

**2006-1709: DEVELOPMENT AND IMPLEMENTATION OF A PEER MENTORING PROGRAM FOR WOMEN IN ENGINEERING STUDENTS**

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## **Development and implementation of a peer mentoring program for women in engineering students**

### **Abstract**

The College of Engineering at the University of Arkansas is composed of approximately 1600 undergraduate students. Approximately 18 percent of those students are women, although the percent of female students varies widely from department to department. We developed and implemented the Society of Women Engineers (SWE)/Women in Engineering (WiE) Peer Mentoring Program to increase retention of our women in engineering students. The program was implemented in August of 2005, and at the time of paper submission, we have completed one semester of events. The peer mentoring program pairs freshman and transfer women in engineering students with upperclass women in engineering students to help ease the transition from high school to college and provide guidance and information that will assist students in dealing with common first-year student issues as well as issues they may face as a female student in a male-dominated discipline. Students who do not feel like they fit in and feel like they may be being discriminated against may lose confidence in their ability to succeed. However, research has demonstrated that students who had mentors were more socially integrated into academic programs and felt like they belonged more than their non-participatory counterparts. Mentors can help freshman and transfer students better integrate socially into their chosen program, help them develop ties with faculty and staff, and share knowledge of how the program functions. We currently have over sixty students who have expressed interest in being a part of the SWE/WiE Peer Mentoring Program, with the number of mentors and mentees being approximately equal. To recruit mentors for our program, an e-mail was sent to all women who were enrolled in the College of Engineering during spring semester. Anyone who was interested in participating was asked to fill out a brief questionnaire. To recruit freshman and transfer women to the program, a representative spoke in each of the "Introduction to Engineering" classes for each department in the College of Engineering to inform them about the program and its benefits. An e-mail was also distributed to the women enrolled in these classes where they too were asked to fill out a questionnaire if they were interested in the program. We are planning to offer two more mentoring events through fall semester with more events to follow in spring semester. For next year, our goals are to recruit mentors throughout summer, contact incoming women in engineering students early by mail and e-mail, pair up students before the school year starts and have the first contact between mentor and mentee occur before classes start in the fall.

### **Introduction**

Women have comprised more than 50% of the enrollment in four-year colleges throughout the United States since 1978, and yet women only comprised 20.3% of total undergraduate enrollment in engineering programs in 2003-2004 <sup>1</sup>. In 2001, women earned 57.4% of all bachelor's degrees in the U.S, but only 20.1% of engineering degrees <sup>2</sup>. Our goal is to retain as many of the women who enroll in engineering as possible since our starting numbers are currently not high. Mentoring programs provide a way to help retain these students through mechanisms that benefit the student. Mentoring has been defined by Dr. Emily Wadsworth as

significant personal and professional assistance given by a more experienced person to a less experienced person during a time of transition, for example, the transition from high school to a university<sup>3</sup>.

The most critical time for student retention is the first year of study<sup>3</sup>. Students who do not feel like they fit in and feel like they are being discriminated against may lose confidence in their ability to succeed<sup>4,5</sup>. Women also report lower levels of self-efficacy than men in math, engineering and physics even though they have similar or higher grades than their male colleagues<sup>6,7</sup>. A major reason that female students transfer out of engineering is because of feelings of isolation and incompetence. Because of this fact, mentoring programs are needed to provide female students in engineering with role models, a peer support network, affirmation of their self-esteem, tools and strategies for success, and encouragement to persevere and persist<sup>3</sup>. Mentoring programs can give students the opportunity to make contacts with others so they know they are not alone in finding courses difficult or in their perceptions of the environment<sup>8</sup>. Research has found that students with mentors were more socially integrated into academic programs and felt like they belonged more than their non-participatory counterparts. Mentors may offer students advice and tips on studying, and “insider” information on the dynamics of how the learning process differs from high school. This helps students adapt better to program and classroom requirements. Mentors can also help freshman and transfer students better integrate socially into their chosen program, help them develop ties with faculty and staff, and share knowledge of how the program functions. This provides new students with a greater sense of belonging and less isolation<sup>4</sup>.

To retain more of our female engineering students in the College of Engineering at the University of Arkansas, we implemented the Society of Women Engineers (SWE)/Women in Engineering (WiE) Peer Mentoring Program in fall semester 2005. This program was designed based on experience the author had with a similar peer mentoring program at The Ohio State University (OSU) and from communication with the Women in Engineering Program Coordinator at OSU. At the time of submission we have completed one semester of the program and are planning our second semester. The goals of our program were to:

1. Increase the retention of women in engineering
2. Introduce freshman and new transfer women in engineering to their peers
3. Ease the transition from high school to college for incoming freshman women in engineering students
4. Provide guidance and information to address common issues faced by first-year students
5. Provide a forum for discussing issues commonly faced by women in engineering and how to appropriately handle these situations

The goals of program evaluation were to:

1. Determine if the program benefits students
2. Determine whether participation in the program increases female engineering student retention as compared with non-participants
3. Determine what changes should be made to the program to better meet the needs of the student participants

## **Women in Engineering at the University of Arkansas**

In fall semester 2005, the total undergraduate engineering student body was composed of 1561 students and 122 faculty members in seven departments. Female students make up 14.7% of the undergraduate engineering student body. This value falls below the 2003 national average of 20.4%. The highest percentages of undergraduate women were enrolled in the Biological Engineering, Chemical Engineering and Industrial Engineering Departments with 37.0%, 30.1% and 27.6%, respectively. The College of Engineering faculty is composed of 11.5% female faculty, with the highest percentages of female faculty in Industrial Engineering, Electrical Engineering and Biological Engineering, respectively.

### **Recruiting Mentoring Program Participants**

Mentors for the SWE/WiE Peer Mentoring Program were recruited via e-mail at the beginning of fall semester 2005. If the students expressed interest, they were asked to fill out a brief informational questionnaire to better pair them with a mentee with similar interests and background. The e-mail solicitation was sent to all undergraduate and graduate women enrolled in the College of Engineering at the end of the spring semester 2005.

Presentations were made to all “Introduction to Engineering” courses offered by each department in the College of Engineering to recruit freshman and transfer students to be mentees in the program. The benefits and goals of the program were briefly summarized at the beginning of their class, and a follow-up e-mail was then sent out to all freshman and transfer students enrolled in one of the Introduction to Engineering courses. Interested students were asked to complete a similar questionnaire and submit it electronically.

Ultimately, we had a total of 57 participants in the SWE/WiE Peer Mentoring Program. There were 29 mentees (6 transfer students, 23 freshmen), and 28 mentors. We had the highest percentage of mentees from Biological/Biomedical Engineering and Chemical Engineering, 27.6 and 24.1% respectively. The lower numbers in Industrial Engineering may be attributed to the fact that they offer their own mentoring program as a department for incoming freshmen.

### **Peer Mentoring Program Events**

Mentor training was the first “event” offered through the SWE/WiE Peer Mentoring Program. Sixteen potential mentors attended the event which was aimed to refresh their memories about their freshman year and common first year issues as well as provide them with information that would be helpful to them as mentors. A PowerPoint presentation was given discussing common first year issues such as homesickness, learning to live with a roommate, time management, developing study habits, etc. Following the presentation, mentors were presented with a packet of information including pertinent articles on mentoring and women in engineering and contact information for resources on campus including the student health center, counseling and psychological services (CAPS), and the conflict resolution office. They were also provided with information that would also be distributed to the mentees including a bus map, library

information, tutoring center information, important dates for the semester, information on each engineering department, and contact information for advisors for each department.

The first event where mentors and mentees had an opportunity to meet was organized around a tour of the physical fitness facilities available to students on campus. Students had a chance to meet with other women in their department and introduce each other to the group. At this time, mentors were not officially assigned to specific mentees, instead, women were grouped by department and allowed to ask questions and talk freely about suggested topics to learn about one another. Following the students getting to know each other, interested students were given a tour of the workout facilities and provided with information on the various activities available to them as students to help them de-stress and stay healthy. A total of 29 women attended the event, 16 mentees, and 13 mentors. All mentees were provided with an informational packet similar to the one provided to the mentors with contact/general information about services available to them on campus.

Our second event was a follow-up activity for those interested in the program but unable to attend the first event. It was scheduled to start before the Society of Women Engineers (SWE) student meeting so students could get their information packets, meet some other women in engineering and then attend the SWE meeting. Approximately ten students were expected to attend, but the turn-out was phenomenal with 32 participants in attendance (17 mentors and 15 mentees). Once again students were grouped by department to discuss how classes were going, and touch base with each other. New participants were given an informational packet as well. Over 60 women then attended the SWE meeting, our best turn out ever.

Our third scheduled event was an informational event to help students with class scheduling for the upcoming spring semester. Advisors from each engineering department were invited to meet with students and help them determine their course plan before the scheduling window opened. This way students had the highest probability of ending up in the correct class and not getting blocked out because the class was full. At the completion of the advising session, a woman from the campus physical fitness facility came and led the participants in a series of relaxing stretches and yoga poses for stress relief options during mid-term exam week. Nineteen women (9 mentors, 10 mentees) attended this event and many thought it was the most helpful event overall.

The final event of the semester was designed to be a low-stress social event scheduled at the local bowling alley. All women in engineering were invited to attend. Since the event was off-campus, transportation was arranged for those without cars. The turn-out was lower for this event than the other three, but it was the end of the semester and students were busy finishing projects and studying for finals. In all, 11 women attended the bowling event, and all were part of the Peer Mentoring Program.

### **Program Evaluation**

Immediately before the beginning of spring semester 2006, surveys were e-mailed to the SWE/WiE Peer Mentoring Program mentors and mentees. Surveys were e-mailed to all women who completed a questionnaire, or who attended at least one event and provided their contact information. Results were kept confidential and surveys were printed out to prevent their

information being connected to their names. Participants were asked to rate certain statements on a scale of 1 – 5, with 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree. Select results are presented for mentors and mentees (Table 1 and 2).

Table 1: Averaged mentee scores for selected questions on evaluation (n = 3)

I think that this is an important and valuable program and I am glad I had the opportunity to participate	4.7
I would recommend this program to other freshman and transfer women in engineering	4.7
I enjoyed attending the SWE/WiE Peer Mentoring Events	4.3
I found Peer Mentoring Events helpful	4.7
I enjoyed socializing with other women in engineering	5.0
I enjoyed socializing with other women in my department	5.0

Table 2: Averaged mentor scores for selected questions on program evaluation (n = 9)

I enjoyed attending the SWE/WiE Peer Mentoring Events	4.2
I would have participated in a program like this if it had been available to me as a freshman woman in engineering	4.1
I would recommend this program to other women in engineering students	4.8

We believe that the low number of respondents was due in part to the time of the semester that the survey was sent out, and because many of the students did not understand that we wanted them to fill out the evaluation regardless of their plans to participate in the program the following semester. We also asked those students who showed interest in the program, but did not participate, to let us know why they did not end up attending any events. Generally, the students who replied to the evaluation were those students who attended a majority of the mentoring program events the semester before and were active in the program.

Over the last few years, the percent of first-year women retained after their first semester was declining. Table 3 shows the trend our first-year student retention was following, including the retention of first-year women who participated in the SWE/WiE Peer Mentoring Program.

Table 3: Retention information for first-year engineering students, first-year female engineering students and for participants in the SWE/WiE Peer Mentoring Program. Data are for retention after their first semester of coursework.

School Year	Percent of First-Year Engineering Students Retained	Percent of Female First-Year Engineering Students Retained	Percent of SWE/WiE Peer Mentoring Program First-Year Student Participants Retained
Fall 2003 - Spring 2004	81.2	80.9	---
Fall 2004 - Spring 2005	79.3	75.0	---
Fall 2005 - Spring 2006	77.8	77.2	78.6

## Conclusions

We believe the SWE/WiE Peer Mentoring Program was very successful for our first semester attempt at a peer mentoring program for undergraduate women in engineering. We have come to this conclusion based on our evaluation as well as anecdotal evidence. We had a remarkable turn out for many of our activities, and overall the students enjoyed the experience and found the mentoring events helpful. According to feedback from the evaluations distributed, the women enjoyed spending time with other women in engineering and in their department. A majority of mentors who responded to the survey would have participated in a program like this if it had been available to them as freshman women in engineering. All mentees who responded would recommend the program to other students, and all respondents expressed an interest in participating in the program this upcoming semester.

## Future Work

For next fall we look forward to having some changes implemented to improve the program. A handbook will be created to provide all necessary information to mentors and mentees in a more concise format. We will be soliciting interested mentors before the end of spring semester and

obtaining summer contact information. To solicit interested mentees, we will be sending information via regular mail and e-mail over the summer once they have been officially accepted into the College of Engineering. Once we have this information, we will be assigning mentors and mentees and initiating mentor-mentee communication before the students arrive on campus for fall semester. To better evaluate the program in its first year, we will distribute a survey at the end of spring semester, and examine retention rates for the entire year. We will also be incorporating suggestions from the students who participated in the program to make it a more effective program that is ultimately more useful to them.

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