The Power of Peer Mentoring of Undergraduate Women in Engineering: Fostering Persistence through Academic and Social Integration

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Abstract

The academic and social integration of women in engineering majors does not occur in a vacuum. With the goal of expansion and improvement of educational and professional STEM opportunities for women, this convergent parallel mixed methods study was conducted to explore the impacts of a formal peer mentoring program at Stony Brook University, a large research university in the Northeast U.S. Social cognitive constructs including self-efficacy, persistence, and engagement were measured by a survey adapted from *Assessing Women and Men in Engineering* for first year female students ($N = 51$) in the Women in Science and Engineering Program (WISE). Most respondents (78%) reported that the initial decision to enter a science or engineering related field was because they were "good at math or science," while 70% "wanted to be able to get a well-paying job after graduation," and 54% "liked to solve problems." Most (72%) reported that the number one goal for entering the program was to "help me do well in my major," with 58% reporting "meeting other students my field" as a secondary goal. Many respondents (43%) reported that the organization with which they most strongly identified was the WISE program, with 98% expressing confidence in completing their degree. There were significant moderate to strong correlations between participation in the program and friendship development within majors, friendships within majors and anticipated success in a career related to the major, and academic and social integration between friends studying within the major and not giving up participation in outside interests, as well as shared personal interests. Qualitative findings showed that academic and social support were the two most common benefits from peer mentoring experienced by participants, indicating that the academic and social engagement provided by peer mentoring aspects of the program may be positive predictors of retention for first-year women in science and engineering.

Introduction

Despite gender similarities in mathematics and science achievement, women continue to be underrepresented in STEM education and careers [1]-[3]. Of the 108,969 bachelor's degrees in engineering awarded in 2013-2014, 20,031 (18.4%) were awarded to women [4]. Between 2000 and 2013, the proportion of science and engineering bachelor's degrees in all fields awarded to women remained mostly flat with declines in computer science (10%), mathematics and statistics (5%), physics (3%), and engineering (1%) [5]. Some researchers reported retention rates in science and engineering in the U.S. have been disproportionately high for women [1], [6], while others have pointed out the attrition rates for women were consistent with those in other majors [7]. Research has shown that attrition from women in science and engineering majors is partially due to a lack of self-efficacy in their abilities compared to those who persist [6], [8]-[11]. Brainard and Carlin [8] found that 25% of undergraduate women in science and engineering frequently cited a "lack of self-confidence" as a challenge, and by senior year, 44% of persisters still reported lack of confidence as a challenging barrier. Raelin et al. [9], in a longitudinal study on the effects of cooperative education, support, and self-efficacy on undergraduate retention, found that academic achievement and academic self-efficacy, as well as contextual support for women, were critical for the retention of female science and engineering students. In science, students' self-efficacy beliefs about their abilities in different science tasks, courses, and activities affected the effort they expended, the perseverance they demonstrated after encountering difficulties, and the ultimate success they experienced [10], [11].

The contribution of Women in Science and Engineering (WISE) programs to improve STEM learning and persistence, particularly for underrepresented female students, is important in determining the role these programs play in improving self-efficacy and providing an environment where women can cultivate their skills and feel competent. Educational reform and policy initiatives that seek to improve the representation of women and ethnic minorities in STEM would do well to promote the influence of role models and mentors to increase the potential recruitment and retention of these women in STEM-related majors [12], [13]. Role models can shape positive attitudes and beliefs about STEM abilities and career outcomes [2], [14], [15]. Student engagement, academic or social, does not occur in a vacuum. With the goal of expansion and improvement of educational and professional STEM opportunities for female students by facilitating individual, institutional, and social change, this study was conducted as a preliminary effort to evaluate a formal peer mentoring program at a large research university. The overarching research question was: How does the peer mentoring aspect of a WISE Honors Program affect the academic and social integration of undergraduate women in science and engineering?

Theoretical Framework

Bandura's perspective on social cognitive theory provides the theoretical framework for this study [15]-[18]. Bandura suggested that individuals prefer tasks and activities in which they feel competent, confident, and capable. Bandura [17], [18] defined self-efficacy as judgment of capability, and referred to self-efficacy as "human agency" that extends to a collective power. Within social groups, shared beliefs in collective efficacy come from shared intentions, knowledge, and skills as well as the interactive and dynamic interactions between them. As a result, beliefs regarding collective efficacy function in a similar way to self-efficacy and operate through similar processes. According to Bandura [17], the collective performance of a social system involves the dynamic interplay of perceived collective efficacy as an emergent property of the social group. In a sense, people share the belief in their collective power to produce a desired outcome. Participation in social practices, or social integration, is a fundamental form of learning where a social display of cognitive competency through group participation serves as a mechanism for internalizing and practicing knowledge and skills [19].

Academic and social integration facilitated by mentoring relationships has been associated with decreased attrition rates for undergraduate STEM majors [20], [21]. Academic integration plays a pivotal role in the retention and graduation of students and can be measured in terms of grade performance and intellectual development during the college years [22]. While ability has been positively associated with college persistence, commitment to the goal of completion is the most influential factor in determining persistence [22]. A feeling of success and congruence in the academic environment may lead to increased motivation to study, which may lead to better performance, increased academic self-efficacy, and institutional commitment [23]. Learning communities are a way to combine academic and social aspects of an institution to help increase academic performance and retention, particularly in the transition from high school to college [24]. Learning communities that include mentoring encourage personal growth and positive social interaction and have been associated with increased self-confidence, satisfaction, and retention [9], [20], [21]. For students at large institutions, learning communities such as WISE create positive experiences and interactions with peers, faculty, and staff that enable students to better adapt to academic requirements by developing strategies that lead to long term success. Mentoring may facilitate a greater sense of connection and community by creating a support network, particularly at large institutions [25]. Peer groups also allow for students to observe coping strategies for stressful situations when working together to solve academic problems [26]. As students establish positive social relationships with peers, academic and social integration increases [23], [27].

Research Context

The study participants (N = 51) were WISE undergraduate first year students declaring science (n = 32) or engineering (n = 19) majors at Stony Brook University in the 2016-2017 academic year (Figure 1). Stony Brook is a large research intensive university enrolling 17,000 undergraduates, with slightly more than half of all students enrolled in STEM-related disciplines. Student gender distribution is 54% male and 46% female. The ethnicities of undergraduate students in 2017 were reported as 36% White, 23% Asian, 11% Hispanic/Latino, 14% Non-Resident Alien, 7% Black or African American, and 9% Other.

The WISE Honors Program offers educational and professional science, technology, engineering and mathematics (STEM) opportunities for undergraduate female students at the university by facilitating individual, institutional, and social change. The main goals of the program are to: (1) provide academic excellence; (2) promote professional development; (3) facilitate research opportunities; (4) establish and maintain community outreach; (5) encourage global collaboration; and (6) enact inclusive strategies. The four-year curriculum is designed to promote academics, research, service, and leadership. The WISE Honors Program is competitive and applicants must have a demonstrated aptitude and interest in science, technology, mathematics, and/or engineering (STEM) as evidenced by factors such as mathematics and/or science courses in high school, above-average grades, research or other relevant experience, above-average scores on the quantitative parts of the SAT or ACT examination, and/or an SAT science or mathematics achievement test. Incoming successful applicants have historically had 95-99 high school GPAs, 1350-1480 SAT (critical reading and math) composite scores, and 30-34 ACT composite scores. Strong applicants should have demonstrated interest in the WISE mission as shown by extracurricular activities, service and leadership.

The core of the WISE Program curriculum emphasizes not only academic excellence in STEM, but service and leadership with a deep and rigorous research and career focus. The WISE Honors Program is administered by a Faculty Director (Bugallo) who is a full-time Professor of Electrical and Computer Engineering, while WISE honors courses are taught by affiliated STEM faculty and staff. The majority of WISE students are residents who live together freshmen year in a designated dormitory, which is designed to promote social acclimation to campus and major. WISE first-year students all take one-credit introductory seminars on university life and STEM career planning; specific science and mathematics coursework varies by major, for example, engineering students begin with physics, mathematics, and introductory engineering. During the first year, WISE students joined five or six additional first year WISE students in a weekly study and discussion group led by an upperclass undergraduate mentor; the mentors were trained and monitored by WISE faculty and staff. First year WISE members attended evening programs specially designed to introduce and advise students to the opportunities in science and engineering both on and off campus.

Declared majors of WISE participants are summarized in Figure 1. Data were collected from a survey conducted at the end of the spring semester 2017 to collect baseline data and evaluate experiences and opinions of the WISE program and their academic and social experiences. Surveys were completed via Qualtrics and participants were assured their responses would be kept confidential.

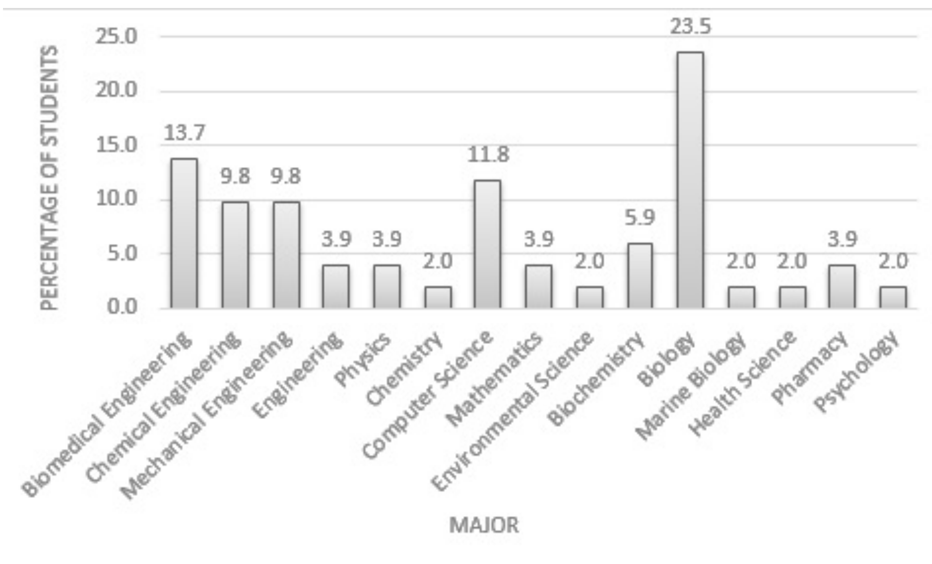

Figure 1. *Percentage of WISE first year students by major, 2016-17.*

Research Design

The researchers employed a convergent parallel mixed methods research design [28], with quantitative and qualitative methods for measuring programmatic impacts. The triangulation of quantitative and qualitative findings allows for more complete contextual analysis while increasing validity [29]. Self-efficacy, persistence, and engagement were measured by a survey adapted from the *Engineering Student Survey and Students Persisting in Engineering Survey* [30] for $N = 51$ first year female students in science and engineering majors. Survey responses indicated acceptable reliability, or response consistency (Cronbach's $\alpha = .80$). The survey measured reasons for majoring in science and engineering, social engagement, career intentions and goals, strategies for academic success, self-efficacy and confidence in meeting their academic goals. The instrument also included formative items designed to determine the level of respondent participation, persistence, engagement in the activity and overall satisfaction of the mentoring program. Student responses in open-ended questions and general comments were analyzed qualitatively to provide more nuanced interpretations of quantitative findings.

Data Analysis

Descriptive statistics (frequencies, means and standard deviations) were calculated from survey items and Pearson product-moment correlations were used to determine the strength and direction of linear relationships between feelings of academic success and social integration. Qualitative response data were analyzed through coding techniques to elicit key thematic elements; coding was conducted separately by the researchers' using response frequencies, and interrater reliability was established through extended discussions to reach 95% agreement. Interpretations were formulated collaboratively and key findings were summarized. Qualitative methods of analysis involved multiple stages of identification of interrelationships among categories and information derived from phenomenology with elements of grounded theory [31]. Grounded theory involves constant comparison of data with emerging categories to maximize similarities and differences between constructs. In the first phase, open ended responses were open coded by noting emerging ideas. These codes included participant perspectives on strengths and weaknesses in their roles as students, satisfaction in their roles as mentees, and strengths and weaknesses of the mentoring program. In the second phase of qualitative data reduction, axial coding was used to make connections between categories that focused on academic and social support from peer mentoring experienced by students.

Results

Quantitative findings

Study participants in the first-year mentoring program reported high levels of social activity with other students both within and outside of their academic majors. They were largely high performing academically (mean GPA = 3.56), and most preferred studying alone most of the time while also participating less often in study groups, mostly with other majors in their disciplines. Table 1 presents descriptive statistics for relevant items from the questionnaire adapted from the *Engineering Student Survey and Students Persisting in Engineering Survey* [30]. The self-reported ethnicities of WISE students indicated higher percentages of White and Asian students than the overall undergraduate population. GPA and percent of time studying during a typical week were normally distributed as assessed by histograms and q-q plots. Data were self-reported and not available for undergraduate women STEM majors who did not participate in WISE.

Table 1. *Participant Characteristics from the WISE Mentee Survey* (*N* = 51)

Characteristic	*n*	Percentage
Ethnicity		
Asian & Pacific American	21	41.2
Latino/Hispanic American	2	3.9
White American	26	51.0
Mixed	2	3.9
Social		
Leisure time with others interested in engineering, mathematics, or science	49	96.1
Leisure time spent with *other women* interested in engineering, mathematics, or science	48	94.1
Academic	***M***	***SD***
GPA	3.56	0.63
Percentage of time spent studying during a typical week		
Study practice	19.5	16.0
Studying alone	48.7	22.8
Studying with other students in my major	19.0	17.2
Studying with other students not in my major	12.6	16.6
Other "mentor"	0.6	3.1

Reasons for majoring in science or engineering. Students were asked to rank choices indicating their reasons for majoring in science or engineering. The primary reason for choice of major reported by 78% of first year female students (*n* = 39) engaged in the WISE program was that they were *good at math or science*. The second most reported reason at 70% (*n* = 35) was that they *wanted to be able to get a well-paying job after graduation*. Third, 54% (*n* = 27) reported that they *liked to solve problems*, and 44% (*n* = 22) reported that they were *attracted by challenge of a difficult curriculum*. The fifth most reported reason for majoring in science or engineering at 42% (*n* = 21) was to *use science or engineering to address social problems*.

Goals for participating in the WISE mentoring program. Students were asked to rank choices indicating their reasons for voluntarily participating in the mentoring program. The women reported that their number one goal for participating in the peer mentoring program (72%, *n* = 36) was to *help me do well in my major*. The second most reported goal at 58% (*n* = 29) was to *meet other students in my field*. The third most reported goal at 46% (*n* = 23) for participating in the WISE mentoring program was to *help me with career and job search skills*. Immediately after finishing their degree, 60% of students reported that they *expect to go on to graduate school*.

Confidence in meeting academic goals. Most participants (82%) reported that they felt confident to very confident that they would be enrolled in the College of Arts and Sciences or the College of Engineering and Applied Sciences in the next academic year, with 98% reporting that they felt fairly to very confident that they would complete any science, social science, or engineering-related degree and/or any degree at this institution. The breakdown of responses is shown in Table 2.

Table 2. *Percentage of Confidence Levels for Major and Degree* (*N* = 51)

Question	Not at all confident	Not confident	Fairly confident	Very confident
• Be enrolled in any major in CAS or CEAS in the next academic year	11.8	5.9	15.7	66.7
• Complete any science, social science, or engineering-related degree	2.0	0	27.5	70.6
• Complete any degree at this institution	2.0	0	19.6	78.4

0 = Not at all confident, 4 = Very confident

CAS = College of Arts and Sciences, CEAS = College of Engineering and Applied Sciences

Social integration. Nearly all (98%) first-year students in the WISE mentoring program reported that when they participated in science or engineering professional societies or extracurricular activities, they felt welcome, while 88% reported enjoying working with other students on academic activities outside of classes. Most (80%) had many friends who were studying within their discipline. Faculty office hours were attended once per week by 26% of students, while 63% reported that they somewhat disagreed or disagreed with attending office hours once per week. Some participants (43%) reported that they had family members or close family friends who were engineers or scientists.

Coping strategies. Students ranked their top three reactions to challenging academic situations. For one item, *when I have difficulties with one of my professors, I..* the number one ranked reaction (90%) was *talk to a friend about it.* Most (63%) reported the second choice as *talk to my academic adviser about it* and the third most popular response (51%) was to *do nothing*. Another item asked students *when I have difficulty deciding what classes to choose in the next semester, I…,* and the top ranked reaction (96%) was to *talk to my peers/friends in the same major*. The second ranked response (90%) was to *talk to an academic adviser* and the third most ranked response (74.5%) was *to make the best decision on my own*. Students were asked to describe and rank order reactions *to if I were on a team and had difficulty with one or more of my team members, I would…* first, with 78% responding they *do the best I can to work effectively on the team*. The second ranked response (67%) was to *gather the entire team and try to solve the problem*, and the third ranked choice (60.8%) was to *talk to the course professor or TA about rectifying the problem*. The item, *if I just found out I had performed poorly on an exam in class that is critical to my major, I would…,* had top-ranked (94%) reaction of *talk to a friend about it*, second ranked (78%) was to *talk to the professor*, and the third ranked (67%) reaction was to *talk to an academic adviser* about it.

Self-efficacy of academic and social integration. To assess self-efficacy statements regarding academic and social integration, we asked participants to rate their agreement with eight statements concerning relationships and success in their studies. Respondents rated both the extent to which they personally agreed with the statements and the level of importance (Table 3).

Table 3. *Mentee Perspectives on Studying Engineering, Science, Technology, or Mathematics*

Item Statement	Mean	SD	Level of Agreement
I can relate to people around me in my classes.	4.4	1.5	Slightly agree
Importance rating	2.9	1.0	Important
I can succeed in my major curriculum.	4.8	1.2	Agree
Importance rating	3.5	0.8	Very important
I have a lot in common with other students in my classes.	4.3	1.4	Slightly agree
Importance rating	2.5	0.9	Neither
Someone like me can succeed in a career related to my major.	4.9	1.5	Agree
Importance rating	3.4	0.8	Important
The students in my classes share my personal interests.	4.3	1.7	Slightly agree
Importance rating	2.2	1.0	Neither
I can succeed in my major while not having to give up participation in my outside interests (e.g., extracurricular activities, family, sports).	4.0	1.7	Slightly agree
Importance rating	3.2	0.9	Important
I can relate to people around me in my extracurricular activities.	4.8	1.5	Agree
Importance rating	2.9	1.0	Important
I can make friends with people from different backgrounds and/or values.	5.4	1.0	Agree
Importance rating	3.1	0.9	Important

Statement scale: 0 = Strongly Disagree, 6 = Strongly Agree
Importance scale: 0 = Very Unimportant, 4 = Very Important

To further explore social and academic integration, a Pearson's product-moment correlation was performed to assess the relationship between one item, *Having many friends studying in my discipline* and the self-efficacy statements of academic and social integration presented in Table 3. There were moderate positive correlations between having many friends studying in the same discipline and *I can succeed in my major curriculum*, $r = .44$, $p < .01$; *I have a lot in common with other students in my classes*, $r = .31$, $p < .05$; *Someone like me can succeed in a career related to my major*, $r = .37$, $p < .01$; *The students in my classes share my personal interests*, $r = .39$, $p < .01$; *I can succeed in my major while not having to give up participation in my outside interests (e.g., extracurricular activities, family, sports),* $r = .33$, $p < .05$; and *I can relate to people around me in my extracurricular activities,* $r = .28$, $p < .05$.

Qualitative findings

The coding analysis generated two major themes. First, the freshman women in the WISE program frequently reported strong relationships with mentors and study groups and the value of social support for advice, guidance, and a sense of belonging. The mentors typically shared the same major with most of the young women in their groups. Second, participation in the program and peer mentoring sessions provided academic support and advantages with increased access to research and internship opportunities, study strategies, and the benefit of early registration to secure first-choice classes.

Social support. Many women expressed increased social integration and a high degree of satisfaction with the program, particularly with friendship for new students entering a large university. One biology student commented, “WISE has been great so far since I've met some of my closest friends due to this program,” while a chemical engineering major said, “I think WISE is very helpful program in guiding us to do well and for providing a support system as a first-year student. It also helped me meet lots of new people in and out of my field that I share common interests with.” Participants felt the social support was a vital component to assimilating in the first year, with the mentoring program having a positive impact. One participant, a marine biology major, contextualized the importance of the mentoring program in relation to other experiences in WISE:

> So far, I am very satisfied with the WISE program. Strengths include the solid foundation offered by our advisors and the camaraderie created by connecting a small group of girls initially entering a big school. The best part, in my opinion, is the mentoring program. My group was a huge positive impact on my first year here.

Feelings of isolation in male dominated classes seemed to be countered by the support and friendship provided by participation in the program. As one mechanical engineering student stated, “I am satisfied with my participation in WISE. I have support and friendship of women who are both in my major and going through similar situations…it is sometimes hard to be a woman and stand up for things in male dominated classes.” This camaraderie from peers and advice from upperclassman seemed to help the first-year female students in science and engineering cope with the academic and social stressors within their majors, as reported by a general engineering student:

> I like how the other students in the program are like-minded as me, and understand the struggles/challenges I face not only as a woman in STEM, but simply as a college student. Not only that but the upperclassmen WISE students have a lot of experience and wisdom. I find that they're always willing to give advice on just about anything.

Mentoring seemed to contribute to a social self-efficacy by providing different avenues to interpret and experience the institution’s social environment. Mentoring exposed students to new opportunities and helped students self-determine their own academic success, as reported by a pharmacy student:

> Being a WISE mentee was one of the best experiences I have had being in the WISE program. I met a lot of students who are taking the same courses as me, worked together on homework, made friends, and had fun at the same time. Having a WISE mentor was very helpful and meeting with my WISE mentoring group for 4-6 hours a week made me more productive and through it, I got to know everyone better. That bond would not have been possible if we did not meet every week for a few hours.

The support, referrals, and information provided by mentors in the small group settings functioned as a learning community and facilitated social adaptation and academic integration contributing to success in the freshman year. An environmental science student stated, “I feel like the best advice you can get in college comes from other students who have recently experienced the things I am about to go through. Mentoring helped me a lot with planning my schedule and finding class resources.” The formal peer mentoring provided an opportunity for first-year science and engineering students to address problems, unknowns, needs, and develop coping strategies encountered during exposure to a large campus setting for the first time. As a chemical engineering student commented, “Not only did I meet a lot of hard working students who encouraged me to improve my skills, but I made a lot of friends as well. This program has given me a lot of valuable experiences that I would not have had otherwise.”

With encouragement and support by an upperclassman mentor and a peer group within the same major and specialty in science and engineering, students established positive social relationships and a sense of increased confidence within a community of likeminded peers. One biology major shared many positive personal outcomes from her experience as a mentee:

> I am extremely satisfied as a WISE mentee. My mentor always checks in on us and makes sure we are physically and mentally doing okay and she is always there even when we just need to talk or vent. She was very helpful in the class selection process and has had extensive experience with the school, the major, and the professors which made it that much more helpful. We also do fun things outside of just school work to break mentoring up, such as get food, which allow us to connect to the other girls in our mentoring group on a more personal level.

Academic support. Participating in a formal mentoring program where students met weekly for 4-6 hours per week facilitated a sense of connection and community by creating a social support network that benefitted each participant academically. This was particularly notable since many students had to adjust to a rigorous academic workload in addition to college life itself. One chemical engineering major commented on the helpful programmatic guidance and inspiration from students with strong work ethics and commitment:

> Being in WISE was very helpful, especially having another academic advisor to help you and participating in events that help you make your schedule for the following semester. Not only did I meet a lot of hard working students who encouraged me to improve my skills, but I made a lot of friends as well. This program has given me a lot of valuable experiences that I would not have had otherwise.

The peer mentoring and social connections that were made promoted a deeper level of interaction between women in similar majors in science and engineering, fostered communication, and increased opportunity for academic growth and intellectual development. One mathematics student recognized the positional advantage offered by having access to research opportunities and mentoring:

> I appreciate WISE for giving me opportunities in the research fields, it allows me to go ahead of others that are not in the program. Also the mentoring sessions allow me to focus on my work and I was able to gain a lot of help and advice

> from my mentor. In general, this program is very beneficial to me in my academic career and I appreciate what it has offered to my academics.

The only drawback to the program that was reported by the first-year science and engineering students was the time commitment, however, the benefits of the formal peer mentoring program seemed to outweigh any concerns with mandatory attendance at sessions. One biology and psychology major rationalized the cost of the time commitment with respect to the advantages she perceived from her participation:

> Mentoring was the one thing in WISE that I really enjoyed this year. Although it was a lot to meet for six hours in the first semester, it made me get work done during that time and it made me focus on a certain task for some allotted time during the week. It also helped a lot that all the girls in my group were my own major, including my mentor. It also gave me a great outlet to meet people and become friends with people, who also happened to be in my major. My mentor also helped a lot with advice for my major and what classes to take. Overall, mentoring this year was a good experience. Although six hours was a lot, I think that a smaller amount of time is necessary but it still should be enough to foster an environment where the groups can get to know each other well and have a support system to fall back on if you need anything.

While the time commitment for formal peer mentoring seemed to be a drawback at first, the students developed positive attitudes about the mandatory small group meetings that benefitted them academically and socially. Two women, the first a mechanical engineering student and the second a biochemistry major, shared their enthusiasm for become more socialized and focused by participating in the mentoring program, which seemed to increase their overall academic commitment:

> I really enjoyed being a part of the WISE mentoring program. Even though six hours for the first semester was a very large time block to commit to, I really enjoyed having that time dedicated to mentoring and not being able to just do something unproductive. Mentoring was great for me in particular because I had a great group of girls in my group who are now some of my closest friends in WISE.

> I think mentoring has been a benefit to me and being able to get advice and guidance from an older student in my major has been really helpful when going through problems and struggles as a first-year college student. Having a dedicated six and then four hours of mentoring really helped me develop study patterns and get to know my peers and mentor better during my first year.

Discussion and Conclusions

Formal peer mentoring encouraged positive social interaction, fostered academic skills, and provided emotional support with academic guidance as peers shared their experiences in a learning community of likeminded women studying science and engineering. Ability, as evidenced by the mean GPA of 3.56 in this sample was one of the individual characteristics that has been shown to be associated with persistence in college [22]. Once ability was considered, the commitment to the goal of completing a science or engineering degree was evidenced by nearly all reporting confident to very confident in completion. Academic and social integration were supported with the number one goal of entering the WISE mentoring program, which was to *help me to do well in my major,* with a secondary goal of *meet students in my field*. Social integration was evidenced by 98% of freshman women in science and engineering reporting that they felt welcome when participating in science and engineering extracurricular activities and over 80% indicating they had friends studying within their major disciplines. Social integration and a sense of belonging was also evident in reactions to difficulties with the majority reporting they would talk to friends regarding difficulties with professors and choosing to speak with an academic adviser about a difficult situation. Similar reactions to group difficulties or exam performance within the major also showed that turning to friends and academic advisers were the number one and two coping strategies.

Academic integration and self-efficacy in science and engineering were evidenced by the majority of participants agreeing that they could be successful in their major curricula and in careers related to majors. Feelings of success were rated as very important to the first-year students. Significant correlations between success in majors and careers with having many friends in the academic disciplines suggest that the first-year female science and engineering students successfully integrated into a large university academically and socially, with participation in the mentoring program playing a large part in their success.

Qualitative findings showed that academic and social engagement provided by formal peer mentoring had a positive impact on the freshman women, facilitating a sense of belonging, opportunities, networking, early enrollment, in addition to the social gains as a result of participation in the program. Preliminary findings indicate that the academic and social engagement provided by peer mentoring aspects of the program may be positive predictors of retention for first year female students in science and engineering.

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