Recruitment, Retention, and Advancement of Female STEM Students at the University of Wisconsin-Eau Claire

Joseph Weirich (Biology) and Dr. Lori Bica, Faculty Mentor (Psychology)

Introduction

"The test for whether or not you can hold a job should not be the arrangement of your chromosomes."
~Bella Abzug

Previous decades have seen the greatest negative effects of social stereotypes on women in STEM fields. The notion that women were naturally poor at math inhibited many women's career choices and guided them away from STEM fields, issues that current generations of female STEM students still struggle with. As of 2006, women are 37% less likely to achieve a STEM degree and compose only ¼ of the national workforce in the sciences (Carrell, Page & West, 2010). It has only been recently that the social stereotype that women are naturally poor at math has begun to fade. During this degradation of social bias, society has seen the emergence of an ever-increasing population of women in mathematics-based careers. For instance, women have been earning half the biology bachelor's degrees in the United States since 1996 (Luckenbill-Edds, 2002).

An important factor contributing to the recruitment, retention, and advancement of female students in STEM fields is the availability of female mentors. There is evidence suggesting that female students who interact with female mentors are more productive in the classroom when compared to cross-gender pairings of mentor and student (Crombie, Pyke & Silverthorn, 2003). Many universities have proposed formal mentoring programs for female students in fields where women are underrepresented. These programs use techniques such as female-to-female mentorship opportunities and hiring more female faculty in STEM fields in order to pave the way for other women (Neumark & Gardecki, 1998). Given the increasing importance of research experience at the undergraduate level for acceptance into graduate programs, one would also want to investigate the relationship between numbers of female faculty and female students' opportunities to participate in student-faculty collaborative research.

The purpose of this study is to determine if barriers exist limiting recruitment, retention, and advancement of traditional-age female students in STEM disciplines at UW-Eau Claire. We selected biology, chemistry, physics, computer science, and geology as representative STEM disciplines for the variety these departments provide in terms of numbers of female faculty and female undergraduate majors. It is hypothesized that departments with greater numbers of female faculty members will be associated with higher satisfaction levels with respect to recruitment, retention, and advancement of female students.

Biology major Kaleigh Spickerman collecting field data in the Boundary Waters Canoe Area. Who says women and biology don't mix?

Method

Participants

Participants (N = 15) were female UW-Eau Claire students majoring in STEM disciplines. Majors represented in the sample included 10 from Biology, 1 from Biochemistry/Molecular Biology, 4 from Physics, 1 from Computer Science, and 2 from Mathematics. The discrepancy between total number of participants and number of majors is due to the fact that five participants held double majors, three of which were STEM fields. Participants' ages ranged from 19 to 23 years (*M* = 20.7, *SD* = 1.61). Two participants were freshman, 4 were sophomores, 2 were juniors, and 7 were seniors.

Materials

Researchers developed a structured interview to assess participants' educational experiences, focusing on recruitment, retention, and advancement in their chosen major. We first asked participants their age, class rank, chosen major/minor, and when they declared their major (e.g., 1st semester junior year).

For **recruitment**, 7 questions focused on how attracted participants were to their major and awareness of gender differences in involvement (e.g., Did the number of female students/faculty influence your choice of major?). For **retention**, 4 questions focused on resources and feelings of support from faculty and other students (e.g., Do you notice a difference in the number of female and male professors or advisors in your major?). For **advancement**, 5 questions focused on preparation for post-undergraduate plans (e.g., How often are you asked by faculty members or your advisor about post-undergraduate plans such as graduate school?). One final question gave participants the opportunity to talk about any relevant aspects of their education or expand on previous thoughts or experiences concerning their career and gender differences.

Procedure

We recruited participants by circulating information about the study in psychology classes and emailing an invitation to participate in the study to biology, chemistry, geology, physics, and computer science majors. The researcher conducted one-on-one interviews with each participant. Pending participant permission, audiotaping was used to ensure accurate and thorough data collection. Handwritten notes were also taken. Each interview took approximately 15-20 minutes.

Results

Recruitment

- The majority of participants knew they wanted to pursue their chosen major before starting college, usually citing some sort of positive experience with high school science classes or teachers.
- None of the participants were contacted by their respective departments before declaring their majors.
- More than 75% of participants were well aware of emphases offered by their respective departments.
- Half of the participants were not aware of differences in number of male and female students before starting their major and half assumed there would be more male students based on previous experiences.
- The majority of participants were not aware of differences in number of male and female faculty before starting major.
- Participants felt that numbers of female students and female faculty did not influence their choice of major.
- Most participants were aware of negative stereotypes about women and STEM (e.g., "women and biology don't mix"). A small number of participants experienced social bias from others (e.g., called "nerdy" for taking rigorous courses).

Retention

- All participants felt supported by faculty and students in their major.
- All participants were satisfied with resources available through their departments, though utilization of resources such as tutoring and advising was varied.
- 8 participants thought a mentorship program would benefit them, 3 did not think it would benefit them, and 3 were indifferent to the idea. Most participants did not care about the mentor's gender.
- Participants majoring in Biology reported an even mix of female and male students in lower-level classes and a decrease in the number of female students as class level increased. Participants from other majors reported fewer female students across all classes.
- More than half the participants noticed slightly higher male faculty presence. Physics students said almost all of their professors are male.
- Participants felt that numbers of female students and female faculty did not influence their educational experiences.

Advancement

- The majority of participants were satisfied with the number of collaborative research opportunities; many indicated that research is a large commitment.
- Participants were also satisfied with the number of internships presented by their department, however some indicated that certain emphases have more internship offers than others. A couple of participants noted that some internships are specific to women, and that being female makes them more desirable when applying for research positions or internships.
- All participants felt there was adequate access to supportive student organizations specific to their major, however utilization of these organizations varied.
- All participants felt that adequate advising about post-graduation plans was available (i.e., jobs and graduate school); some had not yet discussed plans with advisors because of their first-year standing.

Discussion

Conclusions from these interviews help us begin to understand the academic environment for female STEM students at UW-Eau Claire.

The Student

Participants in this study have long-standing interests in science, which resulted in declaring a STEM major. Given societal pressures that work against women pursuing science and mathematics, these participants are rather unique. Many researchers find that girls enter high school less confident in their math and science abilities, more likely to underestimate their achievement, and less likely to express interest in STEM careers (Berk, 2010). In college, the career aspirations of many women further decline as they question their capacity and opportunities to succeed in male-dominated fields.

Participants' awareness of discrepancies in the numbers of female students and faculty, both before declaring their major and during their time in the major, is high. Participants in all majors observed men to be the majority of faculty as well as students. However, participants noticed that fields like Biology had greater gender equity. Interestingly, participants felt that gender differences at both faculty and student levels, no matter how severe, had no negative effects on their educational experience.

The Academic Environment

Participant accounts depict a safe and supportive academic environment for female STEM students at UW-Eau Claire, though there are some areas that could use improvement. One area associated with high participant satisfaction is the support they receive from faculty and other students, as well as the academic resources available through their departments. These are important qualities and serve as the foundation to Eau Claire's supportive atmosphere for female STEM students. Participants also expressed high levels of satisfaction with the numbers of student-faculty collaborative research and internship opportunities available to them, as well as advising on post-graduation plans from their academic advisors.

Limitations and Recommendations

This study is limited by its small sample size in terms of participants as well as its sample of majors. The majority of participants were Biology majors. Other majors, such as Mathematics, Physics, and Computer Science were represented by only 1-4 participants. In order to achieve a better representation of the STEM student body, this study would need to be extrapolated to encompass more majors and have comparable numbers of students from each STEM field.

Based on participant responses, we feel there are areas within STEM fields that need improvement. We feel it would be most effective to first establish STEM-wide or department specific goals for the recruitment, retention, and advancement of female students. Some goals may include setting targets for female enrollment in programs that currently have few female students or quantifying how many female STEM students are participating in student-faculty collaborative research and engaging in efforts to increase that number over time. Other suggestions include the development of a mentorship program for female students in STEM fields. Though most participants in our study did not indicate a gender preference for the mentor, literature suggests that same-sex pairings of mentor and student are more productive than cross-gender pairings (Crombie, Pyke & Silverthorn, 2003). Advertisement and outreach efforts from departments can be improved by targeting young women in local high schools and possibly middle schools. Promoting the successes and positive qualities of STEM fields to female middle and high school students could aid in their decision to select a STEM-based career in college. We also suggest hiring and promoting more female faculty in STEM disciplines, given research findings that more female mentors and female role models can bolster female student enrollment and satisfaction (Neumark & Gardecki, 1998). Finally, we suggest that student organizations are the ideal venue for female faculty and students to discuss experiences with stereotypes and social bias, as well as implement the mentorship recommendations described above.

References & Acknowledgements

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