

Working Directly with Engineering Departments to Increase Diversity

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Despite some progress toward equality in engineering, women remain underrepresented, especially in mechanical and electrical engineering, which are two of the largest disciplines. This underrepresentation stems from several issues relating to recruiting and retaining women, including inaccurate views of engineers and engineering that discourage them from entering the field. Female students especially are turned away by images of engineers as males who work alone in cubicles squinting at computer screens while typing arcane formulas. Thus, it is important to disseminate accurate portrayals of engineering to students of all ages.

However, improving the perception of engineering alone may not increase the number of women attaining baccalaureate degrees in engineering, as students also need to have confidence in their own skills in engineering and a network of peers and mentors who can support them through their studies and their careers. Mentors should be persons who are approachable and to whom students can relate on a personal level. This indicates that undergraduate women in engineering could effectively mentor younger students because they would be able to relate to them as individuals. Another important element, especially for girls, is having a role model who provides an existence proof of a position to which they can aspire.

The Engineering Equity Extension Service (EEES) aims to increase the number of women who graduate with baccalaureate degrees in engineering, with a specific focus on the two largest engineering disciplines with the lowest female enrollments, electrical and mechanical. By bringing together expertise in gender studies and the research base on engineering education, EEES seeks to enhance the academic preparation, social interactions, and engineering knowledge and skills attainment of girls and women. In 2008, projects at fourteen departments (ten Mechanical Engineering, and four Electrical or Electrical /Computer Engineering) were selected from among competitively submitted proposals for improving gender equity in individual ME or EE/ECE departments.

Each department designated one person (the Extension Agent) to work with EEES staff as well as with our external evaluator. The evaluator worked with each Extension Agent to determine the type of data to collect and also developed several surveys that were easily adaptable to the individual sites. The nature of project activities was well characterized as part of the department proposals. The evaluation also allowed for characterizing the extent or “reach” for project activities. Data collected over the spring 2009 semester included variables such as number of students or faculty attending activities, number of speakers or panelists, number of mentors and protégés, and number of materials changed and disseminated.

The specific plans varied across departments but many included similar activities. For example, eight departments planned outreach activities to undergraduates or K-12 students, six planned to host workshops or speakers for faculty or students, and five focused on revising course or recruiting materials. Two departments used funds to support undergraduates’ travel to conferences and two formed Society of Women Engineers (SWE) chapters. Finally, two campuses focused on mentoring undergraduate students and two sponsored social events for those students.

Some departments developed projects that involved K-12 students in workshops and other engineering activities, either on the school’s campus or on the university campus. Several departments were already involved in these types of outreach programs, so they used their funds to revise recruiting materials or to bring in extra speakers for the students who attended. Other departments focused on undergraduate students by reaching out to female students with social activities, mentoring programs, or peer support programs, or by providing exposure to female engineers as speakers or at conferences. Others chose to work with faculty to make them aware of gender-equitable teaching techniques, advising how and why to incorporate them into their classrooms. Others worked to revise course content, course or curricular

	# Departments
Outreach	8
Workshops and Speakers	6
Materials revision	5
Conference support for undergraduates	2
Forming/extending SWE chapters	2
Undergraduate mentoring	2
Sponsoring social events	2

Table 1. Number of Participating Departments Undertaking Specific Gender Equity Activities.

materials, or recruiting materials. Several departments undertook more than one activity, for a total of 27 activities across the 14 institutions. See Table 1 for an overview of the projects undertaken.

Our results show positive changes. Women on campus joined groups and in many cases took the lead in developing projects for those groups. Younger girls who were exposed to engineering in workshops or speaker activities generally stated that they were more interested in engineering after participating. Some of the Extension Agents stated that they realized how difficult it is to change faculty behavior, but others found that women were more interested in classes that included activities designed to appeal to women. These results show that with a small amount of money and expert advice, institutions can advance gender equity within certain departments and begin the process of effecting change in the number of women receiving electrical or mechanical engineering degrees. Overall, this endeavor is showing positive progress toward the goal of increasing the number of female mechanical and electrical engineers. We encourage institutions and campus research centers to develop these types of small projects to increase diversity in engineering.

A variety of lessons can be drawn, but the most fundamental are these two:

- We need to make explicit and available for all students the guidance and support previously available to those students with whom we personally resonated; and
- We need to stop wishing for the types of students we used to have, adjust to realities of who today's students are, and actively compete for their attention and affection by engaging them in the excitement of what engineers do.

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