

## **An Integrated Program to Recruit and Retain Women Engineering Students**

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### **Abstract**

The need for efforts to recruit and retain women in engineering is well known, and many programs to bring women into the engineering profession have been proposed and implemented. Unfortunately, in spite of those efforts, the percentage of women in engineering schools and among practicing engineers continues to hover around 20% and 10%, respectively.

At Ohio State, we undertake many of the recruitment programs that serve broad audiences, such as workshops, campus visits, and printed materials. In addition, however, we conduct programs that focus on recruiting women from high schools known to provide them with the skills necessary to study engineering and on integrating those programs with others designed to retain women who have chosen to study engineering. This paper documents the suite of recruitment and retention programs at Ohio State; several of which were supported, in part, by the Gateway Engineering Education Coalition.

### **Introduction**

Our society is becoming increasingly reliant on technology, and as a result, there is an increasing demand for people with training in technical fields, particularly engineering. Young women form a substantial and largely untapped pool of potential engineers that could help to meet this growing need. In addition, employers are eager to hire women engineers who often provide different perspectives from their male colleagues, helping their companies to develop innovative products and services.

One of the primary goals of the Women in Engineering Program at The Ohio State University is to increase the number of women graduating with degrees in engineering. Meeting that goal requires both recruiting - increasing numbers of women engineering students, and retention - ensuring that those who do enroll complete their degrees.

The Women in Engineering Program has three integrated sets of programs to recruit and retain women engineering students. The first set of programs focuses on women attending the 25 Ohio high schools that historically send the largest number of engineering students to Ohio State. These schools typically have strong math and science curricula and large numbers of male and female students with the academic preparation required for success in engineering. Successful recruiting at these schools can immediately increase the number of women engineering students. The second set of programs is designed to make young women attending other high schools and those still in junior high aware of engineering as a career option and to encourage them to take the courses that will prepare them to study engineering. In the long run, these programs will also result in larger numbers of women in engineering. The third set of programs is designed give women engineering students the support and encouragement they need to remain in the engineering program and to complete their degrees.

Each of these three sets of programs is described in more detail in the remaining sections of this paper.

### **Recruiting from the Top 25 Ohio Schools**

The top 25 Ohio schools are sent a newsletter twice a year. This newsletter contains information on programs suitable for high school students interested in engineering; websites with projects for teachers to use in the classroom; and information on what engineering is, typical careers, statistics, and college admission application deadlines. The high school contacts are encouraged to access the Women in Engineering website (<http://wie.eng.ohio-state.edu/>) which contains additional information useful to prospective women engineering students, parents, and high school personnel. Personal contact with these schools is made either by the Director of the Women in Engineering program, current engineering students, alumni, or a combination of these. Current engineering students are encouraged to participate in “Holiday Homecoming” – a program where the current engineering student visits her high school over the break between Autumn and Winter quarters. She is given a suggested list of topics as well as Women in Engineering (WiE) recruitment brochures. These brochures outline the WiE programs available to prospective and current women engineering students and descriptions of engineering majors. The Director of the Women in Engineering program visits Ohio high schools and is typically accompanied by current engineering students and alumni working in the area. Depending on the requests of the school, the format is either a 30 minute presentation followed by 15 minutes of questions and answers given to a large group of male and females or a luncheon involving 10-20 female high school students and their teachers with informal conversations with the engineers and students. Targeting the feeder high schools is different approach to recruiting students into engineering. Since it is new program, there is no qualitative assessment at this time but 11 of the high schools have been visited so far.

### **Recruiting – Long-Term Programs**

Recruiting women engineering students is a daily task within the College of Engineering at Ohio State. The Director of Women in Engineering meets, writes to, or talks by phone with several individual women who are prospective engineering students each day. However, some programs are designed to reach large groups of young women. Four such programs are described below.

Weekend for Women: High school junior and senior women interested in engineering and architecture are invited to OSU for a weekend in Autumn and Spring to learn more about Ohio State and engineering at Ohio State. On Friday, the women and their parents, will get a tour of the engineering or architecture campus and will get the opportunity to meet and ask questions of faculty, advisors, and current engineering students. The women will also get an opportunity to see what dorm life is like by staying with a current student in the dorms. The weekend continues on Saturday with the Engineering/Architecture Open House. The first Weekend for Women was held in May 2001 with 67 high school juniors and their parents. In December 2001, a Weekend for Women for high school seniors was held with 38 in attendance (due to the September 11 tragedies and home OSU football games, the event had to be moved to December which probably affected attendance). The next event is scheduled for May 2002. Evaluations are given

to each student during the event in order to receive feedback from the high school students and parents. As a follow up, students are contacted via e-mail once a quarter giving them information on events and deadlines and giving them another opportunity to ask questions about engineering and Ohio State. Texas A&M (<http://www.tamu.edu/west/>) currently has a similar program. Tracking will be done to see how many of the participants enroll in Engineering at the Ohio State University. Autumn 2002 enrollment is the first quarter to benefit from this program.

4-H: The College of Engineering participates in the Ohio 4-H Youth Expo each summer. About 400 4-H members from around Ohio, ages 14-17, usually about 60% women, are involved with the Expo. The focus is on career exploration and community service. Students select one area from 20 that they are interested in exploring. In July 2001, the Director of Women in Engineering coordinated hands on workshops for 12 4-H students. The first day involved hands on exercises in three different areas of engineering. The second day involved a community service project – the students learned about the design and maintenance of bridges through staining a local foot bridge. Evaluations are given to all participants and students are given an opportunity to provide their mailing address for further information and for tracking purposes. The next event is scheduled for June 2002. This event is a unique opportunity to expose students to engineering and 50 percent of 4-H participants are female.

Girl Scouts: In July 2001, the Women in Engineering Program hosted 90 local Girl Scouts (7<sup>th</sup>, 8<sup>th</sup>, and 9<sup>th</sup> grade) as part of the nationwide program Girl Scout Wider Opportunity. Students spent the day doing hands on activities. They created their own web page, did chemistry experiments, learned how a toaster works, used Microsoft Encarta® Encyclopedia software, and designed buildings using architecture software. In July 2002, 500 Girl Scouts will be attending similar workshops. Evaluations are given to all participants and students are given an opportunity to provide their mailing address for further information and for tracking purposes. Several universities have similar programs: Pennsylvania State University (<http://www.engr.psu.edu/wep/>), Lawrence Technical University ([http://www.ltu.edu/news/pr\\_jan18\\_scouts.html](http://www.ltu.edu/news/pr_jan18_scouts.html)); University of Colorado at Boulder ([http://www.colorado.edu/engineering/k12\\_precollegiate.html](http://www.colorado.edu/engineering/k12_precollegiate.html)); and Miami University (Karen Schmahl; 1996 ASEE Annual Conference Proceeding).

College Bound Summer Institute: The College Bound Summer Institute is a summer program for all pre-college students, six years and older. University faculty and other educators provide dynamic learning activities offering the students a well-rounded, individualized schedule of academic and recreational activities. The students learn first-hand the importance of a college education and are taken on tours to visit several departments, laboratories, learning/cultural centers, and athletic facilities on the OSU Campus. In August of 2001, the Women in Engineering program hosted a half day workshop for 20 students (10 of them female) where students designed cameras for children and redesigned a paper clip. Evaluations are given to all participants and students are given an opportunity to provide their mailing address for further information and for tracking purposes.

## **Retention**

Typically, fewer than half of the students who enter college with plans to become engineers complete an engineering degree. The number of young women choosing engineering as a major is small, and it is important to do all that is possible to encourage those who are truly interested in engineering to complete their degrees. Five programs implemented at Ohio State to increase the retention rate for women engineering students are briefly described in this section.

Summer Workshop: Women accepted to Ohio State with a major in Engineering are eligible to spend the week in the Summer at Ohio State learning all about engineering and Ohio State. This workshop gives the women an opportunity to meet other women who will be studying engineering at Ohio State in the autumn, meet engineering faculty, learn about the different engineering programs, work in groups on engineering experiments, and get to know the OSU campus. They spend the week visiting different engineering departments and doing many hands-on activities. For example, in Mechanical Engineering they designed their own rockets out of 2-liter bottles and used water to shoot them off. In Industrial, Welding, & Systems Engineering, they designed and made their own candlestick holders. Tracking of students' GPA's and enrollment will be done to see the impact of the program as compared to students that did not participate in the program. Several universities have similar programs: Arizona State University (<http://www.eas.asu.edu/~wise/>); Cornell University (<http://www.engr.cornell.edu/>); Stevens Institute of Technology (<http://attila.stevens-tech.edu/lore-el/>); University of Maryland (<http://www.engr.umd.edu/wie/>); Ohio University (<http://www.ohiou.edu/>); University of Massachusetts (Nancy Bottone Hellman; 1996 WEPAN Conference); and University of Dayton (<http://www.engr.udayton.edu/>).

Personal Monitoring: The Director of the Women in Engineering Program closely monitors every students' academic progress and grades. Contact is made with every student during and after each quarter – contact is either in person, over the phone or (most common) e-mail. Some students are congratulated for good grades while others are contacted to encourage a future meeting to discuss poor grades. Every student receives an e-mail on their birthday. The Women in Engineering staff also offers advising to any student on a walk-in basis. A newsletter is published every quarter and a bulletin board and web page (<http://wie.eng.ohio-state.edu/>) are updated regularly keeping the students up to date on the events going on with the WiE program.

Peer and Alumni Mentoring: The Peer Mentor program pairs a first year female engineering student with a current student. This pairing gives the incoming students the opportunity to ask questions throughout their first year at OSU and to meet other incoming students through the Peer Mentor activities. Each pair is also matched with an alumni mentor. 176 students participated in the 2001-2002 program along with 43 alumni mentors. Quarterly evaluations are given to evaluate the overall program and also the social events. Tracking of students' GPA's and enrollment will be done to see the impact of the mentoring program as compared to students that did not participate in the mentoring program. The Women in Engineering program is also a campus participant in the nationwide MentorNet e-mail mentoring program.

Seminar Course: The Women in Engineering Program offers a course, Engineering 195, during Spring quarter on women in engineering. During this course, women engineers come in each week to share their experiences as an engineer. This course gives the students a better understanding of what engineers actually do on the job, the different directions an engineering

degree can take them, and good ways to balance a career and family. 40 students participated Spring 2001. Evaluations are given to each student after each speaker in order to receive feedback for future years.

Scholarships and Awards: Outstanding women engineering students are given special recognition at the annual WiE banquet. Cash awards sponsored by industries are given for outstanding academic achievement and leadership. The banquet also gives the women the opportunity to meet industry sponsors who are eager to speak to students about opportunities at their company. Scholarships are also awarded to first year students as a recruitment tool.

## **Conclusions**

The demand for engineers is increasing, and one of the largely untapped talent pools from which future engineers may be drawn are the nation's young women. Increasing the number of women earning engineering degrees is a complex task. It requires not only recruiting women for our engineering schools but also providing, or helping the women develop, a supportive network that will increase their chances of successfully completing an engineering degree.

Different women respond to different types of recruiting and retention strategies. It is important for engineering schools to have a variety of recruitment and retention programs so that each woman can participate in the one that is most valuable to her. Integrated recruitment and retention programs in which current engineering students help to mentor younger students and recruit pre-college women not only provide a service to the younger students but also help to link the more senior students to the College of Engineering and the engineering profession. Such an integrated program should result in both a larger number of women entering engineering and more women earning engineering degrees.

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# Recruitment

## Junior High

- Girl Scout Program
- College Bound



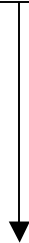
## High School

- Weekend For Women
- Visits To Ohio State
- 4H



## Transition

- Summer Workshop



# Retention

## Counseling



## Freshmen Mentoring Program



## Upperclassmen

- Engineering Seminar Course
- Plant Trips
- Recognition Banquet