

STUDENTS MENTORING STUDENTS: RECRUITING AND RETAINING WOMEN IN SCIENCE AND ENGINEERING

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Abstract

The economy of the United States is dependent upon a strong work force; the need for scientists, engineers, and mathematicians within this work force is particularly critical. To meet the need for technically trained professionals, it is essential that women be encouraged to choose careers in science, engineering, and mathematics. Within the College of Science and Engineering (CSE) at the University of Minnesota, Duluth (UMD), we have established a mentoring program for women students.

Because women faculty in CSE are already overextended, we decided to consider our women students as potential mentors. Volunteer junior and senior women students in CSE act as mentors for new students. Planned activities provide structured opportunities for students to meet and focus on the special issues of women in engineering and science. Through this program we believe that we can increase the number of women successfully completing degrees in science and engineering at UMD. This increase will have a positive effect on the national infrastructure of science and engineering.

1 Introduction

Well-trained engineers and scientists are important to our technological future. The segment of the population traditionally most likely to fill jobs in science and engineering is that of white men. This segment is projected to decrease in relative size over the next ten years [1, 2, 6, 7]. As this happens, the need for other segments of the population to enter the technical work force will become more critical. Women form a key segment, but the shortage of women choosing to enter and stay in careers in science, mathematics, and engineering is well documented [1, 2, 6, 8]. To meet the need for technically trained professionals, it is essential that women be encouraged to choose careers in science, engineering, and mathematics.

The University of Minnesota, Duluth (UMD) is a coordinate campus in the University of Minnesota system. UMD has both a teaching and a research mission. It serves approximately 8,000 students; the student body is primarily undergraduate with some masters degree students. The College of Science and Engineering (CSE) serves approximately 2,000 students. There are about 500 students in three engineering programs: chemical, computer, and industrial engineering. There are programs in four sciences of biology, chemistry, geology, and physics. Mathematical sciences are mathematics, statistics, and computer science.

We have established an ongoing mentoring program for women students within CSE at UMD. This mentoring program provides structured contact with role models, thus making inroads into the cultural bias that prevents women from entering science and engineering fields. In this program upper-division women students in CSE act as mentors for new students.

2 Climate for Women at UMD

On August 13, 1980, the United States District Court, District of Minnesota, approved a Consent Decree in *Rajender v. University of Minnesota*. Shyamala Rajender was a faculty member in the Department of Chemistry at the Twin Cities campus of the University of Minnesota. As a result of her lawsuit and the resulting consent decree, the University of Minnesota, including all of its coordinate campuses, operated under strict guidelines for searches and for salary and retention decisions until 1991. Under this provision the court appointed Special Masters to hear petitions regarding discrimination against women. Even now, with the Consent Decree expired, affirmative action procedures in hiring and retention are carefully followed.

In the past ten years, women have risen to important administrative positions at UMD and in CSE. The Vice Chancellor for Academic Administration, our chief academic officer, is a woman. The Dean of CSE is a woman. Three of nine department heads in CSE are women. The advancement of women in administrative ranks has not met with unqualified approval in the campus community. Serious incidents of harassment have occurred, including threats of violence. These threats have been aimed primarily at women in positions of power, but they have also been aimed at men who are supportive of women. One department head was suspended without pay for a short period of time; a number of faculty left the university. It is not known who has been making the recent round of threats; the police and FBI continue to monitor the situation. Despite all this, UMD remains a good place for women. It is precisely *because* UMD has made such strides in improving the situation for women on campus that the reactionary elements are responding so negatively.

During the Rajender Consent Decree years, a number of advocacy groups for women grew in the University of Minnesota communities. When the decree expired, the Commission on Women was formed to provide ongoing leadership in the area of women's rights. The UMD Commission on Women has been an important presence on our campus. It monitors issues of interest to women on campus, provide funding for events of interest to women, support travel for women, and function as advisors to administration.

Within CSE the administrators in student affairs have built a strong program for recruiting and retaining high-quality students. Part of this effort has been aimed at women. A special recruiting mailing goes to women each year, including a newsletter on women in science and engineering. The collegiate newsletter *Interface* has numerous articles about the achievements of women students in the college. The percentage of women students in the college has risen from 26 in the fall of 1988 to 31 in the spring of 1992.

3 Mentoring

A mentor is a more experienced person who provides guidance and support to a less

experienced protégé in a collegial relationship. It is well documented that a mentor's support and guidance is of critical importance to a protégé in building confidence and belief in the ability to succeed [3, 4, 8, 9]. This is particularly true for women in technical fields. The mentoring relationship is beneficial not only to the protégé but also to the mentor; by providing support to another person, one often strengthens one's own self-confidence [9]. Mentoring builds partnerships and networks for women that enhance their professional and personal lives.

Levin and Wyckoff [5] studied the entering class of 1984 at Pennsylvania State University and developed a mathematical model to predict persistence and success in baccalaureate engineering. They found that women are less likely to persist successfully in engineering, even though on all other independent variables examined they are essentially the same as men. The cultural bias that discourages women from considering science and engineering careers is a likely reason for this difference. A good mentoring program can improve the environment for women in science and engineering and increase the retention of women in these fields.

4 The CSE Mentoring Program

When we began to think of a mentoring program for women students, we first thought of women faculty serving as mentors [4]. In CSE we have a strong core of active women faculty members who do substantial informal mentoring of women students. These women faculty also carry a higher service load on campus, since the University's diversity goals call for women to be represented on all committees. Because women faculty in CSE are already overextended, we decided to consider our women students as potential mentors. We realized that we have active and committed women students at the upper-division level who could serve as mentors to incoming students. Not only would these women be good mentors, but they would also benefit from serving as mentors. By providing support and reassurance to others, they would reinforce their beliefs in their own capabilities and strengthen their self-concepts. For these reasons we decided to build this program where women students will serve as mentors to other women students.

During the 1991-92 academic year, we had 70 mentors working with 115 protégés. There were 212 first-year women students and 604 women students in total. As we prepare for the 1992-93 academic year, we have 67 mentors trained and ready to work with incoming students. We are expecting 182 new first-year women students in the fall.

4.1 Recruiting and Training Mentors

In the spring of the year we send out a letter to all women students enrolled in CSE asking if they would like to participate in the program as mentors for the coming year. We explain a little about what mentoring is and appeal to their altruism and to their desire to succeed in difficult fields. We try to market the program as something that will help them as much as it will help their protégés. We also ask them to return a form indicating their interest, their willingness to attend the training session, and their biographical data.

When we first started this program, we developed a set of training materials that we continue to update each year. The training materials take the form of a workbook emphasizing active involvement by the participants. The workbook begins with an ice-breaker and introductions. We then discuss the national need for scientists, engineers,

and mathematicians. Next we move into the definition of a mentor and a group discussion of how one mentors. The highlight of the training session is a set of case studies of typical situations women face during their academic lives. The students, working in small groups, are asked to read through the case studies and choose one that interests them. They then prepare a skit to illustrate the situation and show how a mentor might respond. After preparation is completed, each group performs its skit for everyone. We end with administrative details, including what to do and who to contact if there are questions or concerns. We also collect evaluations from the previous year's program. Finally, we ask the participants to contact other mentors who were unable to attend the training session in order to deliver the training materials with explanations.

4.2 Matching Mentors and Protégés

During the summer we obtain the names of all new women students coming into CSE. We send each one a letter describing the program and inviting them to participate. They are asked to return a prepaid post card on which they give some biographical information and indicate interest in the program. We then match mentors with protégés, pairing students with common majors whenever possible. Frequently a mentor will have more than one protégé. We inform the participants by mail; we tell them the mentor or protégé to whom they have been assigned and remind the mentors to contact their protégés as soon as they get to campus in the fall.

4.3 Activities

During the academic year we provide activities for mentors and protégés. These activities provide structured opportunities for students to meet, and they also provide focus on the special issues of women in engineering and science.

During the 1991-92 academic year we started with a welcoming reception for the participants early in the fall quarter. Featured speakers were the Vice Chancellor for Academic Administration and the Dean and Associate Dean of College of Science and Engineering. During the winter quarter we asked the participants, working in mentor-protégé pairs, to build a directory of women professionals in the community. We asked that each pair contact one professional and ask permission for us to include her name and biographical information in the directory. Students were also asked to invite the professional to our winter quarter event. This project failed miserably. Very few students made any attempt to contact a professional woman, and we did not have enough names to create a directory. The winter quarter event was a presentation on "Women in Chemistry" by Professor Bilin Tsai of the UMD Chemistry Department. It was sparsely attend; we speculate that this was due to the specialized nature of the talk. Spring quarter events included a panel discussion, a picnic, and mentor training.

Women in Engineering and Science (WES), a student club, has been instrumental in supporting the mentoring program. WES was established during the 1990-91 academic year as a professional and personal support group for women engineering and science students. They were particularly helpful in planning and executing the spring quarter events. The panel discussion, entitled "Engineering and Science: Women and Success," featured women students with majors in CSE. These students discussed their backgrounds and experiences: how they decided to enter their fields, how they overcame

difficult situations, what they like about their work, and what are their plans for the future. They also answered questions from the audience. WES also organized the spring picnic. We plan to rely more heavily on WES in the future for help in planning events.

We anticipate sponsoring similar activities in the coming year. We may try again with the directory of women professionals, but we recognize that we will have to provide better guidance to the students if this is to be a successful project. We would eventually like to provide mentors from among women professionals for our student mentors, and we view this project as an important step in that process. We also anticipate organizing a series of small-group discussions focused on issues of interest to women in engineering and science.

4.4 Funding

As with many programs of this type, funding is a serious concern. CSE provided us with some seed money for the project. We submitted a proposal to the NSF Access Program in January 1991, but unfortunately it was not funded. In January of 1992 we sent a request for funding to the Association for Women in Science (AWIS) Mentoring Program. Their program "Retaining Women Science Students: A Mentoring Project of the Association for Women in Science" is a three-year program, initiated in July 1990, and funded by the Sloan Foundation. Its goal is to increase the percentage of women who graduate with bachelors degrees and doctorates in the sciences. They provided us with program support for the coming year. The UMD Commission on Women gave us some support to attend this conference. Expenditures to date have been approximately \$4000.

Our expenditures have been quite modest, which illustrates that a program like ours can be run on a relatively small amount of money. To do this, however, requires the dedication and energy of people like us who are willing to work for nothing but the intrinsic rewards that come from supporting our values. This cannot go on indefinitely. We must actively seek both funding and involvement of other faculty and administrators interested in supporting this program.

5 Evaluation

Our long-term evaluation goals include examining the recruitment and retention data for women in CSE. We recognize that it is too early to draw any conclusions about the impact of the mentoring program on the retention of women students in CSE, but we are beginning to gather data. To obtain some feedback from the participants in the program this year, we asked them to fill out the standard AWIS evaluation forms; there were different forms for mentors and protégés. These forms showed us that there was not enough contact between mentors and protégés this year and that students want more from the program. Mentors indicated that it is difficult for them to mentor and requested more planned activities to assist them in the process. Students seemed committed to the program despite the low level of activity, which is evidenced by the fact that we had as large a pool of volunteer mentors for next year as we did for this year.

The AWIS evaluation forms asked participants to indicate which issues they were most likely to discuss. The most common issues cited were course selection, study skills,

time management, career opportunities and options, balancing family and work, and self image and self confidence.

6 Conclusions

While we are interested in seeing a strong mentoring program for women continue in CSE, we are overextended and tired of administering this program without any compensation. We would like to draw more faculty and administrators from the college into the program in order to lighten the load for us. We also recognize the need for ongoing funding, but pursuing funding takes additional time and energy.

Our student club, Women in Engineering and Science, presents us with an ideal group to provide ideas and energy to help sustain the program. We have seen that we need to plan more activities and provide more guidance for the students in the program. We hope to be able to count on WES to assist us.

This program could be expanded to include other groups within the college, particularly minority students. We have even had requests from male students to expand the program to all students in the college. Any expansion of the program will require commitment from additional faculty or administrators.

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