

THE WOMEN ENGINEERING PROGRAMS AT OKLAHOMA STATE UNIVERSITY:
THE FIRST YEAR

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The Women in Engineering Program of the College of Engineering, Architecture, and Technology (CEAT) at the Oklahoma State University (OSU) was established in 1991 to serve the needs of its female students as well as to recruit more women high school students into these technological programs. This program development was actually an evolutionary process (as opposed to revolutionary) as it was built from existing programs as is common in the establishment of most programs. These programs were started by the student chapter of the Society of Women Engineers and CEAT Student Services.

The current percentage of women engineering students in the college is approximately 15%. Nationwide, the average is about 17%. To help meet the challenges of the 21st century, more underrepresented groups in engineering, such as women, need to be encouraged to pursue engineering careers. The Women in Engineering Program serves to support women students, both current and future, through programming that provides a positive environment for women engineers. The program works very closely with the Society of Women Engineers (SWE) student chapter at OSU.

Oklahoma State University is unique in the United States in that it is the only college that maintains centralized programs in Engineering, Architecture, and Technology. The programs described in this paper will be those primarily for engineering. This paper will describe the strategic plan developed to meet the goal of increasing the number of women pursuing technological careers. In addition, statistics and some of the more important activities will be described. Future directions of the program will be examined.

PROGRAM GOALS, POSITION RESPONSIBILITIES

The Dean of the College, Dr. Karl Reid, and Dr. Larry Zirkle, Director of Student Services, established a half time coordinator position in the fall of 1991 to initiate new and expand existing programs with the assistance of the student chapter of SWE and the Office of Student Services.

One of the first tasks was to determine the goals of the program as listed below:

- 1) Plan, initiate, facilitate, and coordinate programs in the CEAT regarding guidance, recruitment, and retention of women.
- 2) Increase the percentages of women enrolled in the Fall of 1995 semester to 20% for Engineering (19% for Technology, 12% for Architecture).

The major responsibilities of the program coordinator are to:

- 1) Plan programs for guidance, recruitment, and retention of women into majors offered by the CEAT. Develop a comprehensive plan by the end of the Fall 1991 semester (20% time).
- 2) Implementation and coordination of CEAT On-Campus Women's Programs (15% time).

3) Develop resources for funding of CEAT Women's Programs (15% time).

The coordinator spends the other 50% of her time as a Visiting Assistant Professor of Chemical Engineering. Duties there include teaching and conducting research.

STATISTICS AT OKLAHOMA STATE UNIVERSITY

To plan a program that adequately meets the goal of increasing the number of women in engineering to 20% by the year 1995, it was important to examine the number of women entering into engineering and advancing to the senior level as well as the number that are graduating in engineering. Statistics for fall semester enrollments are given below for the years 1987 to 1991. Enrollment statistics for the Fall of 1992 are not available yet. As is shown in the following table, both the percentages of women enrolled increased as well as the absolute number over the last five years.

Year	# Women	Total Students	% That Are Women
1987	198	1607	12.3
1988	221	1585	13.9
1989	238	1542	15.4
1990	235	1561	15.1
1991	254	1641	15.5
Average			14.4%

As shown in the following table, the number of women in the freshman year that advance to the junior year are fairly consistent (around 15%, includes transfer students). The numbers in the brackets are for total students. The CEAT is a professional school, the students enter their major in the junior year. It is at this point that it appears that female students are beginning to drop out.

Year	Freshman	%	Sophomore	%	Junior	%	Senior	%
1987	51 (392)	13.0	46 (304)	15.1	47 (358)	13.1	54 (553)	9.8
1988	68 (466)	14.6	48 (299)	16.1	49 (303)	16.2	56 (516)	10.9
1989	65 (462)	14.1	60 (332)	18.1	46 (297)	15.5	67 (450)	14.9
1990	70 (420)	16.7	48 (381)	12.6	53 (319)	16.6	64 (441)	14.5
1991	75 (416)	18.0	64 (359)	17.8	48 (400)	12.0	67 (466)	14.4
Average		15.3%		15.9%		14.7%		12.9%

This retention problem is further seen in the following table. The percentage of graduates that are women (five year average of 11.1%) is lower than the percentage of students that are women (five year average 14.4 %).

Year	# B.S. (Women)	Total B.S. Graduates	Percentage That Are Women
1986/1987	47	336	14.0%
1987/1988	25	298	8.4%
1988/1989	41	323	12.7%
1989/1990	18	245	7.3%
1990/1991	27	208	13.0%
Average			11.1%

The following statistics track students from their freshman to their junior year. The numbers in parenthesis are for all students. It appears that the percentage of women that make it to their junior year (average 80.6%) is approximately equivalent to the total number of engineers that make it to their junior year (77.0 % average). The senior year figures

were not used because at OSU, as in many schools, students may need five years or more to graduate. Retention of younger female students does not appear to be a problem.

<u>Freshman Year</u>	<u># Women (Total)</u>	<u>Junior Year</u>	<u># Women (Total)</u>	<u>% Ret. (Total)</u>
1987	51 (392)	1989	46 (297)	90.2 (75.8)
1988	68 (466)	1990	53 (319)	77.9 (68.5)
1989	65 (462)	1991	48 (400)	73.8 (86.6)
Average				80.6 (77.0)

STRATEGIC PLAN FOR PROGRAM

As shown by the numbers described in the section above, the two critical areas to focus on are 1) increasing the numbers of women entering into engineering as freshman and 2) increasing the retention of women students in the senior year and the number that graduate. The major thrust of the program will be to recruit more women into the freshman year which allows the program to build on past, pre-college programs.

Based on these reasons, the following will be the strategic plan for the first year:

- 1) Continue to introduce high school women to engineering through the high school conference and summer program
- 2) Introduce younger women to science and technology

Future directions include enhancing the retention of women students to increase the numbers of female students that graduate.

PROGRAMMING

The following descriptions detail the major events that have occurred in the Women in Engineering Program at OSU in the first year.

"DIAMONDS IN THE ROUGH" PROGRAM

This event was a four-week summer program for 18 junior and senior high school students. The title of the program came from activities in a diamond synthesis project. The program was held on the OSU campus June 30 to July 26th, 1991. The funding for the project was provided by the Oklahoma State Regents for Higher Education. This funding (\$51,000) covered the girls' room and board, staff salaries, supplies and materials, and recreational activities. Dr. Larry Zirkle, Director of Student Services, and Sandrel Jones-Webster, Coordinator of Student Recruitment and Minority Programs in CEAT, were in charge of the program. Student counselors stayed with the girls in the dorms. Nine faculty and nine teaching assistants were responsible for the academic portion of the event. Activities in the areas of electrical, chemical, mechanical, civil, and industrial engineering, as well as architecture, technology, and mathematics were conducted. Tours included visits to campus laboratories and Conoco. Other social and recreational activities were planned. Of the 18 students that participated in the program, 10 were seniors. All of the 10 seniors applied to OSU, six applied to CEAT, two to the College of Arts and Sciences, and two to Business.

HIGH SCHOOL GIRL'S ENGINEERING CONFERENCE

The OSU College of Engineering, Architecture, and Technology co-sponsored this event with the Society of Women Engineers student chapter. This event involved 111 high school girls (75 seniors, 15 juniors, 21 others; 16 of the students had been to the Diamonds summer program), SWE students, and 14 professional women from the area. Oklahoma female high school students were invited that had ACT scores of 25 or greater. In addition, high school teachers and counselors were sent information regarding the event. This one

day event gave the girls an idea of what engineering was, what it was like to be a student studying engineering, and what it is like being a female engineer in the workplace. Panel discussions were held in addition to small breakout groups of students, SWE students, and professionals. They also had a tour of campus as well as lunch with a keynote speaker Deborah Grubbe from DuPont. Deborah described engineering and her career to the students. The Dean of the College and the Heads of the various schools of the college also attended the lunch. Each student was given a t-shirt. This event was an overwhelming success and will be continued next year.

The cost of the event was \$3000 to cover mainly t-shirts as well as breakfast and lunch. Of the 75 senior women that came to event, 47 applied to CEAT (63%) and 15 others applied to OSU for the fall 1992.

GIRL SCOUTS WORKSHOP

This event was held on March 28, 1992 on the OSU campus. This workshop was for 25 junior girl scouts in fourth through sixth grade. The girls were from the Stillwater area. The SWE student chapter were mainly responsible for the event. The event was held in the afternoon for approximately 3 hours. The purpose of the workshop was to help the girls earn one of their contemporary issues patches entitled "Leading Girls to Mathematics, Science, and Technology" of the series "Into the World of Today and Tomorrow". They also worked on some requirements for the Computer Fun Badge. This event was a highly successful event as it opened the minds of younger girls to science and engineering. The entire cost of the event was about \$100.

For the patch requirements, the girls performed a chemistry experiment involving fluids of different densities (each fluid has a different color). They also operated a computer. A discussion was held where the girls talked about what a scientist is, famous women scientists (the two they always came up with were Marie Curie and Sally Ride), and why women don't pursue science and engineering as a career. For some of the requirements of the Computer Fun Badge, the students learned how to format a disk, play a computer game, create a file, save a file, and print a file. They also saw the inside of a computer.

CAREERS ON THE MOVE FOR THE ENGINEERS OF TOMORROW (COMET)

This summer program will follow the successful summer program of 1991, Diamonds in the Rough, in structure. The program will be run from July 5 to July 31, 1992. The main theme of the project is transportation, and 21 female students that have finished their sophomore or junior year will work in teams to design and build model cars that can be powered using solar and conventional forms of energy. In addition, complementary activities are planned for chemical, civil, and electrical engineering as well as architecture. The students will be exposed to issues relating to the environment, energy conservation, ethics, safety, the various CEAT disciplines, teamwork, and multi-cultural issues. The four-week session will be filled with tours, hands-on labs and demonstrations, and exciting presentations and discussions.

Funding was again obtained from the Oklahoma State Regents for Higher Education in the amount of \$55,000 to support the room and board of the students, salaries for the faculty and staff involved, and fees for activities; \$34,000 for indirect and \$21,000 for direct costs (~ \$1000 per student). The only expenses that the students must provide are transportation to the camp as well as incidentals expenses. The staff consists of the program coordinator, 7 faculty members, 5 teaching assistants, and 2 student counselors. The program will start with a mixer to introduce the parents and students to the program staff and activities.

Jill Baylor, past president of SWE, and various college alumnae will participate in some events. This provides the students an opportunity to meet with female role models.

Tours are planned for visits to Boeing, Conoco, CMI (a construction company), and an architectural firm in Tulsa whose two principals are women. Trips to Oklahoma City to visit Enterprise Square (a facility that describes the economics and the free enterprise system) and Kirkpatrick Center (science and technology). In addition, research presentations by faculty and graduate students are planned. Other activities include interactions with the OSU Writing Center, the Math Learning Resource Center, the library, the counseling center and tours of campus facilities and laboratories.

Also included in the program are get acquainted sessions, a "ROPES" course to develop teamwork, a nominal group technique session (brainstorming), discussion of "BIKES" and other career videos, college information sessions, discussions and planned study time to finish homework assignments. The students will be completing written and oral reports, keeping journals and recording data in lab books, and will serve on committees to develop a t-shirt for the academy and to work on the final summer program and fall programs. The final program will involve races of the cars in addition to presentations of the activities that the students participated in and an awards ceremony. The fall programs include the OSU high school girl conference as well as activities at the COMET participants schools.

Recreational activities include trips to the Oklahoma City Zoo, Myriad Gardens. The students will also go to a local nursery to select a plant to keep in their dorm room, craft nights to make clay whistles, a picnic and a barbecue, as well as ice cream and movie nights. The students will have access to the Colvin Recreational and Wellness Centers.

ALUMNAE MAILING

A mailing to women alumnae of the CEAT was sent to create a mailing list with updated addresses. The mailing was targeted to those alumnae in the Kansas, Oklahoma, and Texas areas. In the letter, help was solicited for the summer and fall programs. So far the response has been good. Many of our alumnae have been very eager to help. The next step is to expand our mailing list to include all alumnae.

FRESHMAN MAILING

Another important mailing was sent to all female students that were accepted into the College. In this letter, I explained what the Women in Engineering Program was all about and that I enjoyed being a chemical engineer. I also sent them some SWE scholarship information, and congratulated them on their acceptance to the University and welcomed them to OSU. This will be followed up with a letter in the late summer to those students that enroll in CEAT. Next year information will be sent to students in the fall before the application procedure begins to try to recruit more female students to come to OSU.

FUTURE OF THE PROGRAM

Several events are expected to be added to the program for next year:

- 1) Develop a detailed strategic plan
- 2) Obtain better retention statistics
- 3) Develop activities to improve retention of juniors and seniors
- 4) Expand girl scout program to include more students and women scientists
- 5) Establish event for 7-9th grade students
- 6) Develop activities for the existing female engineering dormitory floor
- 7) Establish an advisory board
- 8) Involve alumnae and area professionals as mentors and role models
- 9) Develop a featured seminar series of women professionals of national stature
- 10) Obtain corporate and government funding

