

## A CLIMATE SURVEY AND NEEDS ASSESSMENT

Catherine R. Cosgrove, Stephanie Blaisdell, and Dr. Mary R. Anderson

College of Engineering and Applied Sciences  
Arizona State University  
Tempe, Arizona 85287

### Abstract

Women in the College of Engineering and Applied Sciences at Arizona State University are an under represented group, making up about 20% of the College's enrollment. Before launching a women's recruitment and retention program, the authors collected baseline data on student perceptions and problems. A questionnaire was completed by 108 female graduate and undergraduate students in the College. Results of the survey and implications for present and future intervention programs are discussed.

### Introduction

During the late 1960s, society began focusing on the problems of under representation of women in certain fields. Since then, much research and a number of programs have been implemented to achieve a gender balance in previously male-dominated careers. In medicine, business and law, a gender-neutral atmosphere is beginning to emerge<sup>1</sup>, but this is not the case in engineering. In 1979 women earned only 3% of the doctorates in engineering<sup>2</sup>. The number of women earning Bachelor's degrees in engineering increased from less than 1% in 1971 to 8% in 1979. As of May, 1991, there were 74,783 engineers, but only 3.1% were female. Furthermore, women's interest in the sciences actually declined by more than two-fifths during the past 20 years<sup>3</sup>. To understand what was needed to increase the recruitment and retention of women in the College, a survey was developed and distributed to over 320 students. 78 undergraduate and 30 graduate women participated in the survey, a return rate of 33.5%.

### Demographics

All participants were majors in the College of Engineering and Applied Sciences. One graduate student reported a prior associate's degree, 22 had a B.S., and three reported a masters. Eight undergraduates had a prior B.S. degree. Although 86% of the women were full time students, 73% of undergraduates and 69% of graduates reported working at least part time. Of those working, 44% of undergraduates and 60% of graduates reported working more than 20 hours/week. The average age of undergraduates was 24.5 years (range 18-46), and graduates was 29.4 (range 22-49). Most students were single, never married (68% undergraduates, 60% graduates), but 10% of each group reported being divorced or separated. Only 14% of each group reported living with their children. Most students were U.S. citizens (88% undergraduates, 76% graduates) and Arizona residents (90% of U.S. undergraduates, 74% of U.S. graduates). Only 6% of the respondents lived on campus. One-third of the undergraduates and 20% of graduates lived off campus with their family or parents, while 45% of undergraduates and 67% of graduates lived with a roommate or spouse. Only 14% of respondents lived alone off campus.



### **Recruiting Women into Engineering**

Most women reported their first interest in science an engineering at the high school (30% undergraduate, 40% graduate) or college level (27% for both). About 20% of the undergraduate women and 12% of graduates reported their first interest prior to junior high school. Respondents were asked to report on the sources they used for information about their major field. Predominant graduate responses were: College courses (60%), college faculty or staff (57%), friends and fellow students (43%), professionals in the field (33%), family member (23%), work experience (23%), summer internships (23%), and high school teacher (20%). High school counselors and courses were notably low (13% and 7%, respectively). Undergraduates listed: Professional in the field (51%), college courses and college faculty and staff (38% each), friends and fellow students (32%), family member (31%), career conferences and work experience (24% each), high school courses and teachers (18% each). High school counselors provided information to only 12% of undergraduate students.

Before developing support programs, it was important to identify sources of support already available to students. Respondents were asked to indicate who encouraged them in their major. Students were asked to mark all that applied, so results do not equal 100%. Graduate students reported encouragement from parents (73%), teachers or counselors (73%), other family members (60%), friends or fellow students (50%), professional in the desired field (43%), other adult (27%), and work supervisor (23%). Undergraduates reported parents (68%), teacher or counselor (56%), other family members (51%), professional in desired field (48%), friend or fellow student (47%), and other adult (42%). Only 12% of undergraduates reported support from a work supervisor.

Students were asked why they chose their major. Enjoyment or interest in the field was the most popular reason for both undergraduate and graduate women, followed by availability of jobs, and salary. Survey participants were also asked to rate their pre-college (or undergraduate) preparation for their current major. About 25% of the undergraduates and nearly 70% of graduate students said they were well prepared. More than half (55%) of undergraduates and 27% of undergraduates reported being somewhat prepared for their major. A minority of undergraduates (20%) and less than 10% of graduates reported being not prepared.

### **Retaining Women in Engineering**

Many of the women who enter engineering programs as freshmen or transfer students change majors after their first or second semester to a major outside the College. All survey participants were currently enrolled in the College, so first-hand information about "transfers out" was not available. However, survey participants provided information on their observations of friends and peers, as well as what could motivate them to change majors.

Nearly a third (30%) of graduate students and 39% of undergraduate students reported changing their major at least once. Furthermore, 40% of undergraduate students and 38% of undergraduate students would change their major with a reason. The most common reasons given were: get information about more interesting major (24% undergraduates, 20% graduates), the faculty are not supportive (14% undergraduates, 23% graduates), lack of employment opportunity (14% undergraduates, 10% graduates), and inadequate or inappropriate advising (13% for each).

Table 1 summarizes the students' perceptions of faculty-student interactions in the College of Engineering and Applied Sciences at A.S.U. and Table 2 summarizes students' perceptions of student-student interactions.



Table 1				
GRADUATE WOMEN				
	Strong Agree	Agree	Disagree	Strong Disagree
Approachable	1 ( 4%)	16 (67%)	5 (21%)	2 ( 8%)
Relaxed Atmosphere	0	16 (67%)	5 (21%)	3 (13%)
Respectful	2 ( 8%)	16 (67%)	6 (25%)	0
Treats Me as an Individual	3 (13%)	15 (63%)	5 (21%)	1 ( 4%)
Concerned	2 ( 8%)	13 (54%)	9 (38%)	0
Responsive	6 (29%)	9 (43%)	5 (24%)	1 ( 5%)
Support Women	1 ( 1%)	8 (33%)	13 (54%)	2 ( 8%)
UNDERGRADUATE WOMEN				
	Strong Agree	Agree	Disagree	Strong Disagree
Respectful	11 (16%)	44 (64%)	12 (17%)	2 (3%)
Support Women	12 (16%)	36 (52%)	20 (29%)	1 (1%)
Approachable	8 (12%)	35 (51%)	23 (34%)	2 (3%)
Responsive	6 ( 9%)	34 (50%)	27 (40%)	1 (1%)
Concerned	11 (16%)	33 (48%)	23 (33%)	2 (3%)
Treats Me as an Individual	10 (14%)	32 (46%)	25 (36%)	2 (3%)
Relaxed Atmosphere	5 ( 7%)	33 (46%)	29 (41%)	1 (1%)

We were surprised to find that 62% of the graduate women and 30 % of the undergraduate women either disagreed or strongly disagreed with the item "faculty in the college support women". The two groups generally agreed that faculty were approachable. A majority in each group felt the engineering faculty was concerned and responsive. However, one third of the graduate students and 36% of the undergraduate students reported experiencing discrimination (or uncomfortable situations) in the College of Engineering and Applied Sciences due to gender bias.

Table 2				
GRADUATE WOMEN				
	Strong Agree	Agree	Disagree	Strong Disagree
Friendly	1 ( 4%)	22 (79%)	5 (18%)	0
Involved	0	18 (64%)	10 (36%)	0
Cooperative	3 (11%)	17 (61%)	8 (29%)	0
Support Women	1 ( 4%)	17 (61%)	9 (32%)	1 (4%)
UNDERGRADUATE WOMEN				
	Strong Agree	Agree	Disagree	Strong Disagree
Friendly	9 (12%)	46 (62%)	16 (22%)	3 (4%)
Support Women	8 (11%)	44 (59%)	20 (27%)	2 (3%)
Involved	4 ( 5%)	40 (54%)	27 (36%)	3 (4%)
Cooperative	12 (17%)	34 (47%)	24 (33%)	2 (3%)

In the case of student-student interactions, 36 % of the graduate women and 30 % of the undergraduate women disagreed with the idea that other students in the College support women, but generally felt other students were cooperative, friendly and involved.

Since the survey was distributed only to women within the College of Engineering and Applied Sciences, information was not available from those women who never entered, or did not stay in engineering. However, the women surveyed are in a good position to theorize about



why women leave, and specifically what hurdles they had to overcome to persist in engineering.

Graduate (65%) and undergraduate (75%) respondents said they had some problem with a lack of contact with women in science. Over 60% of undergraduate and 50% of graduate respondents reported experiencing at least some gender discrimination; and about the same proportions said they'd had problems with competitiveness in the College. Over 50% of each group reported at least some problems with academic advising. Finally, 57% of undergraduates and 24% of graduate students said they had some problem with a lack of encouragement while in high school.

To help us plan college-level support programs, students were asked to indicate how much they valued a variety of activities, and to indicate if they would attend such a seminar or workshop. Results presented in Table 3 are total student responses, not percentages.

Workshops, Seminars and Activities	Table 3 Personal value of activity			Said they would participate
	None	Some	Much	
Research/Internships	2	11	93	97
Professional organizations	7	36	62	88
Internship workshop	3	17	85	84
Team work training	4	33	67	83
Financial aid workshop	9	24	73	82
Career Services workshop	6	36	61	82
Resume workshop	6	36	64	80
Mentor workshop	6	43	56	78
Stress management	6	31	67	77
Informal student seminars	8	52	45	77
Assertiveness training	4	33	67	76
Peer study groups	7	33	66	74
New student orientation	8	35	63	74
Informal faculty discussions	11	43	50	74
Info on entrepreneurship	10	44	49	70
Welcome back social	22	49	35	69
Countering harassment	16	39	48	69
Inter gender communications	15	43	46	68
Time management workshop	12	43	51	65
Harassment awareness	15	42	46	64
Study skills workshop	8	48	50	62
Grad school workshop	12	41	52	62
Social events	26	56	23	62
Department brown bags	26	62	18	53

Almost all the listed programs were well endorsed. Programs least valued were those on pregnancy, eating disorders and parenting skills (omitted from table). Two-thirds of graduate students endorsed peer study groups as very valuable. In order to clarify how students wanted these programs to be run, focus groups consisting of women who expressed an interest in survey results were formed. Three sessions were held to accommodate as many students as possible. During these sessions, a summary of the survey results was presented. The students clarified how each program would best meet their needs.

### Discussion

Survey participants indicated they generally felt self confident; graduate average cumulative GPAs were greater than 3.6 (3.0 minimum) and undergraduate average cumulative GPAs were greater than 3.0 (2.0 minimum). Yet, both groups of women expressed problems with support, particularly in high school. More than half the respondents indicated problems with advising, and focus group discussions indicated poor advising occurred in high school as well as college. The students indicated they wanted more contact with female faculty. Apart from the survey, female faculty have expressed a desire to increase contact with students and one another, but there are practical limitations. Facilitating this process will provide networking opportunities for both students and faculty. It appears important that we continue to explore outreach activities to encourage interest in science and engineering among high school girls, their teachers and counselors. It is also important to encourage college women to consider pursuing advanced degrees, thereby increasing the pool of talented and qualified women available for faculty positions.

The WISE Program has begun to report these results to the faculty, especially through our faculty advisory committee of representatives from all schools in the College. In collaboration with the committee, the WISE Program is spearheading bias awareness and inter-gender communications training for the faculty. Assertiveness training was held during Spring, 1994, with limited participation. We also offer support and advocacy for students when problems with a professor or the administration are reported. In addition, we have opened College-level discussions to review the student academic advisement process.

We feel it was important to take an empirical approach to developing women's support programs at Arizona State University. Review of existing literature is valuable and has helped us get off to a strong start. However, each campus, college and department has its own culture and needs to be assessed to identify local issues and problems.

### References

1. Rix, S.E. (Ed.). (1988). The American Woman, 1988-89. New York: W. W. Norton.
2. Betz, N.E. & Fitzgerald, L.F. (1987). The Career Psychology of Women. New York: Academic Press.
3. Green, K.C. (1989). A profile of undergraduates in the sciences. American Scientist, 77, 475-480.



