A Low-Cost Approach to the Retention of Undergraduate Women Engineering and Science Students

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Abstract
Many large universities have established Women in Engineering Programs, complete with full-time staff and office support. Small universities are less able to support a dedicated program from the regular operating budget once initial grant funding runs out. This paper describes an initiative at the University of Detroit Mercy to establish a formal support mechanism for women engineering and science majors. This program, currently in planning, will require little funding, because it utilizes existing resources inside the university, including faculty, undergraduate and graduate students, and residence life and other student life staff.

Background
The last twenty years have seen a substantial increase in the number of women choosing academic majors in the sciences and engineering. The University of Detroit Mercy (UDM) has also seen an increase in the number of women students choosing such majors at the time they enroll at the University. However, women also leave these majors in disproportionate numbers. The University of Detroit Mercy is no different than other institutions in this regard either.

Institutions of higher education in the United States have for some time recognized that women are under-represented in these fields. They have attempted to rectify that by increasing the number of women that they recruit and admit into these programs. Other institutions have recognized that merely increasing the number of women who have been admitted to these programs is not enough. They realize that they also need to increase the number of women who complete these programs and graduate with degrees in the sciences, engineering and mathematics.

There have been a number of studies, including [1-6] and many others, that have examined why women leave science, engineering and mathematics majors. Some focus on the impact that precollege experiences have upon retention rates. Others have looked at the actual undergraduate experience of women students in these majors to determine what impact that has on persistence of women in these fields.

Among the researchers who have studied the experience of women in science and engineering majors is Elaine Seymour [1-2]. Her articles and books on the retention of women in non-traditional majors have examined many of the factors that have an impact upon the retention of women in these majors. There are a number of factors that have an impact, but a most interesting one is the apparent misfit of women entering these fields with the educational environment that they encounter. This misfit has its most dramatic impact upon these students in their early days

at an institution. The result of this mismatch leaves women confused, unclear about how they can be both successful in these fields and still be viewed as attractive by their male peers, and questioning their own ability to actually succeed in these fields. Seymour has suggested that institutions who want women to succeed in these fields must help women understand why the misfit may occur and how they can overcome it.

Seymour's studies of the persistence of women in science, mathematics and engineering programs follow a pattern established in the standard student affairs literature on attrition for all students. It has become common understanding that the freshmen year is critical to the success of students in college. First year students need to develop confidence in their ability to succeed academically and to fit into a supportive peer social environment. Seymour's findings about the experiences of women in non-traditional fields makes the greater attrition of these women no surprise.

The University of Michigan's Women in Science and Engineering program is a model of an institutional response to the retention of women in these traditionally male fields. The program is targeted at first year women students and seeks to address both the normal adjustment to college issues all undergraduates face as well as the particular needs of women students in science, engineering and mathematics. This living/learning program is supported by the University's housing department, with support from the Colleges of Engineering and Science. The program is directed by a half time coordinator and half time administrative assistant. The program provides tutorial support, mentorship opportunities, extracurricular and community building activities. The program has received grant support from the Federal government, but is now fully supported by the sponsoring departments at the University.

The Situation at UDM

The experiences of women students in science, engineering and mathematics at the University of Detroit Mercy are similar to those described by Seymour. UDM is a medium sized private University with limited resources. It is not in the position to fund dedicated professional staff to support efforts at addressing the retention of first year women students, despite the need.

Starting in the Fall of 1998, the University of Detroit Mercy will implement a residence hall based program that will address the many adjustment needs and concerns of first year women students in science, engineering and mathematics. In its first year, it will limit its attention to fifty students living on campus. In subsequent years, it will broaden its attention to other first year women science, engineering and mathematics students living on and off campus. The program will be coordinated and funded by the University's Office of Residence Life. The oversight of the program will be provided by a team that will include women science and engineering faculty, faculty from the University's Women's Studies program, and student affairs professionals from the residence life department. Additional support will be provided by the campus chapter of the Society of Women Engineers. The day to day supervision of the program will be the responsibility of professional staff in residence life. This will be provided by the Resident Director of the building in which the program will be housed and of the Assistant Director for Resident Student Development.

For the program, a single floor in one of the first year residence halls will be set aside. The floor will accommodate fifty students in double rooms and there are lounge and study spaces on that floor. The building also has additional lounge and classroom spaces that will be available to students in this program and as sites for activities and programs. Only students who elect majors in science, mathematics, engineering or related fields (pre-med, pre-dental, etc.) will be assigned to the floor. The University's residence life department will assign students to this floor.

The assigning of women students in these majors to a particular floor is one part of the effort. The literature on college student development, strongly recommends this type of housing arrangement. Students of like majors who live in the same area tend to perform better academically than do students who have different majors. Common sense supports this finding. Students in the sciences, mathematics and engineering simply have higher work loads than do students in other majors. They need more study time. The distractions of students who have more spare time can interfere with study time and can have a negative impact upon academic performance.

Once assigned to the floor, the University will provide dedicated support that will address the adjustment issues of women students in these majors. Clearly one of the things students in these majors need are mentors who are aware of the rules of the game and have succeeded. These mentors can come in the form of older students and in the form of faculty and alumnae of these programs. The provision of mentors and opportunities to develop relationships with women who have experienced the tribulations freshmen women face is central to this program.

The University of Detroit Mercy like most institutions, staffs its residence halls with undergraduate Resident Advisors. (RAs). These students provide a number of services to students on their floors - helping them adjust, serving as peer counselors, and developing community. In the case of this particular floor, the Resident Advisors who will be assigned to it will themselves be upper class women who are also majoring in science and engineering. These students bring both an understanding of the experience of being a women majoring in one of these fields and a trained ability to communicate their understanding with other students. The Resident Advisors on this floor will do all the things other RA's at the University do, but they will receive added support and guidance so that they can effectively work in a more focused way with the students in this program.

From the start of the academic year, the program will provide multiple floor, building and campus based activities that will address a variety of issues that these women will face. Some of the programming efforts will be of a generic nature - adjustment to college, homesickness, time budgeting. Other efforts will address concerns of a particular interest to women college students - eating disorders, dating relationships, body image, the expectations of women presented by the general society. Going beyond that, students will also be provided with opportunities to meet and learn from older women students in their fields, faculty in these departments and alumnae of the program who have entered into professional work.

Women science and engineering students who do not live on campus will be invited to all of the events described above, and will be encouraged to make use of other vehicles provided for

enhancing connections among other women students and faculty, including chat rooms and electronic mentoring via e-mail.

All of these efforts will help first year women students in the sciences, engineering and math. They will provide opportunities for these women students to understand what is occurring, why they may feel disconnected, and how they can succeed in the scientific and engineering academic and working environment, and understand how they can balance career and personal life decisions. The program's focus will be on the critical first year of a women's time at the University. The student who successfully navigates her first year is likely to succeed and continue at the University. The friendships and connections that they develop during their first year, will remain as sources of support through their college years.

There are two things that make this program unique. First, it will be done with minimal additional resources. The University will seek outside grant funding for the program - to pay for on-site tutors (these in addition to tutors already provided in the College of Engineering and Science) and to equip a small computer lab on the floor. Even without outside funding, the program will proceed. The Resident Advisors are already carried in the budget and a core group of interested faculty have come forward to work with the program. Rather than adding substantial new sources of funds and efforts, the program will result from more focused efforts on the part of staff and faculty.

The second unique feature is that the program will be implemented and conducted without fanfare and great attention. Seymour noted that women students in the sciences and engineering frequently shy away from programs that are directed at them. Such programs can cause too much backlash and thus fail to reach the students who need them. The University of Detroit Mercy has dedicated first year residence halls that clear at the end of each academic year. The assignment of first year students to particular residence halls is done by the Office of Residence Life. It has access to information about students' anticipated majors and can use that information to assign students to particular areas of the residence halls. A major component of this program is simply a matter of assigning female freshmen in these fields to the identified floor. The assignment of Resident Advisors follows and then the range of programs begin in the fall.

This program will be put into place in September of 1998. The program will be assessed at the end of each academic year to determine its efficacy. Assessment will come in the form of measuring student persistence in chosen majors compared to a) persistence rates prior to the implementation of the program and b) to students not living on the floor. Further assessment will be provided by interviews that will be conducted at the end of each academic year with students who lived on the floor and both continued in science, engineering and mathematics majors and those who left. The information gathered from these assessment efforts will be provided to interested parties within the University and without starting in July of 1999.

Next Steps

Clustering women students in science and engineering majors on the same floor in a residence hall is one way to reduce the isolation many women in these majors report. The next phase of the program will explore the possibility of clustering the participants in particular sections of

introductory level course in mathematics, English, and other appropriate areas. Longitudinal studies to track retention within the majors and programs are planned and should provide some sense of the impact of this program upon retention by December 1999.

Conclusion

It is hoped that the initiative described in this paper will improve the retention rate of first year women students in the sciences and engineering. By assigning these women to a common floor in the residence halls and providing support in the form of tutoring and mentoring, they will experience less of the isolation often experienced by women in traditionally male disciplines. Because the program requires very little funding, it represents a very low-risk investment in the retention of first year students.

References

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Biographical Information

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