

Report of the Ad Hoc Committee on Gender Equity in Science, Mathematics, Information Technology and Engineering

Background

UMBC has a strong commitment to providing optimal professional and educational opportunities and experiences to all faculty, staff and students. Demographic data disaggregated by departments, however, suggest that women are under-represented in science, mathematics, information technology, and engineering. Within this context in August 1999, Provost Arthur Johnson appointed the Ad Hoc Committee on Gender Equity in Science, Mathematics, Information Technology, and Engineering to conduct a comprehensive review of the status of women faculty and students in science, mathematics, information technology, and engineering programs at UMBC, and to provide recommendations for increasing the number of women in these areas and for maximizing their opportunities for success. The specific charge to the committee was to review and make recommendations regarding gender equity in the sciences, mathematics, information technology and engineering. The committee focused on two areas:

- 1) Departmental and institutional policies and practices that affect women faculty's recruitment, retention, and advancement.
- 2) Departmental and institutional policies and practices that affect women students' recruitment, retention, and achievement, including earning advanced degrees.

One impetus for the committee grew out of a May 1999 conversation between President Hrabowski, Provost Johnson, and a group of women faculty associated with the President's Commission for Women. In this conversation several factors were noted: 1) UMBC is below the national average for women faculty in science, engineering, and technology fields; 2) there had been a number of recent departures of senior women faculty from UMBC; 3) women students raised some troubling issues at the April 1999 President's Commission for Women Campus Conversation on women in sciences and engineering; and 4) the MIT report indicated issues of equity that might be relevant to UMBC. Given these factors the President and Provost concluded that this was an appropriate time to review campus policies and practices that affect women faculty and students in scientific and technical fields.

The committee convened in August 1999 with Dr. Yelena Yesha as Chair; the full membership of the committee is listed in Appendix A. Initially the committee devoted its attention to reviewing recent studies and commentary on issues of women in science and technical fields. The committee relied on two key publications, "A Study on the Status of Women Faculty in Science at MIT," published in 1999 in *The MIT Faculty Newsletter* and *Women in Science and Engineering: Choices for Success*, Annals of the New York Academy of Sciences, Volume 869. The New York Academy volume resulted from a conference sponsored by the Academy in March 1998. This Conference was held on the 25th anniversary of the first contemporary conference on the status of women in science sponsored by the Academy. The published papers reflect on the changes in women's status in that time period. This literature revealed several key issues faced by women faculty and students in scientific and technical fields.

The broader historical context of the changing status of women in science, mathematics, information technology and engineering, as noted in the literature, is not one of continuous progress. Rather this history reflects a more varied pattern. In the early twentieth century, women entered the scientific and technical professions in fairly large numbers, eventually earning 14% of doctorates in physical and biological sciences. "By the 1950s and throughout the 1960s that number dropped dramatically and did not rebound until the 1970s with the advent of the civil rights and women's movement and the legislative changes they inspired."¹ Moreover, the issue is not simply one of access. Although federal and state law prohibit gender discrimination in access to education, fewer women than men pursue scientific and technical educations and women leave those programs at every level in higher proportions than do men. These phenomena, collectively referred to as the leaky pipeline,"arise from a complex web of educational, institutional, and personal issues,"² requiring multiple strategies to resolve.

Several hints to the underlying causes of the leaky pipeline can be found in published surveys of women graduate students and faculty. The scarcity of women colleagues can have a very isolating effect on women scientists, engineers, and mathematicians. In a 1997 survey of NSF POWRE (Professional Opportunities for Women in Research and Education) awardees, Sue Rosser found that the absence or presence of women colleagues in the lab had a profound effect on the climate of the women's careers. When there are few or no other women, issues and concerns relevant to their career development remain invisible, and this often leads to a sense of isolation among women faculty/researchers. The MIT study found that this sense of isolation and marginalization was felt more profoundly by senior women than by junior women. Rosser concludes that once the number of women within an academic department or research laboratory reaches 15%, the climate shifts to be more inclusive of concerns and perspectives brought by women. While the 15% mark may be difficult to reach in some fields, all the literature stresses the crucial importance of mentoring for the success of women in science and engineering. This mentoring must be responsive to the gender specific issues faced by women as their careers develop.

The literature was consistent in identifying two key gender specific issues central to the climate for women and to the leaky pipeline. The first, interestingly, is the gender differences in research and publication strategies. "According to Holton and Sonnert, women more than men do careful, comprehensive, quality work which results in fewer published papers but, in any given time frame, more citations."³ They conclude that evaluative criteria for faculty/researchers which focus only on numbers of publications reflects a traditional masculine model of scientific productivity and may disadvantage women. Another aspect of the traditional evaluative criteria that poses problems for women is the expectation that one's commitment to the field is demonstrated by single-minded devotion to research.⁴ This traditional view of how a serious scientist conducts him/herself, coupled with changes in the market, frames a career path that is counter to women's needs and priorities to balance family and professional life. This inflexibility of the tenure-track and the difficulty it poses for women who want to have families is the most

¹ *Women in Science*, p. 62.

² *Ibid.*, p. 39 & 62.

³ *Ibid.*, 76.

⁴ *Ibid.*, p. 77.

frequently mentioned problem facing this generation of women researchers. The increased time to completion of the PhD, the increased number of years in Post-Doctoral positions before securing a tenure-track job, and the rigors of the tenure process make women face a choice of delaying childbearing until it is perhaps too late, or interrupting their careers in fields which often judge interruptions to be evidence of a lack of serious devotion to the profession. Graduate students report that the harshness of the life they see among their few women professors is the main reason they intend to go into industry rather than the academy after completing their education. These graduate students do not want to have to be superwoman in order to have both families and scientific careers.⁵ Industry has changed more rapidly than the academy in response to women's priorities of balancing career and family. Parental leave benefits tend to be widespread and generous within both government research laboratories and in industry. Greater attention to this issue and greater flexibility in the tenure track are necessary if the academy is going to compete successfully for talented women in the sciences and engineering. What is required is that "the route to professional science be made more humane."⁶

The committee also reviewed data regarding the proportion of women faculty and students at UMBC. These data, prepared by the women's faculty group and presented to the President and Provost in May 1999, indicate that only 13% of the tenured and tenure-track faculty in science, mathematics, information technology, and engineering at UMBC are women. Two departments, Biological Sciences and Information Systems account for 10 of these 17 women. This falls somewhat below the national percentage of 20% of doctorates in these fields. UMBC performs somewhat better among undergraduates, in which women make up 40% of students.

After completing its review of the literature and background data, the committee decided the most effective plan was to divide into three sub-committees: 1) to conduct a quantitative analysis of salary and resource distribution by gender; 2) to conduct qualitative analysis of campus climate for women; and 3) to conduct a survey of students regarding climate for women. The main findings in the reports of the quantitative subcommittee and the qualitative sub-committee are discussed below. The full reports can be found in Appendix B and Appendix C. The student sub-committee was unable to complete a survey this semester and its report will be submitted after the survey of students in the fall 2000 semester.

Quantitative Analysis

The Quantitative sub-committee (William Rosenberger, Chair, Marilyn Demorest and Jenny Preece) completed a comprehensive review of data on 43 faculty: Twenty-two current and recently departed women in tenured and tenure track positions were paired with male faculty, who closely matched the women by department, date of hire, and rank, and who thus served as controls. Data gathered for these faculty included information about resources (salary, start-up packages, and lab space) they had received, about their research productivity (numbers of publications and grants), and about their teaching (effectiveness and workload). This information was gathered from current C.V.s, departmental records, and university records. The sub-committee examined salary and resource data from two different angles: 1) did pairs have

⁵ Ibid., p. 212.

⁶ Ibid., p. 63.

dissimilar salaries and resources, and if so, was that explainable by their relative qualifications; and 2) did pairs have dissimilar qualifications, and if so, was that reflected in their relative salaries. The committee also examined recent teaching workload data to see if there were any gender-based discrepancies.

With regard to salary and resources, no systematic patterns of gender inequity were found across the data set, or within individual departments. Differences that exist appear to be explainable by differences in research and/or teaching qualifications. The sub-committee did identify five cases where some discrepancies were evident. In three of the pairs, the women faculty member tended to have lower salary and/or resources which were unexplained by research qualifications, and in two pairs the faculty men had lower salary and/or resources. In one additional case, a woman faculty member with substantially more grant dollars and publications than her counterpart received a salary comparable to the man. With regard to teaching workload, no significant differences in workload trends by gender were found. The particular salary/resource disparities will be forwarded to the attention of the Provost and relevant Deans.

Qualitative Analysis

The qualitative sub-committee (Carole McCann, Phyllis Robinson, Yelena Yesha and Brooke Stevens) completed interviews with all but one of the 22 women faculty. Each of the women was interviewed by two of the three female sub-committee members who were not members of the same department and/or college as the interviewee. Interviewers took notes, but each faculty member was assured that her comments would be kept confidential. The women were generally very willing to talk with the sub-committee and were very interested in the full committee's work.

The information gathered through these interviews indicated a range of satisfaction among the women faculty. Some are very satisfied with their working environments, more are dissatisfied by aspects of the climate, and a few are considering leaving. The interviews also revealed several specific climate issues of concern to the women faculty. Reviewing interviewee comments on the topics of support for research, mentoring, service obligations, criteria for faculty evaluation, parental leave, and other gender-related policies, the sub-committee drew the following conclusions about the climate for women faculty in the sciences, mathematics, information technology, and engineering at UMBC:

1) The general climate is positively influenced by the presence of other women faculty within a department. When women are the only one or one of a few, they tend to feel isolated unless they make contacts with women faculty in other departments.

2) The tone set by the department chair is crucial to climate issues within departments. Mentoring is valued where it exists and gives women faculty a stronger sense of their position within the department and university. However, junior faculty who received mentoring were often expected to provide high levels of service to the department. Departments vary greatly in whether they shield junior faculty from service or require a great deal of service from them.

Women faculty at all ranks felt that there was too much service expected of them and that service was not rewarded. There was also real concern that one could not refuse service requests.

3) The growing emphasis on increasing UMBC grants dollars may have the effect of supplanting more thoughtful measures of scholarly productivity. This emphasis may have a negative impact on the evaluation of faculty women who pursue more cautious publication strategies.

4) The lack of a clear and workable parental leave policy is a serious problem. No women in the sciences has felt able to take a full semester's leave and none of the women has received extra time for tenure. In addition, ceding the administration of the parental leave policy to department chairs means that faculty requests for leave are handled at the discretion of chairs who vary in their sympathy and understanding of family responsibilities. This lack of a clear or supportive policy is one of the chief issues identified by women faculty as a hindrance to their retention and promotion.

5) UMBC policy affecting women's work life needs to be more effectively disseminated. Wide variations in departmental practices do not seem to be monitored by any central administrative review. This lack of clear policy undercuts women's ability to use policy without a negative impact on their careers. No one has to respect the rights of faculty women under the parental leave policy when the policy is unknown. Greater information sharing is one positive outcome of the presence of women colleagues within one's department.

Student Sub-Committee

The Student sub-committee (Theresa Scott, Joy Rogers, Mary Rivkin, Vera Da Silva, Earnestine Baker, Cynthia M. Hill, and James Vincent) under took the task of surveying students regarding gender climate in science, engineering, and technological instruction at UMBC. In preparation for this survey, the entire task force met with Dr. Ken Maton, from the Psychology Department who conducts student surveys for the Meyerhoff program, and is currently interviewing Meyerhoff women. Based in part on Dr. Maton's advice and on the interview questions asked of faculty women, the student sub-committee designed a survey to be administered to undergraduate and graduate students. In addition, the sub-committee identified courses to which the survey should be sent. The survey will be conducted in the fall of 2000.

Recommendations

Based upon the review of the literature and the quantitative and qualitative analyses, the committee offers several recommendations intended to improve campus climate and thereby help UMBC hire, retain and promote more women in the sciences, mathematics, engineering, and information systems.

Resources

In this area UMBC has done well in recent years. And the committee has two recommendations to continue this record in the future.

1) Continue Salary Equity Committee. In most cases, faculty women and comparable men, based on rough assessments of productivity (numbers of publications, grant dollars, SECQ question 9) are receiving approximately the same salaries. The absence of wage differentials found by this committee suggests that the decade-long practice of annual review of faculty salaries for gender-based equity is working and should therefore be continued. In addition, steps should be taken to ameliorate the few specific cases the committee found in which gender-based disparities in resources exist.

2) The Provost's Office should develop procedures for periodic review of gender equity regarding other resources provided to faculty (space, DRIF, Start-up). At a minimum, the Deans should provide annual reports to the Provost on the impact of such allocations.

Climate

Climate is an area of gender equity in which there is substantial room for improvement.

3) While mentoring is needed across the campus, there is a specific need for mentoring among women faculty. Many women faculty, who are often in departments with few or no other women colleagues, expressed a strong sense of isolation. The Provost's Office should provide \$10,000 to support development and implementation of an interdepartmental faculty mentoring program for junior faculty women.

The program should be developed under the auspices of the new faculty development director with a committee of senior women faculty in the sciences/engineering, faculty senate representatives, and representatives of information systems, and women's studies. (Both IFS and Women's Studies have developed models of faculty mentoring and can provide valuable expertise for intradepartmental and interdepartmental mentoring.)

A gender-based mentoring program will help improve the campus climate by providing a forum for advice, support, information, and assistance with issues confronting women in the academy. In addition, the existence of such a program will assist in the recruitment of women, especially to those departments that do not have a cohort of women within the department, because it will signal a welcoming and supportive environment.

Finally, this program can help facilitate the effective communication of campus policy and procedures and help ensure that such policy is applied consistently across departments (see recommendation 4 & 5).

4) Policy regarding gender-based benefits and bias must be effectively communicated to the faculty, especially faculty women. Policies related to women's workplace rights and protections are not well known or understood by either women faculty or their department chairs.

The difficulty women faculty have had in finding out what the policy is and in getting authoritative interpretation of how a particular policy is to be implemented has created great

frustration and at times hardship for them. These difficulties can substantially undercut campus efforts to provide a welcoming and supportive environment.

Therefore, the Provost's Office and Deans must immediately develop and implement procedures for disseminating information about gender-based policies to faculty women and to department chairs. At a minimum, the policies and procedures for their implementation should be reviewed annually at Chairs meetings.

In addition, a manual of these policies and procedures for their use should be developed and distributed to faculty women each fall at the annual reception for new faculty and professional staff sponsored by the President's Commission for Women and the Women's Studies Program.

5) The single most important improvement in the gender climate that is needed at UMBC is a clear, well-supported parental leave policy.

The UMBC policy has not been updated since the Family and Medical Leave Act was enacted in 1993. The UMBC policy is not consistent with current USM policy. For instance, the UMBC policy does not provide for an alternative position for a faculty member on F&M leave. The UMBC policy does not provide clear guidance for faculty about how to go about requesting leave, how to calculate available leave, how to apply sick leave and collegial leave, or when and how to secure an extension of the tenure clock.

While the UMBC policy requires each department chairperson to submit procedures for approval of leave, the committee did not find anything that suggested that this provision has been implemented. Moreover, delegating the implementation of the policy to departments has led to wide variations in the leave provided to faculty. It has also led to inconsistency in the calculation of available leave and in the application of leave to days absent. This decentralization also supports continued gender biases within departments that are skeptical of women's ability to combine research and family-life effectively. In turn, this bias discourages faculty women from using this benefit.

A subcommittee of the Ad Hoc committee, along with the addition of representatives from the faculty senate, should be formed to update UMBC's Parental Leave policy to reflect the provisions of system policy. The subcommittee should report its recommendations to the Provost by January 2001. The new policy should provide for an annual review of its use to ensure that the policy works effectively.

In addition, the Provost and Deans should develop and provide department chairs with model procedures for assigning faculty to alternative positions for F & M leave, for integrating F & M leave with other intermittent leave, for calculating available leave, for application of leave to days absent and for extending time to tenure. The Provost and Deans must also take a leading role in countering departmental cultures that discourage women from seeking leave to which they are entitled.

Moreover, since we are competing with industry, which offers far more attractive parental leave benefits, UMBC should identify funding to support a full semester F & M leave for faculty. The

Provost's Office should immediately implement a procedure whereby colleagues can donate their sick leave to faculty for use with F & M leave.

6) UMBC must make a commitment to hire more women faculty in tenure and tenure-track positions. Efforts must be made to diversify the candidate pool to ensure that eligible women apply for faculty positions. The Deans should assist departments by identifying appropriate organizations and professional meetings through which women in science, technology, and engineering fields can be recruited. Departmental faculty should also canvas their professional colleagues to help identify strong applicants. The University should provide funds to support departments pursuing effective strategies to diversify the candidate pool. Deans must also review search procedures and committee configurations to ensure that the priority to diversify the faculty is carried through the selection process.

However, diversifying the candidate pool is not enough. The Provost and Deans must provide additional leadership in the identification and recruitment of women to faculty positions across the science and technical fields. MIT provides several examples of successful strategies that UMBC should adopt: The campus priority of diversifying the faculty, should be incorporated in process for reviewing requests to fill lines and to receive new lines. Departmental requests should include a statement about how their request meets this priority. Departments whose faculty is less than 25% female should be given priority in hiring, if they present an effective plan. Departments whose faculty is less than the critical 15% should be required to present a specific plan for meeting this priority as part of each hiring request. Women hired into departments where their under-representation had been an ongoing concern should be given additional start-up funds to help them succeed. After successful contract renewal, these funds should become a permanent part of the department's operating budget. The Provost should also identify faculty lines to be given at his discretion to departments who identify strong diversity candidates. These lines may be given in addition to already approved lines, but would revert to the Provost if they became vacant. These strategies can also be used to increase the ethnic diversity of the faculty.

7) A sub-committee of the Ad Hoc committee should be continued next year to complete the complicated task of reviewing campus policies and practices that affect women students. The survey developed by this year's committee should be distributed to selected lower and upper division undergraduate courses as well as graduate courses in the sciences, mathematics, information technology and engineering. Particular attention should be paid to undergraduate advising and graduate mentoring.

8) A sub-committee of the Ad Hoc committee should be continued next year to study further the complex issues of the service burdens faced by junior and senior women faculty, possible marginalization of senior women, and to support needs of senior women faculty, including issues of climate.

9) In three years time, a follow-up evaluation of the implementation and effectiveness of these recommendations should be completed. That evaluation should include recommendations for further steps if substantial change has not occurred.

Ad Hoc Committee on Gender Equity in Science, Mathematics,
Information Technology, and Engineering

Chair
Yelena Yesha
Professor of Computer Science
and Electrical Engineering

Members

Earnestine Baker
Director of the Meyerhoff Scholarship Program

Panos Charalambides
Professor of Mechanical Engineering

Vera Da Silva
Instructor of Chemistry and Biochemistry

Marilyn E. Demorest
Professor of Psychology and
Vice Provost for Faculty Affairs

Cynthia M. Hill
Director of Student Support Services

Carole McCann
Associate Professor of American Studies and
Director of Women's Studies

Patrice McDermott
Associate Professor of American Studies and
Associate Dean of Arts and Sciences

Jennifer Preece
Professor and Chair of Information Systems

Mary Rivkin
Associate Professor of Education

Staff

Denise Warren
Project Coordinator
Office of the Provost

Phyllis Robinson
Associate Professor of Biological Sciences

Joy Rouers
Graduate student in Chemistry and
Biochemistry

William Rosenberger
Associate Professor of Mathematics and
Statistics

Theresa Scott
Undergraduate student in Computer Science
and Electrical Engineering

Brooke Stephens
Associate Professor of Computer Science
and Electrical Engineering and
Associate Dean of Engineering

James Vincent
Associate Professor of Chemistry and
Biochemistry and
Associate Dean of the Graduate School

Kathy Miller
Executive Administrative Assistant
Regents' Professor

