

Report of the Student Sub-Committee of the Ad Hoc Committee on Gender Equity in the Sciences, Mathematics, Information Technology, and Engineering

BACKGROUND

The Ad Hoc Committee on Gender Equity for in the Sciences, Mathematics, Information Technology and Engineering began its work in the Fall of 1999. The charge of the committee was to evaluate the status of women working or studying in these specific disciplines in order to determine areas of strength as well as areas that continue to present the UMBC community with challenges. During the academic year 1999-2000, the committee focused on issues pertaining to women faculty and made specific recommendations to the Provost. Also during the first year, several members of the committee were given the responsibility to develop a tool to evaluate student perceptions in this area as well. A survey was created and was to have been administered in the Fall of 2000.

As the second year of work for this committee began, it was decided that for the 2000-2001 academic year, the focus would shift to student issues relating to gender in these disciplines. As a result, committee membership was expanded to include other members of the campus community who work primarily with large numbers of students. The additional new members and some members from the previous year became a sub-committee charged to look at the issues pertaining to women students. The first step was to review the survey that was designed during the previous year.

As we reviewed the survey, we found that it was frequently difficult to ascertain what information we really wanted to get from the students. As a result of having so little knowledge about what the key issues really were, it was very difficult to write questions that the sub-committee felt were focused enough to provide us with useful information. What came out of these initial discussions was the realization that we knew so little about our student's perceptions that developing a useful survey tool required us to do more to identify some of the key issues. As a result the sub-committee decided to proceed with focus groups of students who would be asked to respond and share their experiences around a small set of open-ended questions. These questions (Appendix A) were designed to encourage students to reflect on what brought them to science or engineering, and what encouraged them and discouraged them in the pursuit of science or engineering.

PROCESS

The sub-committee developed the questions and conducted four successful focus groups. The participants included : (Group 1) seven sophomore, junior, and senior mechanical engineering and chemical engineering students; (Group 2) six undergraduate students majoring in information systems, computer science and computer engineering; (Group 3) a group of about a dozen undergraduates in physics, chemistry/biochemistry, and biology; and (Group 4) three

graduate students in the physics and chemical engineering departments. Most participants possessed some significant connection to a faculty member, peer, or student group within their field of study and were either known by or directly referred to the focus groups coordinators. The students who participated in the focus groups were ethnically and racially diverse, from different classes (sophomore, junior and senior) and of somewhat difference ages.

In order to ensure as much uniformity as possible in how the questions were presented, students were given a copy of the questions when they arrived for the focus group. They were encouraged to think about responses prior to the beginning of the conversation. We felt that it was also important to have the same facilitator for each group, because how a question is asked/presented can affect a response, and we felt that, here again, consistency was important. The focus groups met in the Women's Center, thus distancing the students from the academic buildings. This was done because we wanted them to feel that confidentiality need not be a concern. Representatives of the student sub-committee in attendance at the focus groups included: the facilitator, a notetaker, and at least one other member of the sub-committee who observed and listened without distractions. After each focus group, notes were made available to sub-committee members for review and discussion.

Although the focus groups provided us with the perspective of a small cross-section of students, common themes that are consistent with the wider literature on gender issues in science education emerged in the group discussions. These common themes found in the focus group discussions and in the wider literature are presented below. The use of focus groups enabled us to feel confident in identifying the key issues for students and therefore to develop a number of recommendations for next steps.

FINDINGS

The women who ultimately participated were successful undergraduate and graduate students. Success in the major turned out to be an essential quality of those willing to explore the sensitive issue of gender equity. The focus group coordinators encountered difficulty in their efforts to gather a group of women who changed to a non-science or non-engineering major. A single student who did attend the arranged fifth focus group of 'major changers' cited shame around feelings of failure as a primary reason why she believed others did not join her. Additionally, contacts to women who had changed majors made statements such as "I don't get the sense that she is willing to open up old wounds," and "the decision to change majors is not something she seems very willing to talk about." Still other women who self-identified as major changers were hesitant to talk in a group. Some offered to fill out surveys. However, only one was returned and the answers were superficial and self-blaming. Thus, the sub-committee did not develop an assessment of the disciplines as they are perceived by students who leave those fields.

Despite efforts to create a safe, casual, and comfortable environment in the campus Women's Center (with attention to who was present and participants' privacy), even those students who were willing to participate shared most freely once the focus group ended and talk

was more casual. Nevertheless, many common themes arose in the hour-long formal discussions exploring the predetermined questions.

Common Threads

Ultimately, the support of parents and teachers in middle school and high school motivated most of the participants to engage in a science or engineering track. Many reminisced about middle school science projects or the support of a parent or a particular teacher who believed in them. In a few cases, students remarked that a teacher's discouragement actually prompted them to pursue science in effect to prove that instructor wrong. The women were sensitized to many gender issues relating to careers in science early in their educations (middle and high school) both by the encouragement and discouragement they received.

In all of the groups, students possessed a heightened awareness of both supportive and discouraging sentiments at the university level. Most, however, were reluctant to attribute the discouragement to gender dynamics despite the links present in the stories told by some and the nods of agreement during the focus groups conversations. Discouragement took on two faces for the participants: that which was active and direct, and that which was perceived and resulted from the general state of affairs within particular disciplines and society as a whole. Consistently, the need for more female role models and the difficulty in seeing few female faces among peers were stated as concerns. Many also cited instances where male faculty may have had the intent to be supportive, but a lack of awareness resulted in comments that were less than encouraging. This came across as particularly prevalent in the sciences with respect to the desire for family and career.

In most instances, the concern about becoming a mother and still being successful and respected as an engineer or scientist was a major struggle. The pain of this conflict was most evident with Group 3, where a majority of the participants were planning for graduation and weighing their options with respect to graduate school. Participants expressed their desperation for guidance with statements such as "I just don't see how I can do both. If I go to graduate school next year, I can't have a family until it is almost too late." Another student stated that this issue was exactly why she had decided to become a high school teacher rather than pursue an advanced science degree. A handful of students cited significant career path changes as a result of their observations and experiences of gender inequity. Many students responded to the career path question by returning to and further examining the discouragement they had experienced in high school and within their families, as well as that which was present in their UMBC experiences.

Differences Within and Among Groups

The perception of an 'even playing field' for men and women on campus was highly group dependent. Participants described some tension between themselves and male peers. In some instances, this was described in terms of a hostile standoff, whereas others described a more jovial battle of the sexes or sibling rivalry. Gender stereotyping was not a particularly

large focus for any group in its entirety, although each group generally had a participant who alluded to gender-based stereotypes in the form of statements from peers (“you don’t look like a physicist,” and “we just don’t think of you as the engineering type”). In one case, a professor attempted to guide a student away from a particular career based on the dominance of men in that particular engineering speciality.

Of all the groups, Group 2 had the most positive experience. They reported the least discouragement and stated that they rarely felt gender was an issue with respect to how they were treated. This group, in fact, felt encouraged and in some ways indicated that they were at an advantage as women, because there were so few of them. While other groups tended toward a similar message, their stories were less likely to consistently support such claims. Apparent in this contrast was a discrepancy between those disciplines that would lead to careers in industry (Groups 1 & 2) and those leading toward academia (Groups 3 & 4).

UMBC in National Perspective

As part of a three year national study reported in the 1997 monograph, *Talking about Leaving: Why Undergraduates Leave the Sciences*, Elaine Seymour and Nancy M. Hewitt investigated the reasons why high achieving (Math SAT of 650) male and female students who intended to major in science, mathematics, and engineering at seven colleges decided to leave those fields. As part of this study, the authors provide an excellent review of the existing research on factors affecting women’s participation in science, mathematics, and engineering majors (SME). Noting that women are far more vulnerable to leaving SME majors, the authors identify several factors in these majors that dampen women’s interest. Their study has been recommended by the NSF as a resource for those interested in promoting gender equity on their campuses. The several hundred women interviewed for the study raised many of the same issues that the UMBC students raised in the focus groups. Therefore, Seymour and Hewitt’s analysis can provide valuable insights into how UMBC can improve the climate for women in SME majors.

A central factor is the traditional pedagogical structure of SME majors (a rigid curriculum, very fast pace, heavy workload, fierce competition, dull lectures, and lack of attention from faculty). While both male and female students complain about the structure of the majors, especially the fierce competition, it has a gender-specific impact. The traditional pedagogical practices tend to undercut women self-confidence, which, in turn, makes them more likely to leave the field. Young women are less familiar with, less comfortable with, and less convinced of the utility of the pedagogical style they encounter in these fields. This lack of familiarity and discomfort lead them to question whether they belong. Young women often do not find the intense competition of SME majors conducive to effective learning. The distance of faculty, and resulting lack of reassurances about their performance, leads many young women to a cycle of self-doubt about their ability, despite their performance.

Such doubts are sufficient to lead some young women to change majors. However, further elements of the SME context also contribute to women’s departure from the fields. The

relative absence of women further feeds self-doubt. When young women see fewer and fewer women peers in their classes and when they see few or no women faculty, they feel isolated, lonely, and soberly question whether they belong in the major. Moreover, the reactions of male peers to their presence, and especially to their success, further exacerbates the situation. In the Seymour and Hewitt study and at UMBC, young women complained about the hostility of their male peers. (This is the one thing UMBC focus group facilitators were repeatedly told they should have specifically asked about.) This hostility ranged from suggestive sexual comments, accusations of flirting to get good grades, suggestions that they didn't belong or didn't look like scientists, to overt hostility to young women doing well in courses. Young women often assume that such jokes and comments are made to make them feel unwelcome. Thus hostility and the lack of response by faculty and teaching assistants greatly affected young women.

Those who persisted in the majors, despite these factors, like the UMBC students in the focus groups, tended to have independence (in learning style, decision-making and assessment of their abilities) and/or to have alternative strategies to neutralize male peer hostility (primarily alternative support networks). Even with those who persisted, however, anxiety about balancing doing well in the major with more traditional feminine goals undercut their level of achievement and career goals. As it was with the UMBC students, the issue of how to be both feminine and a good scientist was a recurring concern in the Seymour and Hewitt study. When women left the majors, or decided not to pursue further study beyond the B.A., they were most likely to frame their decision in terms of the need to balance career and family.

While Seymour and Hewitt recommend major changes in the structure of SME majors which are beyond the scope of this report, they offer several immediate suggestions for improving the rate of persistence in SME majors by women. What women most need now, they argue, are the basis for understanding how typical their experience of discomfort and self-doubt are, and strategies to deal with the fierce competition, lack of attention, and hostility without losing their self-confidence. The recommendations below draw on the specific insights and suggestions made by Seymour and Hewitt.

RECOMMENDATIONS FOR IMPROVING THE CLIMATE FOR WOMEN STUDENTS IN SCIENCE MATHEMATICS AND ENGINEERING (SME) MAJORS

- The positive impact of the presence of more women faculty on the climate for students is widely recognized in the literature. In the past two years, as a result of a focused effort by the Provost and Deans, departments have been more successful in hiring women faculty. These efforts should be continued and expanded. In particular efforts should be made to hire women in those departments with 0 or 1 women faculty member.
- The university should support the development of mentoring programs for first and second year students. The university should develop a variety of such programs, because the mentoring needs of women in these fields can differ greatly based upon their background experiences with the pedagogical style of SME majors, their personal coping

strategies, and the relative proportion of women in the major. Therefore, mentoring opportunities should include links between older and younger students, graduate and undergraduate students, faculty and students. The programs should also involve opportunities for students to develop peer support groups within their major and across disciplinary lines. Cross-disciplinary opportunities are particularly critical for students in majors where there are few women students and/or faculty. The literature also indicates that programs that include a living and learning component are particularly successful. The mentoring programs should also encourage the development of all-women study groups and tutoring for students who are more comfortable with cooperative learning styles most commonly found among women.

In addition to mentoring, several of the initiatives that the Planning Leadership team has recommended for next year can have a positive impact on the climate for women, if gender is taken seriously as a climate issue. Concern with retention and graduation rates has led to recommendations to focus on improving the freshman year experience.

- One of the central recommendations is to provide first year seminars. We recommend the development of a seminar for women entering SME majors. The seminar should be designed to meet women's needs to understand the sources of their discomfort in SME majors and to develop strategies to deal with them. In addition, the seminar can offer effective early intervention into women's tendency towards the self-doubt and self-criticism in their early years in the major.
- The Provost has indicated that he will ask departments to evaluate how courses are taught and how they engage students as part of a planning effort to improve retention and graduation. We recommend that he include the climate for women among the issues he asks departments to consider. To support this the Faculty Development Office should provide workshops for faculty in which the literature on classroom climate is reviewed and effective strategies are provided. This training should specifically discuss how to monitor male peer interactions with women classmates and effective responses to hostility, both subtle and blatant.
- Given that the literature indicates that the attitudes and behaviors of teaching assistants, lab instructors and faculty lab assistants can have a far greater impact on women's persistence in SME majors in the first two years, training for these staff should include discussion of the full sense of the gender climate. Faculty supervisors of these staff should be urged to attend the training, as the literature shows that faculty assistants often mirror and amplify faculty gender practices. This training should specifically discuss how to monitor male peer interactions with women classmates and effective responses to hostility, both subtle and blatant.
- The teaching evaluation system should be reviewed to develop effective mechanisms for students to register concerns about gender climate in the classroom. In addition periodic follow-up focus groups should be conducted to assess the effectiveness of programs for

improving the climate.

- As the campus moves towards a decentralized advising system, attention should be paid to gender issues for first and second year students. Advisors should be trained to assess those issues as they affect individual students, and to provide effective support for students in dealing with both peer and faculty problems that may arise.

Works Cited:

Elaine Seymour and Nancy M. Hewitt, *Talking about Leaving: Why Undergraduates Leave the Sciences*, (Boulder: Westview Press, 1997).