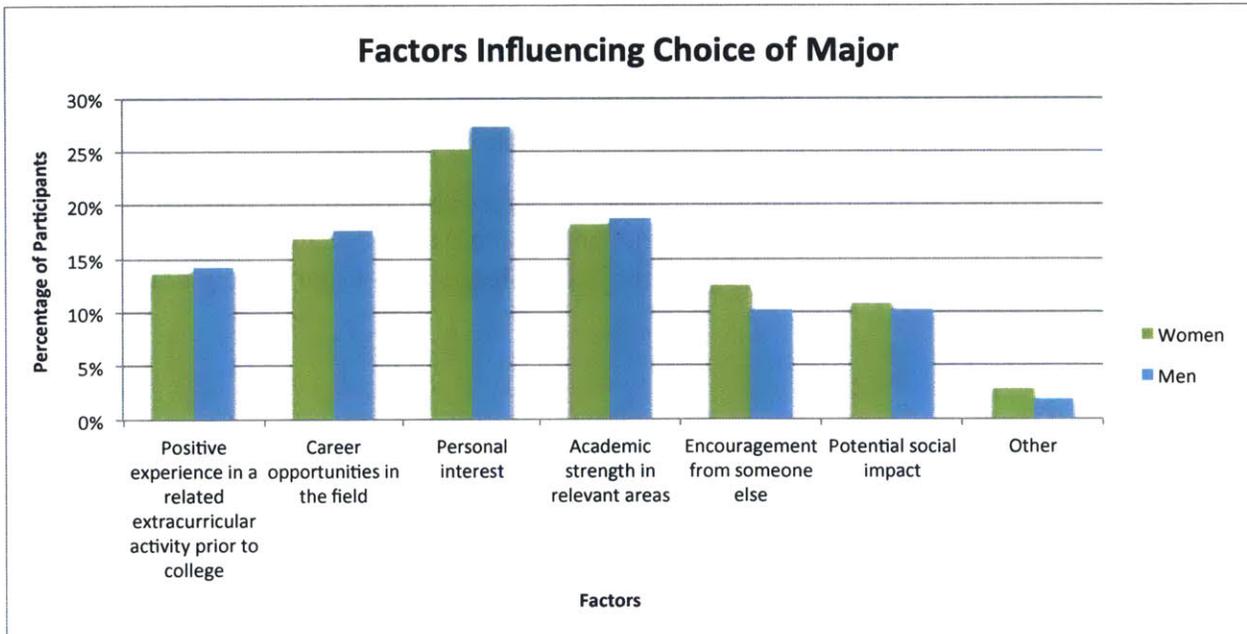


Figure 3: Percentage of participants who indicated each influential factor. The most common factor when picking a major for men and women was personal interest.

Men and women differed in how they ranked the factors that affected their choice of major. A rank of 1 indicated that the factor was most important to the participant. The difference in the distribution of the ranked factors for men and women can be seen in Figure 4. In Figure 4, the factor is indicated by the tag utilized during categorization of the responses for figure clarity (see Table 1). The women's data is green, and the men's data is blue. Men and women ranked having a positive experience prior to college, career opportunities, and personal interest similarly. However, women tended to rank academic strength and encouragement from someone else as a more important factor than men. Men tended to rank potential social impact as a more important factor than women. Because the rank may be affected by the number of factors that participants ranked (since factors cannot be ranked as the same level of importance), the average number of factors was calculated. However, men and women who ranked the factors on average ranked the 3 factors.

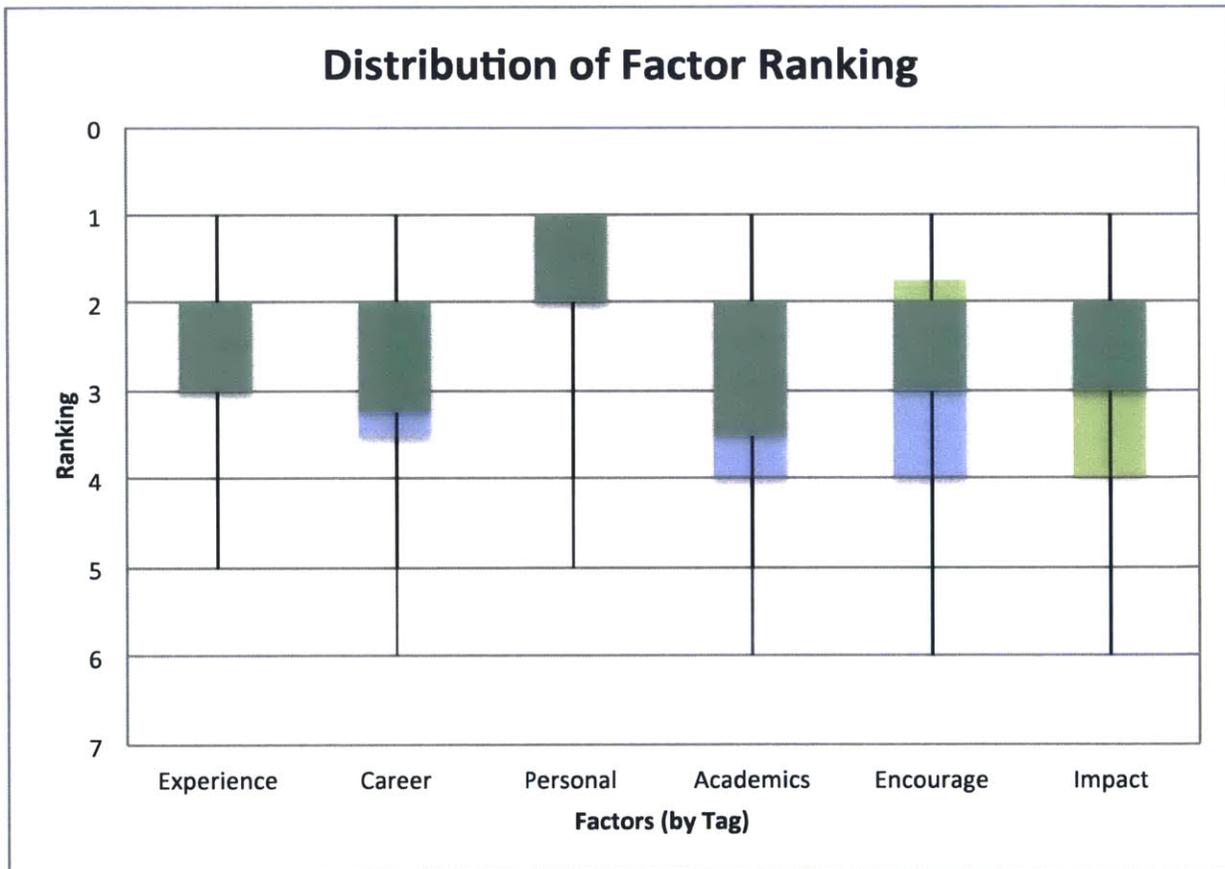


Figure 4: Distribution of factor ranking for women and men. The women's data is shown in green and then men's in blue. The distribution of the factor rankings differs between men and women for academic strength in relevant areas, encouragement from someone else, and potential social impact. Women tended to rank academic strength and encouragement from others as a more important factor.

81% of the women and 80% of the men completed responses for how they ranked the factors. Calculation of the frequency of the categories for these responses (mentioned in Table 1) found that a higher percentage of women mentioned one of factors listed on the survey. However, women generally wrote more for their responses. The average length of

the response (if a response was provided) was 270 characters for women and 208 characters for men. Analysis of the written responses about how they ranked their factors did result in the discovery of two additional factors: Experience in a class and breadth of major. A larger percentage of women (19%) than men (5%) indicated that the ability to apply their major to a variety of different areas was a factor when deciding their major.

The earliest time at which a factor was established as a factor influencing the choice of major was determined from the response categories. Of the responses, 48% of the women's responses and 53% of the men's responses could be categorized with a time. Most men and women (who included time information in their written responses) indicated that they were exposed to one of the factors affecting the college decision during high school. Men were more likely to mention a factor that was established at a young age during childhood. One example of a typical response from a male participant was that he had "a positive experience of building and creating things which I received growing up."

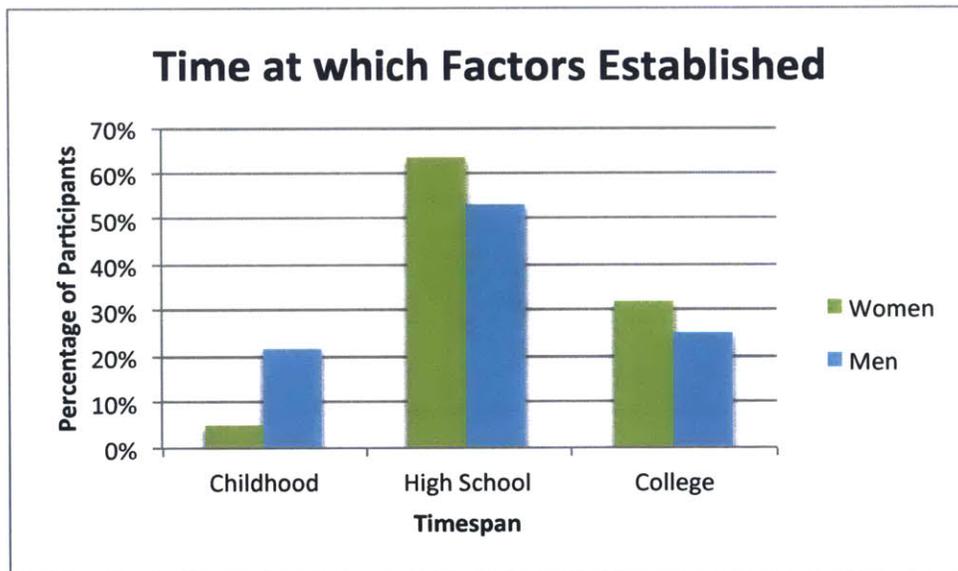


Figure 5: Time at which influencing factors were established for women and men. The majority of men and women established influential factors in high school. More men than women had a factor that was established from childhood.

4.3 Understanding Engineering

Participants were asked to explain how they came to understand what their major entailed and when they learned about their major. 81% of the women and 84% of the men provided written responses for this question. The percentage of participants who learned about engineering through each mechanism can be found in Figure 6. Again, the labels for each mechanism listed correspond with the tags from Table 2.

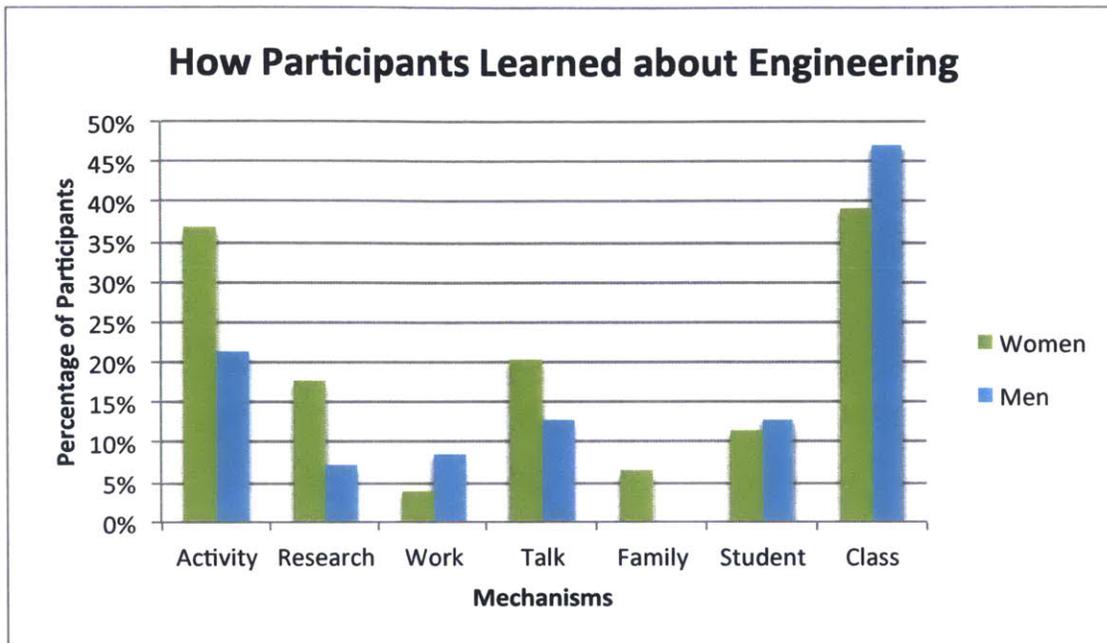


Figure 6: Mechanisms by which participants learned about what engineering entailed. The labels for the mechanisms correspond with the category tags listed in Table 2. Most men and women took classes that taught them about what engineering entailed. More women indicated that they participated in some kind of activity that taught them about what engineering entailed.

Of the responses that were collected, 28% of the women’s and 29% of the men’s responses provided details about when the participants learned about engineering. The majority of the participants felt that they learned what engineering entailed in college as seen in Figure 7. When enough information was provided, the college responses were broken down into the year in college. Total percentages will sum up to more than 100% because responses that were categorized in a specific class year were also categorized as college. The majority of men and women (who provided written information) felt that they learned about what engineering entailed in college.

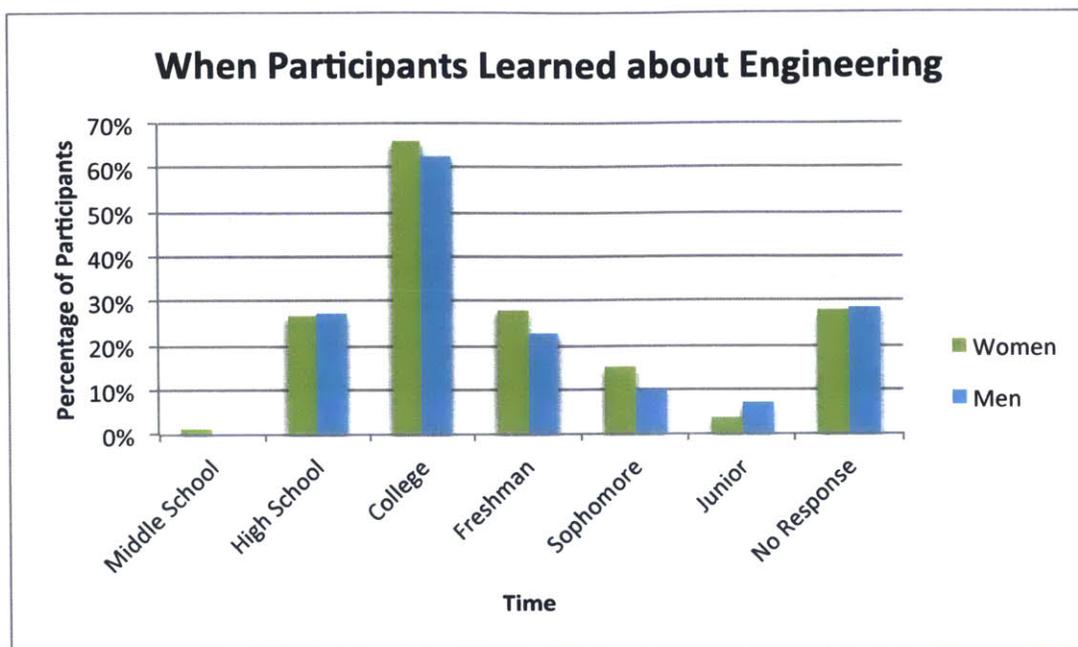


Figure 7: When participants felt they learned about what engineering entailed. The majority of men and women felt they came to understand what engineering entailed in college.

4.4 Perceived Academic Confidence

Perceived academic confidence at the time of entrance into college (as an undergraduate) did not vary much between men and women for the STEM areas as seen in Table 6. Men appeared to be slightly more confident in their physics capabilities, but women were more confident in their biology capabilities. Across all the liberal arts, women’s perceived confidence was higher.

	Women	Men	Δ (Women-Men)
Physics Confidence	3.8	4.1	-0.3
Chemistry Confidence	3.6	3.6	0
Biology Confidence	3.2	2.9	0.3
Math Confidence	4.4	4.4	0
STEM Confidence	15	15.1	-0.1
English Confidence	3.8	3.3	0.5
History Confidence	3.2	3.0	0.2
Art Confidence	3.2	2.7	0.5

Table 6: Average perceived academic confidence for men and women. Men were more confident in their physics capabilities, but women were more confident in their biology capabilities. Women were more confident in their English, history, and art capabilities.

Correlations between different types of science and liberal arts were also graphed using bubble charts to see if there was a trend between pairs of confidences in different subjects. On these bubble charts, the relative size of the bubble is proportional to the number of participants who had that response.

Generally, engineering relies heavily on physics and mathematics, so correlations between the confidence in physics and math were plotted. Figure 8 shows the bubble plots for women and men. Across both genders, the largest bubbles tend to be found in the upper right region of the plot indicating that men and women are generally confident in their physics and math skills. The bubbles in the women's plot span the range of physics confidence levels, indicating that women of a variety of different confidences in physics do chose to study engineering.

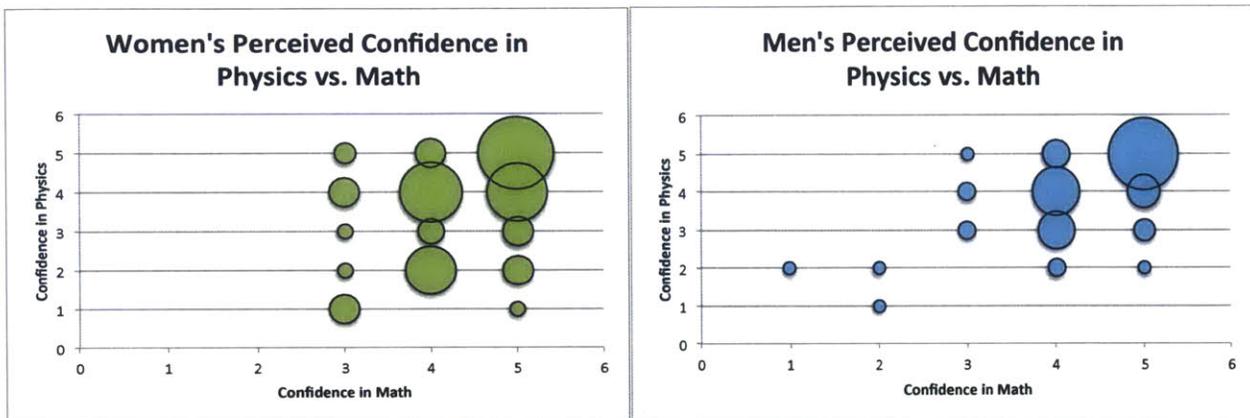


Figure 8: Women's and men's perceived confidence in physics versus their perceived confidence in math at the time of entrance into college. Women and men who chose engineering have high confidence in the combination of their math and physics capabilities. Women tended to vary more greatly in their confidence about their physics capabilities.

Confidence in art versus math and science were plotted to see if there was any correlation between these areas. Figure 9 compares the pairings between the art and math confidence for women and men. Women tended to have higher confidences in their capabilities in the arts and math than men.

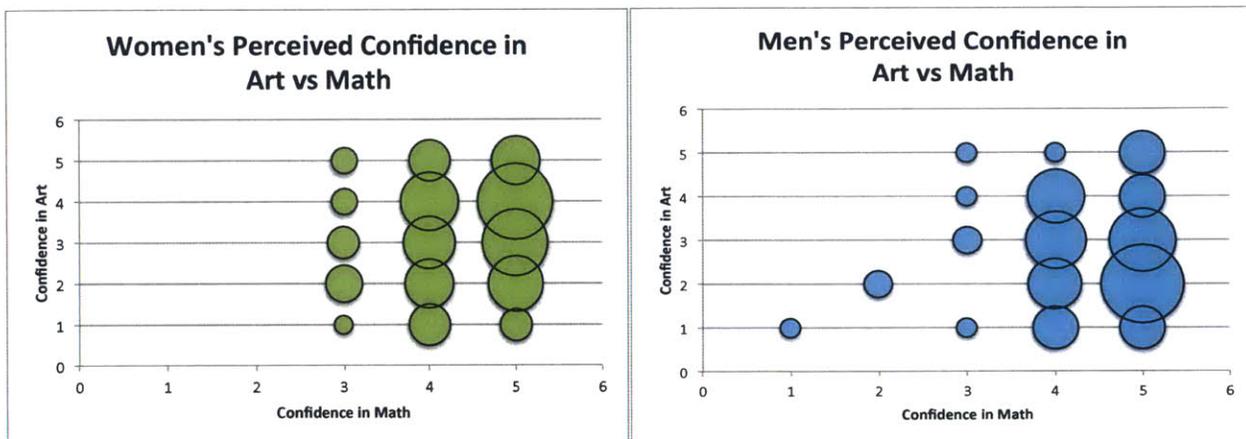


Figure 9: Women's and men's perceived confidences in art versus math. Women tended to have higher confidence in their art and math capabilities than men.

Similarly, Figure 10 shows that men tended to have high confidence in their physics capabilities, but lower confidence in their art capabilities. There is not as clear of a trend among women in the distribution of art versus physics, although men tended to have

higher confidence in their physics capabilities as their bubbles are larger on the right of the chart.

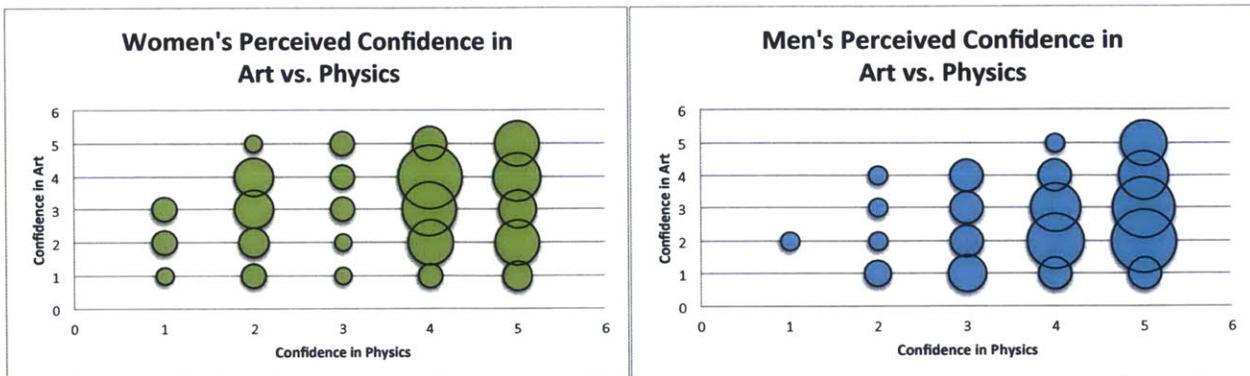


Figure 10: Women's and men's perceived confidence in art versus physics. Women's confidence in physics was more distributed, so there was not as much clustering. Men's bubbles are predominantly on the right side of the chart, indicating higher confidence in physics.

4.5 Influential Summer Activities

Participation in influential summer activities significantly varied between men and women. 47% of women and 29% of men indicated that they attended a summer program which influenced their choice of major. The calculated p-value between the men and women was 0.013, indicating that women in engineering are more likely than men in engineering to have participated in some kind of summer activity that influenced their choice of major.

The types of summer activities that women and men participated in can be found in Figure 11. More women participated in summer programs focused around teaching STEM. Additionally, 30% of the women participated in some kind of summer program for women only. The types of summer activities correspond with the tags from Table 5.

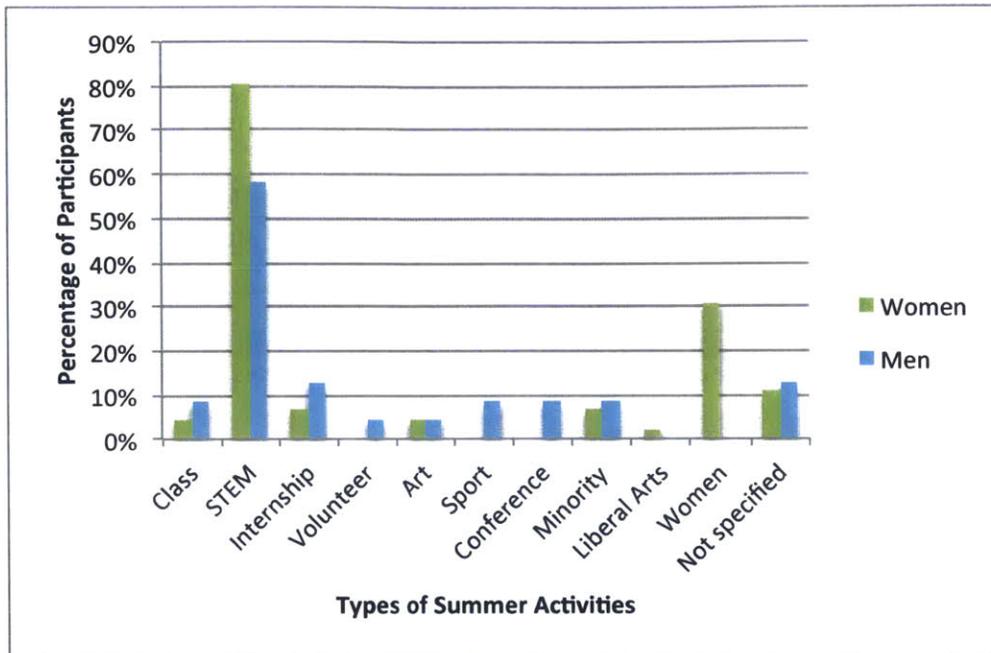


Figure 11: Types of summer activities women and men participated in. Women and men who chose engineering as their major and participated in a summer activity tended to participate in one related to STEM fields.

4.6 High School Activities

73% of women and 72% of men provided information about high school activities that they participated in which were influential to their college major choice. Not surprisingly, STEM activities were commonly listed among men and women as seen in Figure 12. More women reported participated in a STEM activity in high school than men.

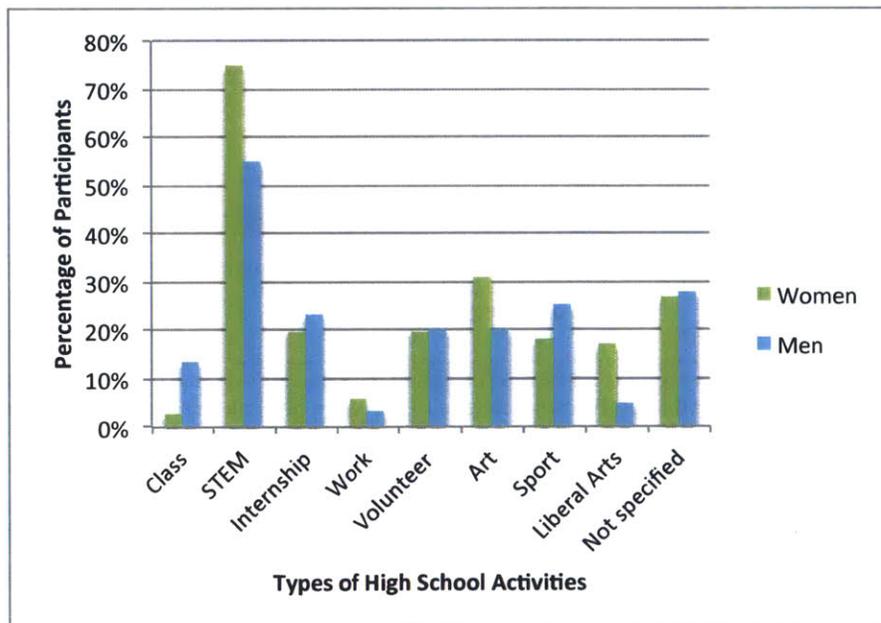


Figure 12: Types of high school activities that men and women indicated influenced their choice of major. More women reported participating in a STEM activity in high school than men.

4.7 Composition of Friends in High School

The majority of the participants tended to have the majority of their high school friends of the same gender. The gender composition of participant’s high school friends can be found in Table 7.

	Women	Men
Same Gender	43% (41)	36% (30)
Opposite Gender	10% (10)	11% (9)
Balanced	47% (45)	53% (44)

Table 7: Gender composition of high school friends for women and men participants. The majority of the participants had the majority of their high school friends of the same gender.

4.8 Influential College Experiences

There was not a statistically significant difference between women and men who felt they had an experience in college such as an introductory engineering class, competition, club/activity, presentation, etc. Of the participants who responded that they had an influential college experience (39% of women and 29% of men), the majority of the students had participated in some kind of class that encouraged them to study engineering as seen in Figure 13. Again, the labels for the type of college experience correspond with the tags from Table 5.

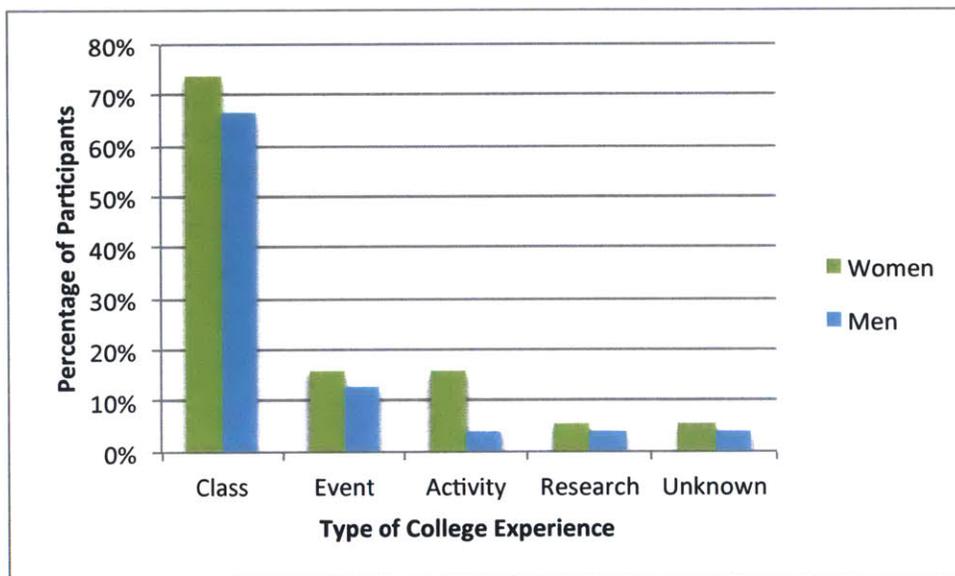


Figure 13: Type of college experience that was influential in a participant’s choice of major. The majority of the participants who indicated they had an influential college experience had taken a class that encouraged them to study engineering.

From the collected responses, women may be more likely to be encouraged to choose a major based off of feedback from another student. 28% of women and 16 % of men responded that there was an influential student during the selection of their college major. However, the calculated p-value between the men and women was 0.05, indicating that more data is necessary to determine whether this is actually a difference between men

and women. Of the women who indicated a college friend influenced their choice of major, most of the women were influenced by someone in the same FSILG as them (fraternity, sorority, or independent living group). Of the men who indicated a college friend influenced them, most of the men were in the same dormitory or FSILG as the friend.

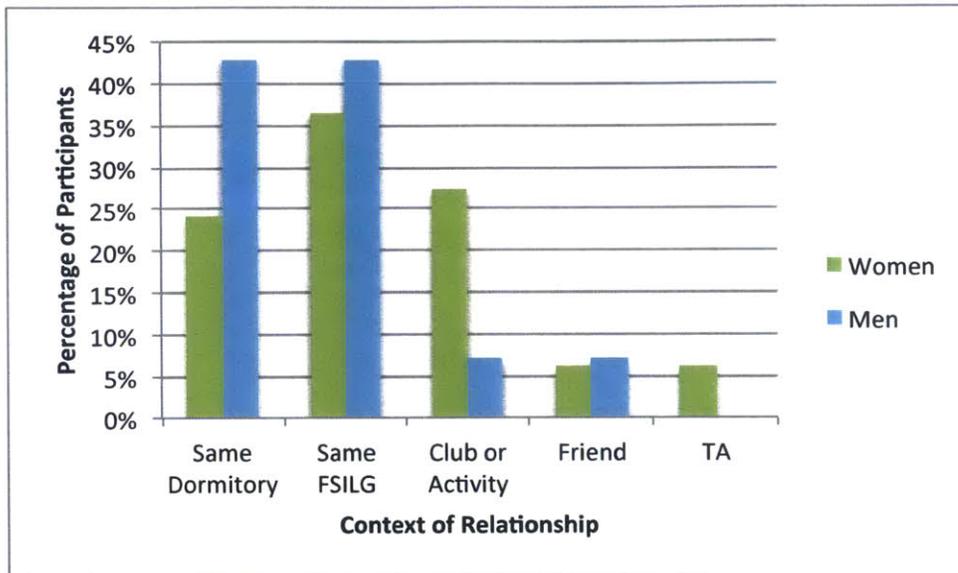


Figure 14: Relationship between participants and influential student. Most women who were influenced by a college friend knew the friend through their FSILG. Most men who were influenced by a college friend lived in the same dormitory or were in the same FSILG as that friend.

4.9 Mentorship

Mentorship for men and women varied depending on the point at which the participant had mentorship. Before college, 75% of women and 73% of men indicated that they had someone they thought of as a mentor. The calculated p-value between the women and men with or without mentorship was 0.97, indicating that men and women who chose to study engineering have the same probability of having a mentor before entering college.

Of the mentored participants, women and men tended to have mentors of the same gender as seen in Table 8. More women had mentors of both genders than men.

Gender of Mentor(s)	Women		Men	
	Count	%	Count	%
Only male	13	18%	13	59%
Only female	18	24%	18	3%
Both	43	58%	43	36%
TOTAL	74	75%	61	73%

Table 8: Gender of participant's mentor(s) prior to entering college. About the same percentage of women and men indicated they had mentors prior to college. Men and women were more likely to predominantly have mentors of the same gender. More women had mentors of both genders.

Participants knew mentors (prior to college) through a variety of different avenues. The majority of men and women found mentorship before college through a teacher or parent. Figure 15 shows the other relationships between participants and their mentors.

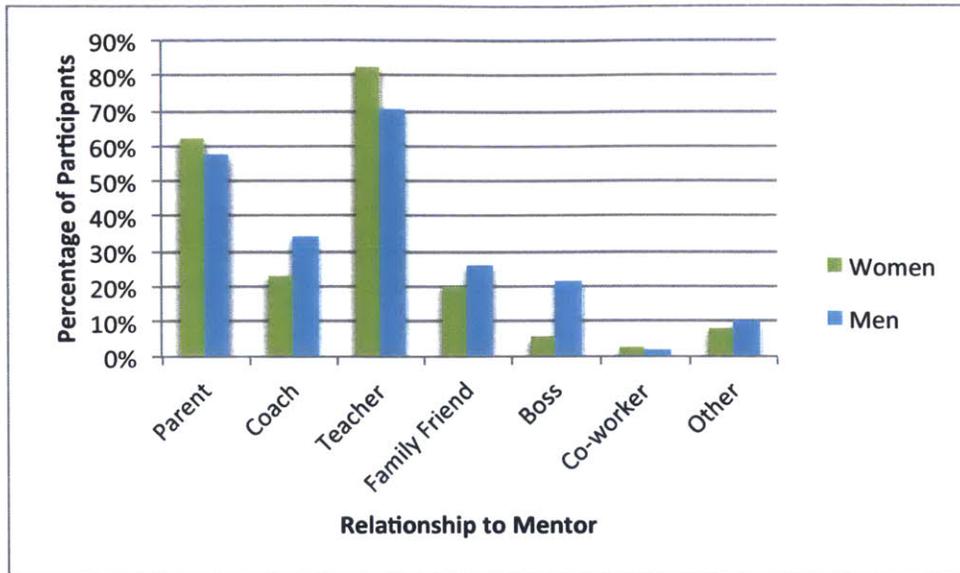


Figure 15: Relationship of participants to their mentor prior to entering college. The majority of the mentors were either teachers or parents for both men and women.

This study found that women who pick engineering are more likely to have mentorship during college. The calculated p-value between women and men with and without mentors was calculated to be 0.0003. 75% of women indicated that they had someone they identified as a mentor during college, whereas only 49% of men indicated that they had a mentor figure.

Table 9 shows the gender of the mentor(s) for women and men. More women had only female mentors than men, and more men had only male mentors supporting the same trend seen in the participant’s mentors prior to entering college.

Gender of Mentor(s)	Women		Men	
	Count	%	Count	%
Only male	19	26%	30	73%
Only female	24	33%	1	2%
Both	30	41%	10	24%
TOTAL	73	75%	41	49%

Table 9: Gender of participant's mentor(s) during college. More women felt they had mentors in college than men. Again men and women were more likely to have mentors of the same gender than the opposite gender. Women were more likely to have mentors of both genders.

4.10 Family

Women who chose to study engineering were not more likely than men to have a family member who was influential in their college decision process. The calculated p-value for this correlation was 0.5770. 23% of women and 19% of men responded that there was at least one family member who was influential during the decision to major engineering. If participants indicated they had an influential family member, their relationship to the participant is plotted in Figure 16. As these results indicate, though, fathers were the

influential one. This supports previous research that women study engineering are more likely to have a father in engineering (Anderson, 1995). Interestingly, more men appeared to be influenced by their mothers than women.

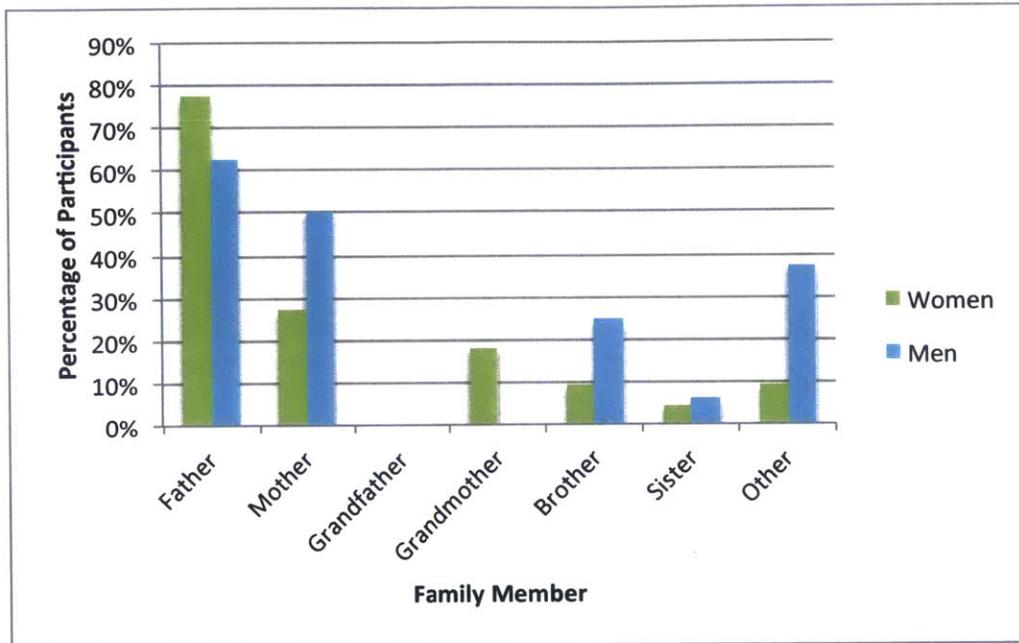


Figure 16: Family member that was influential in the choice of engineering as a major. The most common influential family member for men and women were the fathers. Men appeared to be more influenced by their mothers than women.

4.11 Understanding of the Gender Gap

A majority of the participants indicated that they understood a gender gap exists in the STEM field during high school (78% of women and 72% of men). Their understanding of the gap varied depending on the participant’s experiences and was determined using the written explanations to their understanding of the gap (question 31). The percentage of participants who came to understand the gender gap through each type of experience can be seen in Figure 17. The “understanding of the gender gap” labels correspond to the categorization tags from Table 3. Different sets of data were plotted for each gender depending on whether they indicated “yes,” “no,” or “unsure” on whether they were aware of a gender gap in high school. Most of the women and men who responded that they were aware of the gender gap in high school wrote that their understanding was predominantly some fact about there being more men than women in STEM fields (“Statistic” in Figure 17). Of these responses that specified an experience, the most common experience for men and women, regardless of whether they indicated they understood the gender gap in high school, was that they noticed there were more men than women in their high school STEM classes (20% of women and 25% of men). If women indicated that they did not know about the gender gap, it was most likely because they did not actively notice the gap (6 out of 15 women respondents).

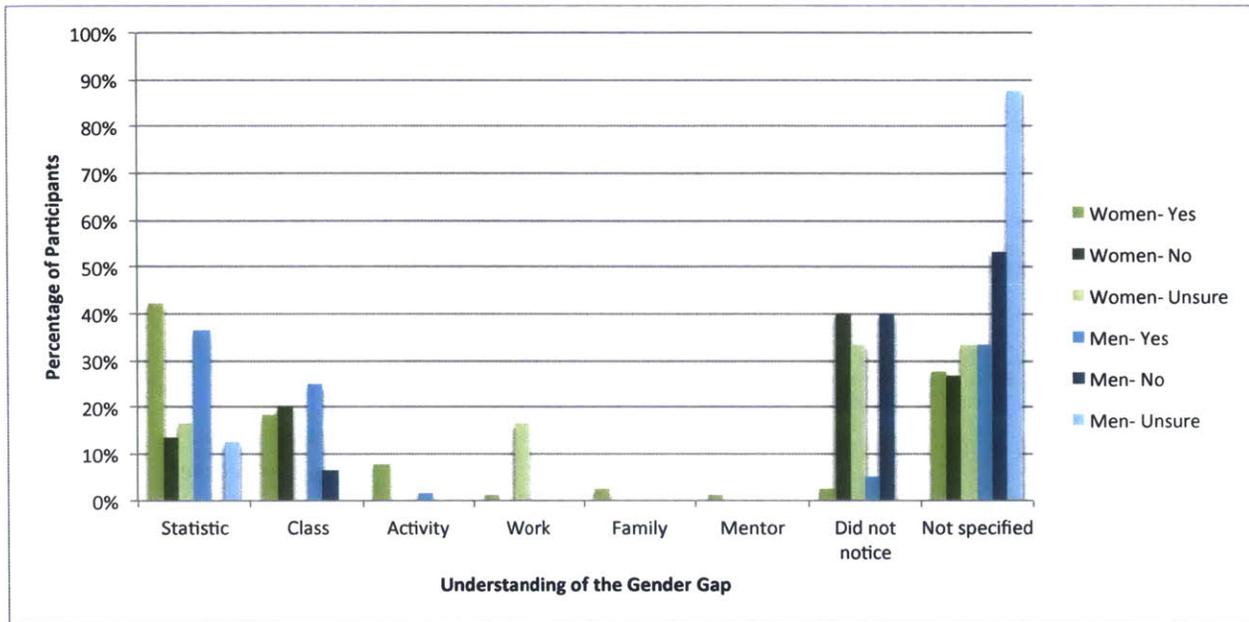


Figure 17: How participants came to understand the gender gap, separated by participant gender and whether they indicated they understood the gender gap prior to coming to college. Different sets of data were plotted among each gender to show whether they felt they understood the gender gap in high school. If the participants indicated the understood the gender gap in high school, the most common understanding was a statistic, such as there being less women than men in engineering.

Among the participants that provided enough of a written response to allow for categorization (64% of the women and 39% of the men), the majority of both men and women explained that their understanding had no effect on their choice of major. This is best visualized as seen in Figure 18. Men were largely not influenced by the gender gap in engineering. There were a couple instances for women where an understanding of the gender gap encouraged women to go into engineering to “prove that a girl could do it.” However, only 7 of the 62 women (11%) who provided responses (that could be categorized) expressed a similar sentiment.

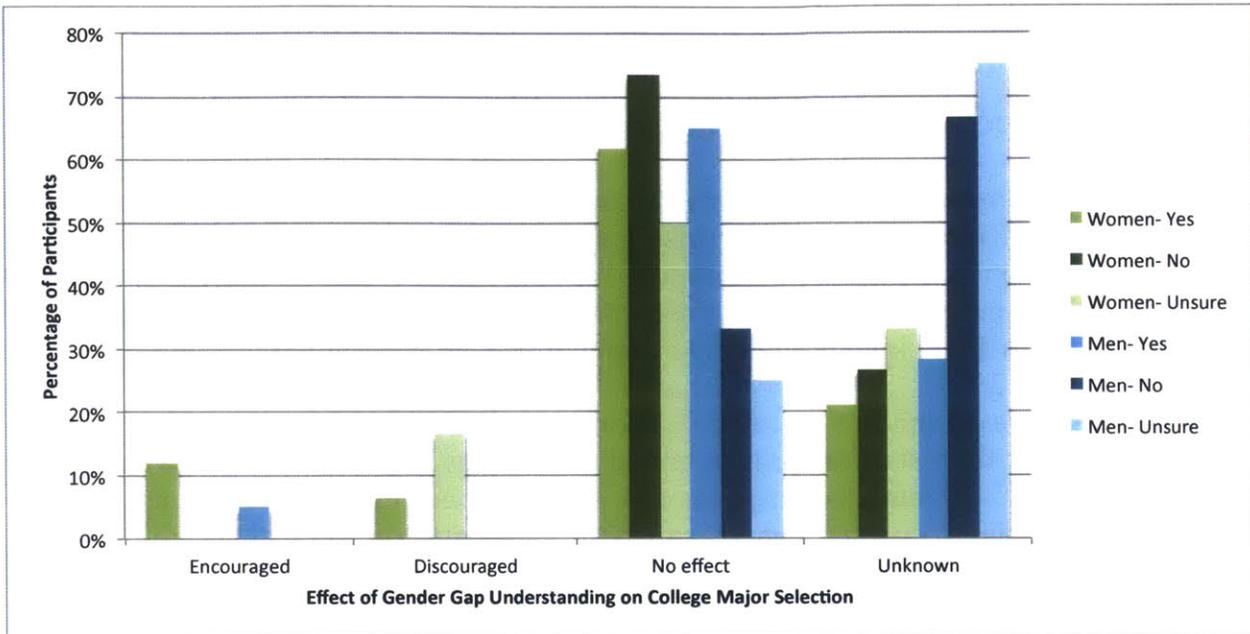


Figure 18: Effect of the gender gap on college major selection, separated by participant gender and whether they indicated they understood the gender gap prior to coming to college. Regardless of their understanding of the gender gap, most women and men felt their understanding of the gender gap had no impact on their choice of college major.

Because such a large portion of the participants knew about the gender gap, there did not appear to be a relationship between the understanding of the gender gap and the gender of the participant’s mentor. There also did not appear to be any correlation between the participant satisfaction in their choice of major and their understanding of the gender gap.

5. Discussion

5.1 Factors Affecting Choice of Major

For both men and women, the highest ranked factor motivating their choice of major was personal interest. This unsurprisingly indicates that an individual must feel a personal connection to the area to be compelled to study engineering regardless of their gender. This finding supports previous research conducted in the area which found that students needed to tie their choice to study engineering with an attainment value (Matusovich et al., 2010). This suggests that one method by which we can recruit more women is to expose students to more applications of engineering that are aligned with student's personal interests. Studies have found that biology tends to be more appealing to women than physics (Baram-Tsabari & Yarden, 2008), so one area where women may be able to be recruited into engineering is through the explanation of medical device development.

Prior research by Seymour and recent press coverage has found that women were more likely to pathway with humanitarian goals, but this study found evidence to the contrary (Nilsson, 2014; Seymour, 1999). Although about the same percentage of men and women selected potential social impact as a factor (11% of women and 10% of men), women were not more likely to rank potential social impact higher in order of importance of the factor on the college major decision. In fact, across the board men tended to rank potential social impact higher as seen in Figure 4.

Men may be more likely to rank potential social impact higher for a couple of reasons. Men studying engineering at MIT may be more likely to have been driven by a passion to help the world. The MIT admissions office has identified that applicants are evaluated for admissions based on are their "alignment with MIT's mission to make the world a better place" (MIT Admissions Office, 2015). Men may also have defined "potential social impact" in a different manner than women, resulting in a higher ranking. Additionally, Nilsson's piece only discusses how more women are attracted to opportunities to work on projects with potential social impact (2015). However, this doesn't indicate that women consider this factor as a rationale to pick engineering as a major, and may become a choice after the decision to study engineering has been made.

Women who study engineering ranked two factors higher on the scale of importance than men: encouragement from others and academic strength in relevant areas. This might explain the importance of mentorship for women who chose to study engineering. Because encouragement from others is something that women seek more than men (Seymour, 1999), it is important to structure engineering classes, activities, and programs to provide some kind of encouragement along the way. This encouragement may also provide women with the opportunity to feel that they can advance their academic abilities in mathematics and science courses.

5.2 Confidence in Academic Abilities

Quantitatively, a difference in the perceived confidence in different academic areas was not seen between men and women across the majority of the STEM fields. This may be a result of the environment because MIT recruits academically strong individuals to join their educational environment. Women tended to feel more confident in biology, which aligned with research regarding higher women interest in biology as a field (Baram-Tsabari & Yarden, 2008). Women also tended to have confidence in their ability to use mathematics (average confidence score of 4.4), which is also supported by prior research (Smith, 2012).

The most notable difference between men and women analyzed in this study was found when comparing the pairings between a participant's perceived confidence in math or physics versus art. Women indicated higher perceived correlations between their confidence in their art skills and math skills. This may indicate that design is an area where more women could be encouraged to enter engineering. Design in this sense refers not to the process of coming up with a solution to a problem, but instead to the synthesis of visual arts with engineering such as the field of product design. Additionally, product design includes elements of user experience research and impact through good design which may appeal to women's interests in humanitarian careers (Seymour, 1999).

Women and men who supplied relevant responses indicated that an experience they had in high school helped them understand their major. A design program for high school students might help to recruit more women into engineering by showing them how they can tie together two areas they perceive they have academic strength in: art and mathematics. Because women who decide to go into engineering in high school are more likely to study engineering in college, a program at this pivotal time where student have enough math and science knowledge to be able to apply to design challenge could have a great impact on recruitment of women into engineering (Blaisdell, 2000).

Interestingly, a few of the written responses from men mentioned that they felt their skills could be developed if they were not strong. None of the women surveyed provided a similar response. A small number of women indicated from their responses that they felt that they enjoyed what they were good at. These responses may seem to indicate different mindsets in men and women. Dweck has developed a theory of two different types of mindsets: fixed and growth. An individual with a fixed mind set believes that intelligence is fixed at a specific value, whereas an individual with a growth mindset believes that intelligence can be developed over time (Dweck, 2010). This may be an interesting area of future study.

5.3 Influential Experiences

Of all the experiences surveyed in this study, the only statistically significant difference between the participation of women and the men was in the participation of an influential summer program or activity. Women who chose to study engineering were more likely to have participated in a summer activity that encouraged them to study engineering. This indicates that summer activities may be a good way to get women interested in engineering. Additionally, because 30% of these summer activities were target towards women, this may suggest that summer programs that create a welcoming

(less Stereotype Threat) environment for women have a great effect on the choice to study engineering.

5.4 Friends, Family, & Mentors

Depending on the relationship to the participant, other individuals were more commonly influential in women than men. More women who chose engineering tended to indicate that they have college mentors more than men who chose engineering. This may be a result of women either seeking out more mentorship in college or potential mentors becoming more active at taking the time to mentor students. It is possible that women are more likely than men to feel that they had a student who was influential in their choice of major. However more data would need to be collected to determine if this trend is significant. The two most common relationships between women who chose engineering and an influential student were through their dormitories or FSILG. This supports that putting women in an environment where they can live and interact with more engineers, such as through a summer program or extracurricular activity, might encourage more women to consider engineering.

5.5 Understanding of the Gender Gap

Research surrounding Stereotype Threat would suggest that having an understanding of the gender gap in engineering would have some effect on the women in engineering, either in their choice of major, satisfaction in the major, or academic performance. While no correlation was observed for a participant's satisfaction with their choice of major, a majority of the women participants understood that a gap existed but did not feel this affected their choice of major. This may be due to the fact that MIT has established a more welcoming environment for women in engineering. Indeed, some participants noted they "felt like MIT was a place where this gender gap didn't exist as much." Because this survey did not access student's academic performance in their engineering course, there is no available information about whether a student's success was affected by their understanding of the gender gap. Additionally, not enough resolution is available on each participant's degree of understanding of the gender gap to see whether there would be a correlation between their understanding and academic success or satisfaction.

5.6 Limitations

Because the information is self-reported, this study is only able to capture as much as participants can recall at the time of making their decision about their college major. As a result, the findings of this paper are limited to what participants chose to share and what they can remember about their past experiences. Additionally, because each student at MIT must be selected to attend by the MIT Admissions committee, they are already hand-selected to some extent. Because admissions is competitive, higher academic performance will be seen across all students, and students may be more likely to have experiences that provide compelling anecdotes to submit in their college application. Finally, this study was

completed by current students and recent graduates of MIT, so it did not explore how people who might have chosen STEM as a major might respond to the questions.

6. Conclusion

In order to attempt to reduce the gender gap in engineering, an understanding of the factors motivating students to study engineering needs to be established. This research attempted to expand upon the current knowledge through development and implementation of a survey to collect more information about trends among engineering students. Among the set of research questions studied, a few relevant trends were identified and advice for how to implement these findings into potentially influential programs were provided.

Future expansions of this study would add additional questions to the survey and change the population of participants surveyed. It would be interesting to evaluate the extent to which participants believe they can gain academic abilities, probing into whether participants tend to be of a growth or fixed mindset. Additionally, it would be great to ask more questions surrounding the understanding of the gender gap prior to entering college. As mentioned in Chapter 5.5 Understanding of the Gender Gap, there was not enough resolution about the extent to which each participant understood the gender gap to be able to meaningfully find correlations with other survey responses.

Surveying students at different educational institutions would also help determine whether observed trends were representative of the overall population. It would also be interesting to collect more information from more students who are not studying in the School of Engineering but are studying some other form of science or math. (Unfortunately, the data set collected from this study was too small to study.) By comparing those in engineering to those who are in other sciences or math, it might be easier to identify trends that are more common among students who are specifically interested in engineering.

Ultimately, the results from this and future studies will be added to the growing understanding of women that chose to study engineering. By identifying more trends that inspire and encourage women to go into engineering, we can create and tailor better programs designed to increase the percentage of women who go into engineering,

Appendix A: Qualtrics Survey

Please note: Conditional formatting of the questions has been mentioned next to the questions that the formatting applies to.

Introduction

Q1. You have been asked to participate in a research study conducted by the Ideation Lab from the Mechanical Engineering department at the Massachusetts Institute of Technology (MIT). **The purpose of this study is to gain a deeper understanding of the factors that affect how students chose their choice of major.**

You have been selected as a possible participant in this study because you are currently a student at MIT.

This survey is voluntary. You have the right to not answer any or all of the questions and to stop the survey at any time for any reason. We expect that the survey will take no longer than 15 minutes to complete. Your responses will be kept confidential. At the end of the survey, you will be given a chance to enter our lottery for a \$100 Amazon gift card.

Please contact whichnumber@mit.edu with any questions or concerns.

If you feel you have been treated unfairly, or if you have any questions regarding your right as a research subject, you may contact:

Chairman of the Committee on the Use of Humans as Experimental Subjects
MIT, Room E25-143b, 77 Massachusetts Ave.
Cambridge, MA 02138
Phone number: 1-617-253-6787

Clicking below indicates that I have read the description of the study and agree to participate.

I agree to participate.

Current Information

Q2. Which of the following best describes your gender?

Male

- Female
- Trans
- Other:

Q3. What is your race or ethnic group?

Please select all that apply.

- American Indian or Alaskan Native
- Asian
- Black or African American
- Hispanic or Latino
- Native Hawaiian or Other Pacific Islander
- White

Q4. Are you affiliated with MIT?

- Yes
- No

Q5. Which of the following best describes your current affiliation with MIT?

- MIT Undergraduate Student
- MIT Graduate Student
- MIT Alumni
- MIT Staff
- Other affiliation to MIT

Q6. What is your year?

- Freshman
- Sophomore
- Junior

This question only displayed if "MIT Undergraduate Student" was selected as the response to Question 5.

Senior

Q7. What degree are you working towards?

Masters

PhD

This question only displayed if "MIT Graduate Student" was selected as the response to Question 5.

Q8. What year are you in your program?

1st Year

2nd Year

3rd Year

4th Year

5th Year

6th Year or Higher

This question only displayed if "MIT Graduate Student" was selected as the response to Question 5.

Q9. What are you currently studying, planning on studying, or have studied?

Please select your primary area of focus.

If you are a graduate student, please indicate your current area of focus.

Q10. If you selected other or multiple majors, please describe here.

If you selected undecided, please explain what you are considering.

Q11. How did you decide on your area(s) of study?

Please select all that apply.

Positive experience in a related extracurricular activity prior to college

Career opportunities in the field

- Personal interest
- Academic strength in relevant areas
- Encouragement from someone else
- Potential social impact
- Other

Q12. Please rank the factors your selected where the **most important factor is ranked as 1.**

Positive experience in extracurricular activity prior to college

Career opportunities

Personal interest

Academic strength in relevant areas

Encouragement from someone else

Potential impact

Other

The factor(s) displayed matched the factor(s) the participant selected in Question 11.

Q13. Please explain how you selected and ranked the factors above.

Q14. How and when did you determine what your major entailed?

Q15. How satisfied are you with your choice of major?

If you have not declared a major, please indicate your satisfaction with your intended choice.

- Very Dissatisfied Dissatisfied Somewhat Dissatisfied Neutral Somewhat Satisfied Satisfied Very Satisfied

Q16. Please explain your choice of satisfaction level.

What aspects of your major do you like best?

Q17. What is your plan post-graduation?

If you do not know, please select undecided or your ideal plan.

- Job or Internship
- Further schooling
- Taking time off
- Undecided
- Other

This question only displayed if “MIT Undergraduate Student” or “MIT Graduate Student” was selected as the response to Question 5.

Q18. Please elaborate on your post-graduation plans.

High School Information

High School Experience

Please answer the following questions with regards to your experiences in High School (or equivalent levels of education)

Q19. What type of high school did you attend?

If you attended multiple high schools, please select all that apply.

Coed (Male and Female)

All Male

All Female

Q20. How would you describe the majority of your friends in high school?

- Mostly male
- Mostly female
- Balanced between males and females

Q21. Did you attend high school in the United States?

- Yes, for all of high school
- Yes, for some of high school
- No

Q22. What country did you attend high school in?

This question only displayed if "Yes, for some of high school" or "No" was selected as the response to Question 21.

Q23. Please rate your confidence (prior to attending college) in the following areas:

	Confidence Level				
	1- No Confidence	2	3	4	5- Complete Confidence
Physics	<input type="radio"/>				
Chemistry	<input type="radio"/>				
Biology	<input type="radio"/>				
Mathematics	<input type="radio"/>				

- | | | | |
|--------------------|-----------------------|---|-----------------------|
| English/Literature | <input type="radio"/> | <input type="radio"/> <input type="radio"/> <input type="radio"/> | <input type="radio"/> |
| History | <input type="radio"/> | <input type="radio"/> <input type="radio"/> <input type="radio"/> | <input type="radio"/> |
| Arts | <input type="radio"/> | <input type="radio"/> <input type="radio"/> <input type="radio"/> | <input type="radio"/> |

Q24. Please list your major high school activities that influenced your choice of major. These can be sports, clubs, arts/music, volunteering opportunities, work, or other activities.

Activity 1	<input type="text"/>
Activity 2	<input type="text"/>
Activity 3	<input type="text"/>
Activity 4	<input type="text"/>
Activity 5	<input type="text"/>
Activity 6	<input type="text"/>
Activity 7	<input type="text"/>
Activity 8	<input type="text"/>
Activity 9	<input type="text"/>
Activity 10	<input type="text"/>

Q25. Did you participate in any summer programs that influenced your choice of major?

- Yes
- No

Q26. Please list the names of the summer programs you attended and how they influenced your decision.

This question only displayed if “Yes” was selected as the response to Question 25.

Q27. Did you have mentors or role models before college?

These can be informal mentors such as parents, coaches, teachers, family friends, bosses, co-workers, etc.

- Yes
- No

Q28. Which of the following best describes your mentor(s) or role model(s)?

Please select all that apply.

- Parent
- Coach
- Teacher
- Family Friend
- Bosses
- Co-workers
- Other

This question only displayed if "Yes" was selected as the response to Question 27.

Q29. What is the gender of your mentor(s) or role model(s)?

If you had multiple mentors or role models, please select all genders that apply.

- Male
- Female
- Other

This question only displayed if "Yes" was selected as the response to Question 27.

Q30. The National Academies have found that there is a gender gap in the number of students for a majority of the STEM fields (Science, Technology, Engineering, and Mathematics). Were you aware of the gender gap in STEM fields when you attended high school?

- Yes
- No
- Unsure

Q31. Please elaborate on your response to your understanding of the gender gap in high school. Did this affect your choice of major?

College Information

College Experience

Please answer the following questions with regards to your experiences in College (or equivalent levels of education)

Q32. Was there a student who was influential when deciding your choice of major?

- Yes
- No

Q33. In what context did you know the student?

Please select all that apply.

- Same Dormitory
- Same FSILG (Fraternity, Sorority, Independent Living Group)
- Club or Activity
- Co-Worker
- Other

This question only displayed if "Yes" was selected as the response to Question 32.

Q34. Was there an intro class, event, competition, or activity that encouraged you to pick your major?

- Yes

No

Q35. Please elaborate on the influential class, event, competition, or activity that encouraged you to pick your major.

Q36. During college, did you (or do you currently) have a mentor or someone that you turn to for advice about your major or career?

This can be a professor, older student, co-worker, etc.

Yes

No

Q37. What is the gender of your mentor(s)?

If you have multiple mentors, please select all genders that apply.

Male

Female

Other

This question only displayed if "Yes" was selected as the response to Question 36.

Q38. Is there someone in your family who was influential in your choice of major (before or during college) because he or she had taken the same academic or career pathway as you?

Yes

No

Q39. Who in your family has taken the same academic or career pathway as you?

Select all that apply.

This question only displayed if "Yes" was selected as the response to Question 38.

- Father
- Mother
- Grandmother
- Grandfather
- Brother
- Sister
- Other member of family

Q40. Thank you for participating in our survey! If you would like more information about the study, please contact whichnumber@mit.edu. Additionally, if you have any comments regarding any part of the survey, please feel free to contact whichnumber@mit.edu.

If you are willing to be contacted for further questions for our research study, please enter your email address here.

. IMPORTANT: Click the ">>" button below to end the survey and proceed to the lottery entry page for the chance to win a \$100 Amazon gift card. The information you provide for the lottery will not be associated with your survey response.

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