Investigating the Role of Faculty Gender in Mentoring Female Engineering Students for Success

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Abstract: While many previously male-dominated collegiate programs have experienced demographic shifts over the past half century to become gender-balanced, engineering has persisted as a male-dominated discipline. Trends between national gender proportions of faculty and degree recipients in engineering over a span of fifty years and their implications on same-gender mentoring relationship for female engineering students are discussed. This paper analyzes the responses of students of all genders from sixteen departments housed in four separate colleges across California State University, Fresno to investigate the relationship between faculty gender and success indicators of female engineering students. The responses of female students in the Lyles College of Engineering are compared with the responses of male and non-binary engineering students as well as gendered groups from gender-balanced and female-dominated departments in the university. While faculty gender was not correlated with academic performance of students in the LCOE, 52% and 56% of female engineering students surveyed agreed that it is important to have professors and mentors, respectively, of their same gender. This was significantly higher than all male student groups surveyed, including those from the LCOE and female-dominated departments, and female students from non-STEM gender balanced and female-dominated departments. Of female engineering students who indicated same gender faculty or mentors in their discipline were important, over 97% indicated having these individuals made them believe they could achieve more in their profession. Agreement with this statement was significantly lower among male engineering students. The survey indicated that in engineering and gender-balanced fields, academically qualified students of all genders were disproportionately more likely to be encouraged to pursue graduate studies by female faculty than by male faculty. The data presented in this paper underscores the importance of women faculty and mentors for the success of female engineering students.

Background

Underrepresentation of women in engineering, despite performing well academically, is a well-established fact and has been the focus of many researchers and policy makers. While lack of role models is considered one of the important factors, the gender of mentoring faculty has recently received some attention [1] and [2]. Because of a lack of introductory courses at the high school level, engineering faculty have the added responsibility of not only teaching the subject but also introducing the profession and mentoring students and developing a sense of belonging [3]. The effect of virtually invisible women in engineering classes, as well as professional life, could adversely affect the sense of belonging among students of minority gender. In addition, unintentional biases and stereotyping could further complicate the situation and may alienate the women in engineering [4]. A study was thus undertaken at California State University, Fresno to understand the importance of a mentor's gender as indicated by female students' preferences and academic intentions, so that they can be appropriately mentored to not only complete their academic pursuits, but also to become successful professionals. A survey was administered to all the students from Lyles College of Engineering (LCOE) as well as students from selected gender balanced departments and departments where male students are a small minority. Before discussing the survey results, a contextual framework based on the historic trends from United States national engineering degree recipient and faculty data [5], [6],

[7] is provided. Figure 1 displays the female percentage and number of women who earned BS, MS, or PhD degrees in engineering as well as those holding tenured or tenure track engineering faculty positions. Viewing both figures together, a robust understanding of the historical trends may be obtained in a manner that accounts for increases or decreases in the overall datasets.

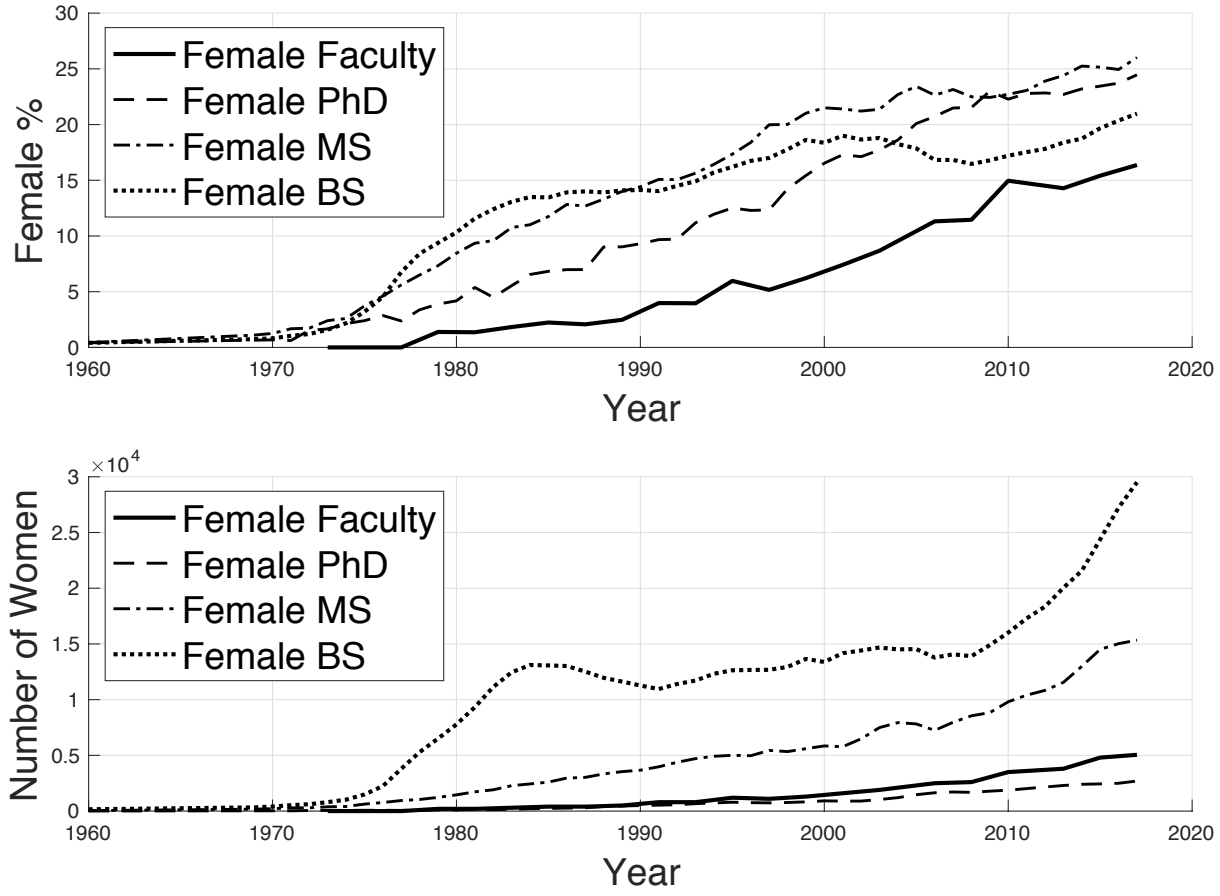

Figure 1. Historical trends in engineering degree recipients and tenured/tenure track engineering faculty expressed in terms of the female percentage (above) and number of women (below) [5], [6], [7]

Figure 1 shows that increases in women among BS degree recipients occurred primarily during two periods: 1) The late 1970s and early 1980s, during which time the percentage of BS degrees conferred to women grew from 2% to 14% and 2) Post 2008. During the current growth period, the number of annual BS degrees awarded to women more than doubled. However, because of the growth in engineering undergraduate education as a whole, the growth rate in terms of percentage of BS degrees is roughly half of what it was in the earlier period. Meanwhile, growth in female faculty remained sluggish through the 1980s, then gained more moderate growth in the 1990s that has been sustained consistently from that point. Because of the way these two groups increased relative to each other, the ratio of annual female BS degree recipients to female tenured/tenure track faculty reached an all-time high of 41.5 to 1 in 1983 and improved over the course of the next 25 years.

Given the high female student to faculty ratio in 1983 and the fact that only approximately 300 female tenured/tenure track faculty were employed nationally, female students rarely had opportunities to learn from and be mentored by female faculty. By comparison, in 2017, the number of female faculty had increased to 4770 and the annual number of female BS degree recipients to faculty ratio had decreased significantly to 6.5. The growth in female faculty occurred simultaneously with a steady increase in the number and proportion of female PhD recipients. Despite these increases, women still only accounted for 17.4% of tenured/tenure track engineering faculty nationally as of 2017, which was lower than the proportion of women earning BS, MS, or PhD degrees. Further increasing the proportion of female faculty, which would make them more accessible to serve as mentors for female students, is dependent on increasing the number of women earning doctoral degrees in engineering, which requires female undergraduate students to be mentored towards pursuing graduate degrees. The remainder of the paper will discuss respondent demographics and present comparisons and analyses based on gender identities of the surveyed students in the California State University, Fresno. Note that in the year the survey was conducted, California State University, Fresno graduated 33 female engineering undergraduate students and employed 5 female tenured/tenure track faculty, reflecting a ratio essentially the same as the national ratio.

Respondent demographics and survey response rates

Over the course of the 2018 - 2019 academic year, students of all genders enrolled in sixteen different departments from four colleges across California State University, Fresno and graduates of these departments from the Spring 2018 semester were asked to complete a survey consisting of a broad set of questions aimed at investigating the effect of minority gender faculty in a field on both the minority gender and majority gender students of that same field. A thorough discussion of the survey questions can be found in [8]. All four departments of the College of Engineering (COE) were surveyed as well as four departments from the College of Sciences and Mathematics (CSM), School of Business (CSB), and the College of Health and Human Services (HHS). Seven departments were selected from the CSM and CSB that had male and female enrollments exceeding 33%, a proportion shown to provide a “critical mass” [9], to provide STEM and non-STEM “gender-balanced” comparisons for the COE data. Computer science, housed in the CSM, was also surveyed, but was not included in the CSM data analyzed in this study due to the department’s student gender ratio not being gender-balanced. Four health and human services departments were selected in which male student ratios most closely matched the female student ratios of the COE departments. Ethnic demographic information pertaining to the University, ethnic and gender demographics specifically pertaining to the COE, as well as enrollment trends, and gender distribution of faculty, for each of the departments in the study were presented previously by [8] and are relied upon in the analysis for this paper.

A total of 1119 students completed the survey. The overall response rate from the COE was 17%, while the other colleges ranged between 9% and 15%. Data was analyzed by college, as opposed to by department, to reduce concerns regarding small data sets. A summary of faculty and enrollment gender data and survey response rates by gender is provided in Table 1. Note that the data, displayed by college, pertains only to the departments analyzed in this study and not the overall college demographics, with the exception of COE because that entire college was surveyed.

Table 1. Faculty and enrollment gender percentages and survey response rates by gender for departments analyzed within each college.

	Faculty	Enrollment		# Respondents[1]			Response Rate	
College	% Female	Total	% Female	Female	Male	Non-binary	Female	Male
LCOE[2]	13%	1652	14%	88	180	4	38%	13%
CSM[3]	40%	1589	60%	145	52	1	16%	11%
CSB[4]	41%	2717	46%	170	95	0	14%	6.5%
HHS[5]	66%	2678	82%	307	31	3	14%	6.4%

[1]Number of respondents in table does not match total who completed the survey because table excludes students who declined to state their gender and students in Computer Science.
[2]Departments Analyzed: Civil & Geomatics Engineering, Construction Management, Electrical & Computer Engineering, and Mechanical Engineering
[3]Departments Analyzed: Biology, Chemistry, and Math
[4]Departments Analyzed: Accounting, Management, Marketing & Logistics, Pre-Business (All business majors begin as Pre-Business before moving into their respective focus areas)
[5]Departments Analyzed: Communication Disorders, Nursing, Public Health, Social Work

Analyzing Student desire for same gender faculty and mentors

Because GPA is a direct measure of student success, the first item considered in this investigation of the role female engineering faculty play in mentoring female engineering students for success was student self-reported GPA relative to the percentage of courses taken within their college taught by a female faculty. No correlation was found between student GPA and the gender proportions of female students' faculty. Nevertheless, 51.9% (n = 79) and 55.8% (n = 77) of female respondents from the LCOE agreed or strongly agreed (as opposed to slightly agreed, slightly disagreed, disagreed, or strongly disagreed) with the statements that "It is important to me to have professors within my major who are of my same gender" and "I prefer to have a mentor within my discipline who is of my same gender", respectively. A mentor was defined in the survey as "A more experienced individual who helps you develop skills and knowledge that will enhance your professional and personal growth. It may be, but is not necessarily, a professor." Comparing female engineering students' responses to self-reported GPA also failed to indicate any correlation. So while female engineering students' GPA was not influenced by having female faculty, nor did it affect their desire for female faculty and mentors, a student's proximity to graduation did show a correlation with their desire for female faculty and mentors. Very strong agreement with these statements was expressed by female engineering students with three or more years remaining in their degree program, i.e. 77.8% and 66.7% (n = 9) relating to faculty and mentors respectively, with agreement decreasing to 40% and 52% (n = 25) for female engineering students in their final year of study. Given the small sample sizes, only the faculty statement is shown to have a statistically significant (95% confidence) difference between proportions. Nevertheless, the responses to the mentor statement indicates there may be a trend that a heightened desire for same-gender mentors exists among female engineering students near the beginning of their program of study.

Because ensuring women complete engineering programs is an essential part of improving the gender balance of the profession, it is worth investigating further the ways in which having

female faculty and mentors may contribute to female student success in engineering. For each of the previously quoted statements regarding faculty and mentors to which a student responded either "Agree" or "Strongly Agree", a follow-up question was asked, prompting them to indicate their level of agreement with a number of statements about either faculty or mentors of their gender. Although the students were not explicitly told to agree or disagree with them based on whether they were the reason they desired to have same gender faculty or mentors, the statements were designed to be likely reasons why students would have that desire. Students were asked to choose from the same six options as before, which carry the following weights: 'Strongly agree' (2.5), 'Agree' (1.5), 'Somewhat Agree' (0.5), 'Somewhat Disagree' (-0.5), 'Disagree' (-1.5), and 'Strongly disagree' (-2.5). For each statement, Table 2 summarizes the percentage of female engineering students agreeing (including responses ranging from 'Somewhat agree' to 'Strongly agree') and the mean response computed using the numerical values corresponding to the response options. Positive mean values indicate that on average, students in that category agree with the statement, while negative mean values indicate disagreement. As the values approach the maximum value of 2.5 or minimum value of -2.5, the level of agreement or disagreement increase, respectively. A mean value of zero would indicate that students, on average, neither agree nor disagree. The sample sizes vary between 24 and 41 for the statements displayed in Table 2.

Table 2. Level of agreement with same gender faculty and mentor statements (data shown for female LCOE students who showed desire for same gender faculty or mentor).

Statements		**% Agreeing**	**Mean Response**
Professor	P1. I can connect better with professors of my gender	89	1.06
	P2. Professors of my gender are more technically competent	75	0.5
	P3. Professors of my gender care more about their students	73	0.87
	P4. Professors of my gender care more about me	81	0.81
	P5. Professors of my gender are more approachable	94	1.29
	P6. Professors of my gender are more accessible	65	0.5
	P7. Having professors of my gender make me believe I can accomplish more in this field	**97**	**1.95**
Mentor	M1. I can connect better with mentors of my gender	97	1.71
	M2. Mentors of my gender understand my situation better	95	1.8
	M3. I feel more comfortable sharing my concerns and aspirations with a mentor of my gender	95	1.78
	M4. Mentors of my gender care more about me	81	0.97
	M5. Having a mentor of my gender makes me believe I can accomplish more in this field	**100**	**1.84**

Observing which of the statements resonated most with the female students provides some insight as to female engineering students' perceived benefit of having female faculty and mentors. The largest level of agreement, by both metrics, in regards to both faculty and mentors was the idea that having female faculty or mentors makes them believe they can accomplish more in their field. Ninety-seven percent of the sample agreed with this statement in regards to female professors and 100% agreed in regards to female mentors. The second most popular statement pertaining to faculty, with 94% agreeing, was that same-gender faculty were more

approachable. It is interesting to contrast this with considering female faculty to be more accessible, which had the lowest level of agreement at 65%. This means that while female students are only mildly more *able* to access female faculty relative to male faculty, they are significantly *more comfortable* approaching female faculty. Also worth mentioning is that 95% of female engineering students agreed that they feel more comfortable sharing their concerns and aspirations with a mentor of their same gender. A recent study [10] showed that sharing one's goal with someone perceived to have higher status, e.g. a mentor, makes one more likely to follow through on achieving their goal. In this context, that might mean that a student who tells a faculty mentor they intend to pursue a graduate degree in engineering would be more likely to complete the degree.

Cross gender and cross discipline comparison of faculty and mentor related responses

In assessing the relevance of these findings relating to female engineering students' desire for female faculty and mentors, the data for female students in engineering was compared to their male and non-binary counterparts as well as students from the other three colleges surveyed. Figures 2a and 2b compare the proportion of students from all four colleges, displayed by gender, who indicated 'Agree' or 'Strongly Agree' to the statements "It is important to me to have professors within my major who are of my same gender" and "I prefer to have a mentor within my discipline who is of my same gender", respectively. The groups of departments surveyed, labeled by the college in which they are housed, are positioned in the figures from left to right in order of increasing percentage of female faculty.

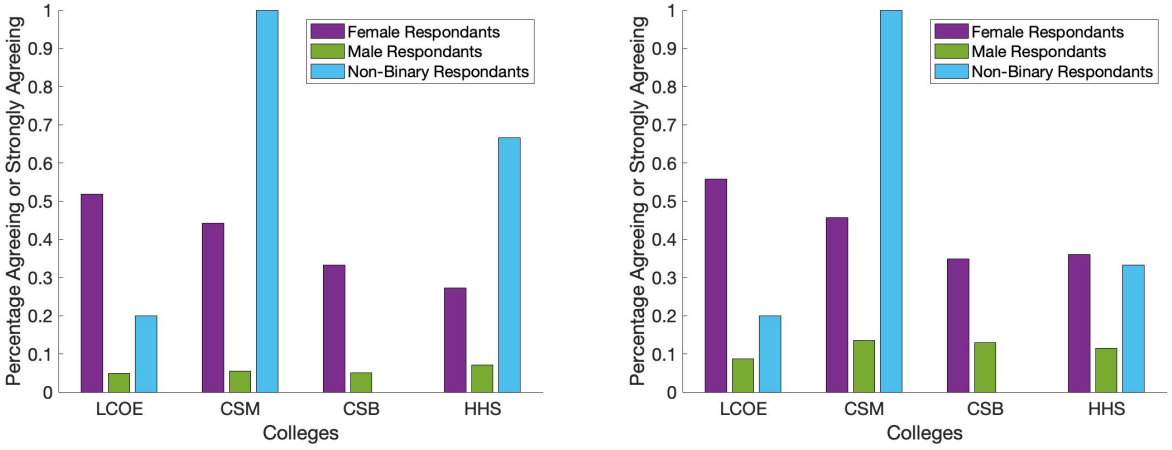

Figure 2. Proportion of students who agreed or strongly agreed that a) it is important to have professors of their gender and b) they prefer a mentor in their discipline who is of their gender.

Looking at these figures, the following observations become apparent:

- In all colleges, for both questions, the proportion of female students agreeing or strongly agreeing was significantly higher than the proportion of male students at the 99% confidence level. This difference between genders was observed to be the greatest among LCOE students (52% compared to 5% pertaining to faculty desire and 56% compared to 9% pertaining to mentor preference).

- As the percentage of female faculty decreased, the female students became increasingly concerned about having same gender faculty and mentors, with those placing importance on same gender faculty ranging from 27% to 52% and those preferring same gender mentors ranging from 35% to 56%. In sharp contrast, very few male students, regardless of college, placed importance on having same-gender faculty nor mentors. Furthermore, the percentage of male students placing importance on having same gender faculty or preferring same gender mentors was not significantly affected by the gender dispersion of their discipline's faculty.

- Although female students in LCOE and male students in HHS are both minority genders in their respective student groups by approximately the same proportion (14% and 18%), the percentage of female students in LCOE placing importance on having faculty and mentors of their gender is significantly higher than male students in HHS, i.e. 52% vs 7% and 56% vs 12%, both statistically significant at the 99% confidence level.

- The percentage of non-binary students who felt having same gender, i.e. non-binary, faculty was important far exceeded the corresponding percentage of female students in HHS and CSM. In terms of desiring same gender mentors, non-binary HHS students affirmatively responded at a similar rate as female students, while the percentage of non-binary CSM students once again far exceeded the female student response. Interestingly, even though non-binary students are a much smaller minority than female students in LCOE and to the authors' knowledge (the university does not have data available on faculty gender besides male and female data), none of the LCOE faculty openly identify as non-binary, the non-binary students were only 36%-40% as likely to agree or strongly agree that it's important to have same gender faculty or that they prefer same gender mentors. Because of the small non-binary student sample size, these results should be interpreted cautiously.

Differences among genders and disciplines were also observed in students' perceptions of faculty and mentors of their gender as expressed in their responses to the follow up questions. Table 3 compares the mean response for each faculty and mentor related follow up statement for male and female students from the four colleges for students who had already indicated they found it important to have same gender faculty or preferred same gender mentors. For each college and gender combination, the mean response to the faculty related and mentor related statements with the highest level of agreement are shown bolded. The key observations made from this data are as follows:

- Among female students from each of the four colleges, believing they can accomplish more in their discipline was the most highly indicated reason for valuing having female faculty. The extent to which female students agreed with this statement was inversely related to the percentage of female faculty in their discipline. Similarly, among male students who consider it important to have male faculty, the extent to which having male faculty made them believe they could accomplish more in their field increased as they became a smaller percentage of the student enrollment. Although both genders followed the same trend, female students in each college demonstrated a higher level of agreement with this statement than their male peers. Albeit, because of small male sample sizes, this

Table 3. Student perception of same gender faculty and mentors[1]

	Engineering		**Science and Math**		**Business**		**Health and Human Services**	
	Female n[2] = 41	**Male n = 7**	**Female n = 59**	**Male n = 3**	**Female n = 51**	**Male n = 4**	**Female n = 67**	**Male n = 4**
P1	1.06	1.17	1.10	0.17	0.85	**0**	1.17	-0.5
P2	0.5[3]	0.1	0.03	0.17	-0.31	-1.5	0.02	-0.5
P3	0.87[3]	0.17	0.28	-1.5	-0.18	-0.5	0.02	-1.5
P4	0.81[3]	-0.17	0.42	-1.5	-0.01	-0.5	0.19	-1.5
P5	1.29[3]	**1.3**	0.72	-0.17	0.76	-0.5	0.93	-1.5
P6	0.5	1.1	0.33	**0.5**	0.47	-0.75	0.4	-1.5
P7	**1.95[3]**	-0.17	**1.63**	0.5	**1.38**	0	**1.34**	**1**
	n = 43	**n = 12**	**n = 58**	**n = 7**	**n = 53**	**n = 10**	**n = 89**	**n = 4**
M1	1.71	**0.8**	1.38	**1.5**	**1.41**	**1.17**	**1.43**	0.83
M2	1.8[3]	0.33	1.09	0.07	0.93	0.75	0.99	1.5
M3	1.78[3]	1	**1.48**	0.36	1.33	0.83	1.37	**1.17**
M4	0.97[3]	-0.72	0.42	-1.00	0.18	-0.5	0.17	0.17
M5	**1.84[3]**	-1.07	1.41	-0.33	1.08	0.17	1.06	0.83

[1]Bolded responses indicate the faculty and mentor statements receiving the highest level of agreement from each gender/discipline sample.
[2] Sample sizes indicate the number of students to whom the questions were asked. Number of students who responded to each statement may vary.
[3]Engineering female student response was statistically higher than Business female student response (95% confidence).

higher level of agreement could only be shown to be statistically significant (95% confidence among engineering students. These trends are illustrated in Figure 3.

- For all statements except P1 (see Table 2), female students in engineering had a higher mean response than female students in any of the other colleges. Comparing the LCOE and CSB female student responses to the remaining eleven statements, LCOE responses were significantly higher (95% confidence) in nine of these responses, i.e. all except statements P6 and M1. These observations imply that among female students who indicated a desire for female faculty or a preference for female mentors in the survey, those in engineering appeared to do so with more intensely than those in a non-STEM gender balanced discipline.

- The mean male HHS student response disagreed, i.e. was negative, with each of the professor related statements with the exception of having same gender faculty making them believing they can accomplish more in their field. Conversely, the mean male HHS student response agreed, i.e. was positive, with each of the mentor related statements. However, because male students are a small percentage of HHS enrollment and a relatively small percentage of the respondents indicated a desire for same gender

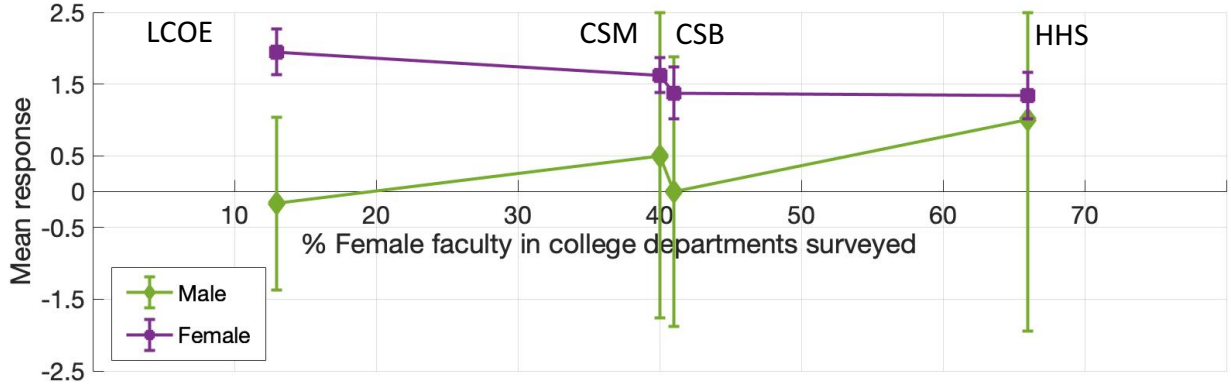

Figure 3. Mean Response and 95% confidence interval for response to "Having same-gender faculty makes me believe I can do more" by college and gender

faculty or mentors, these results are based on very small sample sizes with only one common respondent between the faculty and mentor follow up questions. Therefore, caution should be exercised in reading too much importance into this apparent difference.

The analysis discussed in this section indicates that having female faculty and mentors made female students *believe* they could accomplish more in their field. The following section discusses the results of two additional survey questions aimed at determining whether having female engineering faculty empowers female students to actually *accomplish* more.

Mentoring students towards graduate school

This study's method of assessing whether female engineering faculty contributed to women accomplishing more in their discipline involved observing how faculty and student gender related to students being encouraged to pursue graduate school and students' attitudes towards attending graduate school. Specifically, students were asked to indicate whether female faculty, male faculty, both male and female faculty, or no faculty had encouraged them to pursue a graduate degree in their current field. They were also asked to indicate whether they intended to pursue a graduate degree in their current field, have considered or are currently considering doing so, or do not intend nor have ever considered doing so. LCOE responses are compared to CSB and HHS student responses. The survey responses, summarized in Table 4, indicated that male and female LCOE students were equally likely to be encouraged to attend graduate school, with 61% of each gender reporting being encouraged by a faculty member. This equal academic encouragement is similar to the data observed in the CSB, but is markedly different from HHS. In HHS, male students reported receiving higher encouragement (significant at 93.7% confidence) towards attending graduate school than their peers.

The responses of the engineering students who had been encouraged to attend graduate school were further investigated to determine whether such encouragement was biased by gender. Note that in doing so, the students who indicated both male and female faculty had encouraged them to attend graduate school were counted both in the group of students encouraged by male faculty and the group encouraged by female faculty. Among students with GPA at or above 3.0, nearly equal numbers of female students were encouraged by male and female faculty, whereas 1.35

times more male students were encouraged by male faculty than female faculty. Keeping in mind that male faculty outnumber female faculty in the college by a factor of 6.4, it appears that female faculty disproportionately mentored students towards graduate school compared to their male peers. While this disproportionate mentoring provided by female engineering faculty was directed towards both male and female students, it was especially disproportionate towards mentoring female students. This same observation was made in the gender balanced college data, but to a much lesser extent. Conversely, in the female dominated field, female faculty encouragement of female students relative to male faculty encouragement was lower than the ratio of female to male faculty and was close to parity with the faculty proportions in regards to male student encouragement. Finally, across all disciplines and genders included in Table 4, students received encouragement from each gender of faculty at rates similar to their gender's representation in the 3.0 and above GPA range. Female faculty mentoring tendencies appeared to be slightly targeted towards the minority gender in their field, i.e. towards female students in COE and CSB and male students in HHS, however this could not be shown to be statistically significantly.

Table 4. Trends in mentoring students towards graduate school by student and faculty gender

	LCOE	**CSB**	**HHS**
% of students w/ ≥3.0 GPA receiving encouragement			
All student genders	61%	64%	78%
Female students only	61%	65%	76%
Male students only	61%	62%	89%
Ratio of female to male faculty…			
employed in departments surveyed	1:6.4	1:1.46	1:0.51
who encouraged female students w/ ≥ 3.0 GPA	1:0.96	1:0.88	1:0.69
who encouraged male students ≥ 3.0 GPA	1:1.35	1:1.15	1:0.45
Female students w/ ≥3.0 GPA as..			
% of all students with ≥ 3.0 GPA	34%	62%	90%
% of total student encouraged by female faculty	39%	68%	88%
% of total student encouraged by male faculty	31%	62%	91%

The graduate school mentoring practices of engineering faculty are highly relevant to student achievement, because, as illustrated in Figure 4, the educational intentions of COE students vary between groups of students who have and have not been encouraged to pursue graduate study. For both male and female students with a GPA at or above 3.0, those without encouragement were approximately three times more likely than their encouraged peers to have completely ruled out the idea of attending graduate school or never even considered it. The proportion of female and male students who had not received encouragement from a faculty member, yet intended to attend graduate school was 26.1% and 20.5%, respectively. Whereas, 38.9% and 55.9% of female and male students, respectively, who had been encouraged by one or more faculty were planning to attend graduate school. These observations indicate a statistically significant increase among male students when encouragement is received (99% confidence), but a statistically significant increase among female students can only be observed with 84% confidence.

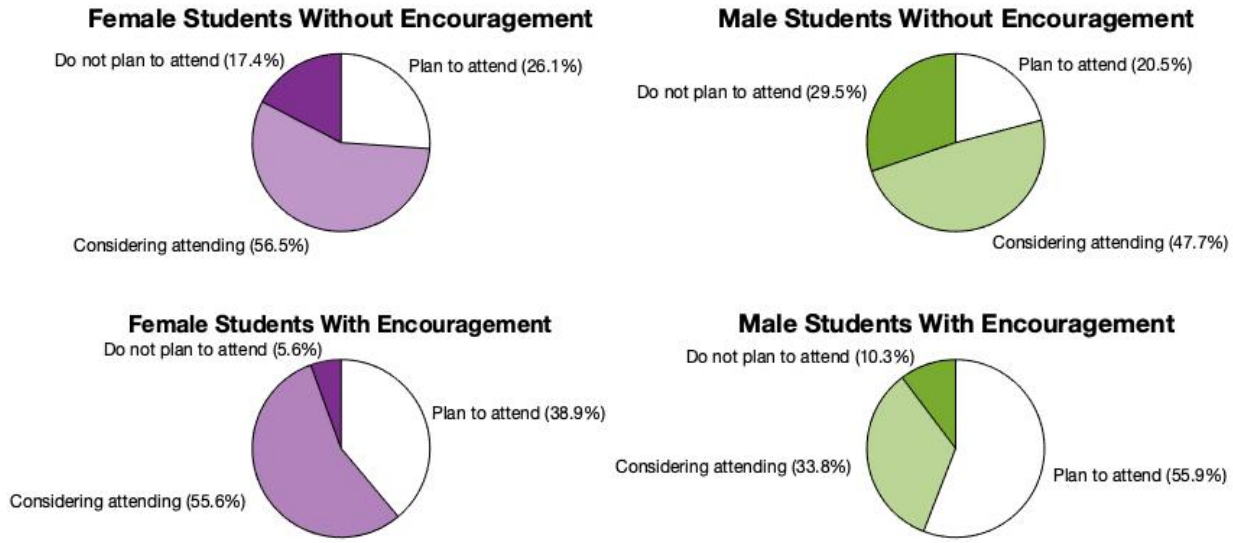

Figure 4. Graduate school intentions of LCOE students with GPA of 3.0 or above displayed by gender and whether or not faculty encouragement to attend graduate school has been received

Analysis & Conclusion

The survey results indicated that regardless of discipline, a higher proportion of female students desired same-gender faculty and mentors than male students. Female students' desire for this was particularly high within the field of engineering, where women are a small minority of the college. These observations from gender balanced disciplines seem to imply that a gender-based difference in desire for gender homophily in mentoring relationships may exist, which could partially explain why in HHS, where male students constitute a similar minority to female students in LCOE, very few male respondents indicated a preference for same gender mentors. However, another explanation may be the fact that 34% of the faculty were male, which is nearly double the percentage of male students. Thus, same gender faculty and mentors were more readily available than in LCOE where female faculty are just as much a minority as female students.

The primary reason indicated by female engineering students for wanting female faculty and mentors was that it made them believe they can accomplish more in their field. This belief was significantly more strongly expressed by female engineering students than male engineering students. This effect was observed to a lesser degree in gender balanced fields. However, because so few male students placed importance on having same gender faculty and mentors, larger male data sets from gender balanced fields would be needed to show this effect with statistical significance. These results seem to imply that female students, particularly in engineering, have internalized limitations on their ability to succeed in their field that their male peers have not. The presence of female faculty, i.e. women who have achieved the highest level of academic accomplishment in their field, helps female students to envision themselves having similar ability to succeed. Believing oneself capable of achieving a goal is an essential element in actually attaining that goal. Therefore, to increase the number of women succeeding in engineering, i.e. not only graduating with undergraduate engineering degrees, but *persisting* in the engineering industry and achieving lofty goals such as earning graduate degrees, attaining

principal engineer positions, or joining the professoriate, more women must first believe they are capable of doing so, which appears to be directly related to having female faculty.

It is also important that academically strong female students are actively encouraged to pursue advanced studies, given that the proportion of students who had received encouragement and intended to attend graduate school was significantly higher than among equally academically qualified students who had not been encouraged. However, this effect was less strong for female students than male students, which is concerning from the perspective of improving the advancement of women in engineering, and merits more investigation. Female and male engineering students reported being encouraged to attend graduate school at equal rates. While equally encouraging male and female students is reasonable in a gender balanced discipline, in a field with starkly disproportionate gender proportions, it is prudent to ensure that students of the minority gender receive heightened encouragement to pursue graduate degrees, as appeared to be the case in HHS. This is particularly important in engineering, given that female students expressed a strong desire for same gender faculty and mentors and the proportion of female faculty lags behind the proportion of female students.

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