

## **CRITICAL CONNECTIONS: THE SECRET TO THE SUCCESS OF WOMEN IN MATH, SCIENCE AND ENGINEERING**

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At Washington State University, there is a strong commitment to supporting women in math, science and engineering. Two units established for this expressed purpose are the Committee on Women in Math, Science and Engineering and the Women in Engineering Program. The two units operate cooperatively, but separately to support the success of undergraduate women in fields in which they have been traditionally under represented. Most of the programs foster the connections between women that are critical to their success.

The Committee on Women in Math, Science and Engineering is an organization of faculty, students, staff and administrators concerned about the under representation of women in math, science and engineering. Nationally, the science and engineering fields are traditionally dominated by males. In the biological sciences, the new generation entering the work force is more gender balanced. However, in the physical sciences and engineering, women continue to be under represented. The national trend is realized at Washington State University. During the five year period from 1989-1993, out of all of the entering freshmen who declared an interest in the biological sciences, 54% were women, whereas for the physical sciences, 40% were women, and for engineering, 17% were women. For that same period, out of the bachelor's degrees granted in the biological sciences, 53% went to women, in the physical sciences, 34% went to women, and in engineering, 12% went to women. The Committee seeks to understand why women are under represented and then designs programs and services that counteract the negative influences. Studies<sup>3,4,5,6</sup> point to poor teaching by science and engineering faculty, inappropriate reasons for choosing majors, inadequate advising or help with academic problems, and lost confidence due to low grades in early classes as factors contributing to students' decisions to leave math, science and engineering fields. Other studies<sup>1</sup> claim that student-student interactions and faculty-student interactions are extremely important to the academic success of undergraduates. A local study<sup>2</sup> found that lower than anticipated grades, the paucity of women in the entry level classes, and the competitive atmosphere in entry level classes also contributed to decisions to change majors. Critical to the success of those who persisted are the socialization systems provided by the Math, Science and Engineering Residence Hall, peer tutoring, and contact with women a couple of years ahead in their studies.

The Committee, in close cooperation with other units on campus, initiates services and programs that promote the success of women (and men) in MS&E. Some of these include the Math, Science and Engineering (MS&E) Residence Hall, the tutor-assisted study hall, and an Advising Fair. The MS&E Hall started six years ago with 25 women and 25 men as a "house" in one of the freshman towers. Three years ago it moved into its permanent home in the Gannon-Goldsworthy complex and this year 142 women and 326 men participated. During this rapid growth period, we have allowed a gender imbalance, but the ultimate goal is to have six floors of women (approximately 300) and six floors of men. The philosophy behind the MS&E Hall is that by clustering students with similar academic interests and demands, it is easier for the students to build the academic/social network that supports

their goals. In this hall it is easy to find study partners in the same entry level math and science courses. The floor lounges are routinely used for small study groups working together on homework or projects. In the non-MS&E halls, women in particular have difficulty finding others close by that are also taking these entry level classes. These classes tend to be a shock for freshmen because of the pace and level of difficulty compared to high school math and science classes. Furthermore, the grades students receive are often lower than what they are accustomed to receiving. Students that are isolated do not realize that this is common and hence have a harder time putting lower grades into perspective. Instead they interpret them as an indication that they are not cut out for a scientific or technical career. Women seem to be much more susceptible to this confidence crisis than men. Hence a supportive environment is all the more valuable to them. The benefits of the MS&E Hall are enhanced by the presence of a computer lab equipped with state-of-the-art equipment and the software used in the MS&E courses, programming directed towards the MS&E community, and the tutor-assisted study hall. The study hall is organized and run by the Committee. Help for entry level math classes, physics classes and biology is available Sunday through Thursday evenings from 6:30 p.m.-9:30 p.m. The study hall is open to all students in these courses regardless of whether or not they live in the hall.

Many (if not most) of our students enter the university with a general interest area, and use the freshman and sophomore years to identify the specific major they want to pursue. Upon entry to the university, students are assigned to an advisor in their general area. In the literature<sup>6</sup>, one factor contributing to the decision to leave MS&E fields was inadequate advising. In an attempt to supplement the official advising and to make information about all MS&E majors readily available to our students, an advising fair was initiated in Spring 1995. This is held two weeks before students meet with their advisors for pre-registration and is intended to help students prepare for their official advising sessions. Representatives from MS&E departments are there with details about specific courses, majors and minors, student clubs, scholarships, career options, and research and work opportunities within their department. Other units on campus are represented including the Honors Program, International Studies, Career Services and Service Learning.

The Committee also works with the undergraduate group *Women in Technology and Science* and the Palouse Chapter of the *Association of Women in Science* to organize special programs and to bring speakers to campus for public lectures and informal contact with MS&E students.

The Women in Engineering Program was organized in 1989 to assist women students in their adjustments to the WSU campus and to provide a supportive program for them throughout their academic programs. Presently the program offers the following: Bridge Workshop for new students, scholarships, organized tutorials and study groups, a study room for group or individual study or relaxation, academic and personal advising from the WEP director, opportunities to meet and network with other women students in upper division classes, a resource center for internships and summer jobs, numerous publications of interest to women students, and an introduction to the student chapter of the Society of Women Engineers.

The Bridge Workshop, which is held one week before the fall registration, provides a complete orientation of all support areas available to students in the university and community. The students are pre-advised and enrolled in "cluster" classes which allow them to be in the same sections with other students they have met through Bridge. (Some cluster classes allow for as much as half the class being women.) In addition, the students have a sample of what to expect in the math and chemistry classes through an orientation presented by the faculty teaching those classes. A one-day computer center orientation with practice on using the features available through the internet provides the comfort necessary so the students will take advantage of the computer services.

Students using the WEP tutoring range between 20 and 40 weekly. Tutors are upper division students who have mastered the subject and have shown an interest in tutoring. The tutors are Tau Beta Pi students providing a service to the program, scholarship recipients who are volunteering time, or paid tutors. The sessions are held twice weekly and students sign a contract for the entire semester specifying that they will attend each session. There could be one student assigned to a tutor or as many as four to ten students assigned to one tutor.

The WEP study room provides a place for students to gather to study or relax. The present room accommodates 20 students comfortably, but through two other adjacent study rooms, any student wanting to find a place to study, can.

In conclusion, both programs strive to create a supportive environment aimed at the academic success of women in math, science or engineering fields. A key to this success is the academic and social networking among the women in these fields which is accomplished through special programs, a unique living environment, peer tutoring and undergraduate organizations such as the Society of Women Engineers and Women in Technology and Science.

### REFERENCES

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