Retention Discussion

INCREASING RETENTION THROUGH
A YEAR-LONG ORIENTATION PROGRAM

Barbara Bogue

Abstract—To increase retention of women engineering students, the Women in Engineering Program piloted WEPO, an orientation-to-engineering, in 1996. A yearlong retention intervention program, it offers first year women students entering the College of Engineering hands-on engineering design experience and builds a working peer network. Mentoring teams participate in teambuilding and an engineering project design and then meet periodically throughout the year. Objectives are to offer entering women the opportunity to:

- Create ownership of engineering facilities and buildings as well as the physical tools, space, and vocabulary of engineering
- Develop a working network with students and mentors
- Develop confidence, competence, and a head start through hands on engineering activities
- Meet and know how to access engineering faculty and administrators

Tracking data indicate a high retention rate among women who participate in WEPO as compared with men and with women who did not attend WEPO.

Index Terms—Orientation, Retention, Mentoring, Basic Skills

INTRODUCTION

Increasing the numbers of women in the College of Engineering is a stated goal of the College's strategic plan for diversity. The Women in Engineering Program Orientation (WEPO), piloted in August 1996, targets the retention of women who are entering Penn State in engineering. This paper describes the yearlong orientation and presents retention data.

WEPO aims to increase the retention of women engineering students through a yearlong intervention emphasizing the creation of learning networks [1],[7] and the development of competency in basic skills [2],[5]—programming designed to enhance individual participants’ success and confidence in engineering classes. In short, WEPO is designed to begin a process of networking, confidence and skill building that will continue throughout participants' academic careers.

As noted in the abstract, program objectives are to offer entering women the opportunity to:

- develop a working network with students and mentors
- develop confidence, competence, and a head start through hands on engineering activities
- meet and know how to access engineering faculty and administrators
- create ownership of engineering facilities and buildings as well as the physical tools, space, and vocabulary of engineering

PROGRAM DESCRIPTION

Twenty-six women attended WEPO '96, just prior to the beginning of the fall 1996 semester. WEPO 2K hosted 101 women and involved 30 mentors and rovers (mentors in training). During the 3-day orientation, students participate in a variety of professional, mentoring, networking, hands-on and social activities in mentoring. The program has two phases: (1) An initial two-day intensive introduction to engineering and (2) a yearlong follow up of mentoring activities and active learning workshops.

The introductory, intensive orientation session is designed to reach three goals:

1. Reinforce students decision to study engineering through hands-on design projects
2. Networking with peers
3. Ownership of the people and physical infrastructure of the College through one-on-one meetings, aggressive use of laboratory space, scavenger hunts, and general use of engineering facilities. Elements of the three-day orientation session are:

   - An introduction to the Penn State computer network, the Internet and the World Wide Web and the computer program used in first year engineering classes
   - An introduction to the College of Engineering and the University Park Campus
   - An intensive team-building activity at Stone Valley Recreation Center
   - An introduction to engineering problem solving
   - A team problem solving and design experience during which students design and build a prototype machine
   - A Career Development dinner with corporate executives
   - Peer and professional mentoring

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Mentoring teams are an important ingredient of the orientation. All WEPOteers are organized into groups of 5 to 6 women led by an upper level mentor who is a junior or senior. These groups then form a team. This organization serves a number of purposes. They provide a larger core, networking group, provide access to two mentors, and creates a unit for many activities. As important, participants start their first semester with an established and active engineering peer/support group. Mentor teams also avoid a key problem in mentoring programs: what happens when mentors and mentees do not mesh on a one-on-one basis. WEPO Mentors work side-by-side with the participants in learning projects, providing active and attractive role models as well as a physical sense of engineering. The mentor program itself has become a valuable retention and leadership program for upper level engineering women.

The year-long WEPO activities build on the initial orientation through a comprehensive program of individual and group mentoring activities, a Listserv, a WWW site, and active learning workshops and monthly meetings on professional development topics led by faculty, students, and alumnae. Topics include study skills, advising, major selection and activities such as machining or electronics breadboarding. Students also gather for focus groups and social activities.

**OUTCOMES**

Three metrics are used to gauge the effectiveness of WEPO against its stated objective to recruit and retain a diverse student body. (It should be noted that women are considered an underrepresented minority in engineering, representing only 20 percent of the undergraduate student population nationwide.) The three metrics are participation, evaluation results, and retention. All are discussed below.

WEPO focuses on experience in the early years of the engineering curriculum, a time when women engineering students at Penn State are most likely to drop out of engineering and a time of growth when students begin to develop a personal world view and life goals. WEPO responds to these twin challenges by creating an early attachment to and identification with engineering and the College of Engineering. Activities are designed to engage women engineering students from the beginning and encourage the development of an intensive, personal, and engineering oriented community. (Table 1). Accordingly, the design addresses specific barriers to retention identified by existing research (see references).

<table>
<thead>
<tr>
<th>Barriers to Retention</th>
<th>WEPO Response</th>
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<td>Lack of contact with engineering during the first two years of the engineering curriculum when students take mainly math and science courses</td>
<td>Hands-on Engineering Design and Computer Workshops</td>
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<td>Isolation from a positive engineering peer group</td>
<td>“Instant” peer group of WEPO participants, reinforced by year-long activities and upper level mentors</td>
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<td>Limited experience with physical problem solving—or more simply put, with “tinkering”</td>
<td>Engineering Design Project with teamwork, problem solving, building, demonstrations and presentations</td>
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<tr>
<td>Lack of positive role models</td>
<td>Contact with faculty, upper level students, and practicing engineers on-site and as E-Mail Mentors</td>
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**Predicted**—In the short-term, we anticipated that WEPO would create a cohort of entering women engineering students prepared for the social, cultural, and academic demands of the first-year engineering curriculum. Through the initial three-day activity and subsequent follow-up, participants entered their beginning classes with known peer groups and support networks, confidence in their novice engineering skills, and an understanding of the demands of the engineering curriculum.

**RESULTS**

**Participation**—WEPO 2K served 101 first year women, including women from Penn State’s Commonwealth Campuses for the first time. For the second year, all women who applied were accepted. Thirty upper level women also participated as mentors and rovers (mentors in training). 6.9 percent of the first year participants were women of color (compared with 4.3 percent of the overall engineering student body). Ten percent of the mentors and rovers were women of color.

**Participant Evaluation**—Participants over the past two years

![Figure 1: Growth in WEPO Fall Participation, 1996-2000](image)

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have gave the overall WEPO experience top marks (1999: 81/88; 2000: 90/93). All activities were ranked high, with the most popular activities remaining the design project, the computer workshop, the career development dinner and, of course, broomball. Students also gave the upper level mentors high marks. Typical comments in focus group sessions are:

“They really helped with the transition and meeting a lot of people.”

“They took the time to tell you things very thoroughly.”

For the mentors, it is also a positive experience:

“Yes, I love having an influence – I want to see it grow on women engineers year after year.”

“What it does – gives a head start to women in engineering – wonderful to watch.”

To determine whether WEPO meets its objective of increasing identification with engineering and the individual determination to continue, we asked students if they better understood engineering following WEPO and if their choice of major had changed. Responses include:

“It made me realize how much support there is for me as a woman in engineering.”

“[WEPO] opened my eyes to other fields of engineering I didn’t really know about and helped me to get a better grasp of the opportunities engineers have.”

When asked what they liked best about WEPO, typical responses are:

“I loved the team. We worked great together and had a fantastic time.”

“[It] really helped with the transition and meeting a lot of people.”

 “[Teams] were good size and made it easy to get to know people, I liked being in a team of 5 but then also being combined with another mentor’s team to be a group of 10.”

When asked what they thought the benefits of WEPO were to them personally, the responses were enthusiastic:

“It was very good with transitioning to college and meeting new people and learning about things that you don’t find out about any other way.”

“A great way to learn about your major from older students who have been going through it.”

“WEPO is a way to begin the college experience by meeting friends who are going through the same academic anxiety”.

When students were asked whether they would recommend WEPO 2001 to incoming students they responded:

“Yes, because you get to meet people before classes start which relieves the stress and apprehension . . .when you walk into a class for the first time you’ll feel comforted that there is at least one person that you know/have seen before.”

“Definitely! I had such a fun time!! I can’t say enough good things about [WEPO]. All the mentors and adults were extremely helpful and informative. It made it easy to make new friends and start forming contacts that will help in the near and distant future.”

RETENTION

A primary goal—retaining women at the same rate as men—is becoming a reality. Initial data indicate that women who participate are retained at a higher rate. At the end of the 1997-98 academic year, women who participated in WEPO ’97 were retained at 81 percent as compared with 77 percent for both men and women who entered in the same year. After their first year, WEPO ’98 women are retained at 76 percent as compared to 73 percent for women entering in 1998 overall and 78% for men entering in 1998 overall. The significant data are those collected at the end of the sophomore year, a time when women are most likely to transfer out of the College of Engineering at Penn State. At this point the WEPO ’97 cohort was retained at 77 percent as compared to 65 percent for women entering engineering overall and for men overall. In fact, 1997 marks the first time that women reached parity with men in the College of Engineering retention study. (Figure 3). (The Penn State College of Engineering Retention study, produced annually by Engineering Instructional Services, tracks all students who enter the Penn State College of Engineering for a six-year period. It tracks only that cohort and does not include students who enter the College from other Colleges or Universities. WEPO figures come from a companion retention study that tracks entering WEPO students as a cohort. [6]

1997 cohort data are based on students entering the Penn State College of Engineering at University Park (UP). In 1997, 78 women participated in WEPO out of a total of 226 women who matriculated at University Park in

Figure 2: Percentage of Students Entering the Penn State College of Engineering in 1997 Retained in Engineering After Years 1 & 2


Qualitative data from focus groups also suggests that WEPO has a positive effect on retention:

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“Meeting people ahead of time made it easier to adjust. I already knew a lot of people and was just more prepared.”

“I figured I wouldn’t have a life, but saw that the mentors did it all. You can do more with yourself than just studying—there was proof right in front of you.”

“I thought it would be harder. Mom kept saying [Penn State] is too big. But walking to class I always see someone I know.”

Retention figures for women students who completed their first year in engineering (1997-98) cohort, reached parity with men for the first time. This coincided with the first year that WEPO and the Women in Engineering Program reached all first year women at Penn State’s University Park (234) through a variety of program activities including WEPO, facilitated study groups, hands-on classes, monthly networking meetings, and mentoring activities.

Projected long-term outcomes for individual students are increased retention of participants as measured by numbers and survey instruments. For the College of Engineering, long-term outcomes are the institutionalization of WEPO through internal and external support and possible extension to all engineering students, including those at other Penn State campuses.

Figure 3: Retention of Women and Men, 1989-97

INSTITUTIONALIZATION AND ACKNOWLEDGEMENT

WEPO is well institutionalized into the Penn State College of Engineering. This year we received 62 applications for rover and mentor positions. Faculty and administrators actively participate in both the social activities and program delivery. WEPO also provided the model for a new orientation activity offered by the College to all first year students as part of the traditional Penn State Orientation. This activity includes many WEPO innovations including team mentoring, projects and scavenger hunts in a daylong experience that complements WEPO (which takes place three days prior to the Penn State Orientation). The College continues to provide seed support which, when coupled with significant funding from the Engineering Information Foundation and Texaco, supports the development and expansion of the program. Other underwritors include ExxonMobil, Corning Incorporated Foundation, and the Alcoa Foundation. We wish to acknowledge the important part that they play in the success of this project.

CONCLUSION

The Women in Engineering Program Orientation has grown to be a successful retention. Preliminary data indicate that WEPO participants are retained at a higher level than women who do not participate in WEPO. Qualitative results indicate that the objectives—developing networks, confidence, access to engineering people and places—are being achieved through WEPO programming. Use of formative evaluations help the organizers to use a continuous improvement process to stay ahead of the ever-changing needs and qualifications of incoming women.

REFERENCES


Barbara Bogue is the Director of the Women in Engineering Program at Penn State. The Program received a WEPAN WIEP Award in 1997. Bogue has coordinated two national conferences—one on peace and one on the development of women engineers before and after graduation—produced a number of training and informational videos on engineering education and the learning environment, and is co-author of a workshop on the latter. Bogue’s areas of research include programming for women in undergraduate engineering programs, women in media, and revolution. She holds a B.A. from Nebraska Wesleyan University and an M.Sc. in from the University of Southampton, U.K.