

LEVERAGING EXPERIENCE TO ACCELERATE PROGRESS: MOVING TOWARDS GENDER EQUITY IN ENGINEERING EDUCATION

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Abstract — Tufts University and the Intel Foundation sponsored a conference on gender equity in engineering education at the National Academy of Engineering January 14-15, 2003, in Washington DC. Engineering schools were invited to send teams led by the engineering dean to the conference. The overall goal was to provide a venue for the exchange of information, highlight cutting edge research about and programs addressing gender issues in engineering, and give participating teams the opportunity to synthesize this information into a plan to accelerate gender equity at their institutions. This paper presents preliminary outcomes from the conference, including challenges that deans and faculty face in addressing issues of gender equity and some strategies for overcoming these obstacles; types of institutional support and roles that administrators or faculty assume that promote change; and action plans developed by the participating teams to mainstream gender equity at their institutions.

Index Terms — engineering education, gender equity, recruitment, retention.

OVERVIEW

On January 14 and 15, 2003, deans of engineering and members of their leadership teams from 27 engineering schools convened at the National Academy of Engineering in Washington DC to plan strategies to improve the climate for female students and faculty in engineering colleges. The conference was organized by the Intel Corporation and Tufts University, with additional support from the GE Fund, IBM Corporation, Hewlett Packard Company, the ExxonMobil Foundation, and DuPont.

The conference opened with a welcome from NAE president Dr. William Wulf, who emphasized the importance of increasing diversity in engineering. The participants heard presentations from Dr. Allan Fisher of Carnegie Mellon University on his research on women in computer science, described in the book he co-authored with Dr. Jane Margolis, *Unlocking the Clubhouse* [1], and Dr. Christine Cunningham on a three-year longitudinal study of women engineering students conducted by Goodman Research

Group, known as Women's Experiences in College Engineering [2].

Luncheon speaker Senator Ron Wyden (D-OR) discussed the application of Title IX of the Educational Amendments of 1972 to increasing the participation of women in science and engineering careers. While the statute is most widely associated with increasing the participation of women in sports, its original intent and legislative language address educational programs. Senator Wyden encouraged conference participants to get involved in the political process and provide input into public policy decisions, and he circulated a draft letter to Secretary of Education Rod Paige urging him to enforce the provisions of Title IX with respect to science education. National Science Foundation Deputy Director Dr. Joe Bordogna also addressed attendees and emphasized the importance of addressing gender equity in science and engineering, noting that much progress was made in the 1970s and 1980s, but that progress has slowed and in some cases stopped and even, in the case of computer science, reversed.

CHALLENGES AND STRATEGIES

One of the primary goals of the Leveraging Experience to Accelerate Progress (LEAP) Conference on Gender Equity was to provide a forum for university participants to gather information and advice to facilitate moving gender equity to the next level at their institution. The conference was structured so that participants could draw upon the challenges and successes others have faced in creating or institutionalizing gender equity initiatives to inform their own nascent or future efforts to implement similar programs and activities. Intense exchanges of information occurred in small group discussions of critical issues. Topics for these roundtable discussions ranged from undergraduate recruitment and retention to faculty quality of life and institutional culture, and included specific strategies for addressing each issue that had actually been implemented by the roundtable facilitators. Examples include:

Undergraduate Recruitment and Retention

- Recruiting and retaining undergraduates through "short courses" designed to inspire interest in engineering for

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engineering majors and non-majors alike. (Facilitator: Ioannis Miaoulis, former Dean of Engineering, Tufts University, and current president of the Boston Museum of Science)

- Creating a general framework for designing, effecting and monitoring institutional change for diversity at the undergraduate level. (Facilitator: Allan Fisher, President and CEO, iCarnegie)
- Integrating socially relevant, interdisciplinary and learner-centered courses into the undergraduate engineering curriculum. (Facilitator: Domenico Grasso, Dean of Engineering, Smith College)

Graduate Student Recruitment and Retention

- Helping women negotiate doctoral programs, and helping institutions respond to the needs of women in those programs. (Facilitator: Cinda-Sue Davis, University of Michigan)

Faculty Recruitment and Retention

- Generating a diverse pool of faculty candidates. (Facilitator: Denice Denton, Dean of Engineering, University of Washington)
- Building a diverse faculty. (Facilitator: Janie Fouke, Dean of Engineering, Michigan State University)
- Assisting women faculty in developing their academic careers with attention to simultaneous development of teaching and research programs and issues related to balancing family and work. (Facilitator: David Wormley, Dean of Engineering, Penn State University)
- Strategies to address transition of women into academic leadership roles and prepare women for success. (Facilitator: Ilene Busch-Vishniac, Dean of Engineering, Johns Hopkins University)

Institutional Change

- Strategies to change faculty attitudes about diversity, and establishing a university culture that embraces diversity. (Facilitator: Jeff Wright, Dean of Engineering, University of California, Merced)
- Examining the negative impact that words and actions of students and faculty can have on female students and faculty, and the challenges that can arise in trying to address them. (Facilitator: Steven Director, Dean of Engineering, University of Michigan)
- Monitoring progress towards the goal of a more equitable and inclusive institution. (Facilitator: Thomas Magnanti, Dean of Engineering, MIT)

ACTION PLANS

University teams were given time at the workshop to develop action plans that identified critical gender equity issues at their institutions and strategies discussed at the conference to address those issues. Teams also identified barriers and resources needed to overcome the barriers, and

listed specific steps to implement the identified strategies at their institutions. Conference organizers collected the Action Plans to assist in planning follow up activities.

Issues

Conference participants were asked to identify two issues and develop actions plans to address those issues. Of the 25 action plans received, 24 identified faculty related issues, 8 identified issues related to graduate students and 7 identified issues related to undergraduate students. Institutional culture or climate issues were identified in 9 action plans. The faculty related issues included the need for more women faculty, issues related to the faculty recruitment process, marginalization of women faculty, faculty quality of life and work/life balance, and retention and advancement of women faculty to leadership positions. Dual career faculty couples (the “two body problem”) are still an issue, especially for smaller schools and those located outside a major metropolitan area. Student issues, both graduate and undergraduate, related to recruitment and retention of women students. The issues of campus climate and culture included a lack of administration support, lack of sensitivity on the part of professors and teaching assistants (“classroom hygiene”), and the fact that diversity is not seen as a “core value” at some institutions.

Barriers

Many action plans identified faculty attitudes as barriers to change at their institutions. Specific comments indicated a lack of ownership of diversity issues on the part of the faculty, faculty desire for independence, perception that the low numbers of women in engineering is not a problem, and faculty resistance to training in classroom techniques. In some cases participants identified a need for leadership on the part of the administration, but another commented that “The dean can only do so much. The faculty must be convinced...”

For student related issues, perceived barriers included a lack of resources for staff and programs, lack of role models for women students, lack of control over the admissions process, lack of time and interest on the part of the faculty in recruiting activities, lack of competitive stipends for graduate students, and the climate in middle school and high school that does not encourage women to pursue engineering careers.

Initiatives

Participants developed a variety of initiatives to address their issues. New approaches to faculty recruitment included finding ways to expand the pool of candidates considered for faculty positions, such as broadening the search criteria, and instituting training and procedures for faculty search committees. At some schools the dean reviews the vitae of all candidates selected for interview before allowing the search to proceed. If no female candidates are in the

interview pool, the search is not allowed to proceed. A lot toolkit” developed by Dean Denice Denton at the University of Washington.

Other faculty related initiatives are an increased focus on quality of life issues, including workload and benefits for junior faculty, and formal training on the tenure and promotion process in an attempt to level the playing field for all faculty.

Initiatives focused on students ranged from improved coordination of recruitment efforts across departments and revised admissions procedures to the use of interactive theater to raise faculty awareness of classroom practices that negatively impact women students. Surveying the students to identify climate issues, peer mentoring for graduate and undergraduate students, and research experiences for undergraduates are other approaches identified to improve retention of female students.

Resources

In addition to money for training programs, additional staff, startup packages for new faculty, and graduate fellowships, participants also identified the need for more intangible support. In particular, support from the administration for flexibility in faculty searches, leadership and coordination from the dean, “faculty champions” and institutional support in general are key to the success of these initiatives. Benchmarking against other institutions is a way to measure progress and provides leverage with administrators. Non-monetary support from outside funders, such as the National Science Foundation requirement for consideration of “broader impacts” in grant proposals, is another source of leverage for these initiatives.

FEEDBACK

Conference participants found the opportunity to network with their peers at other institutions and learn about best practices valuable. The presence of the deans added visibility and importance to the discussions. Suggestions for future events included a session just for department chairs to

of participants indicated interest in the “faculty recruitment emphasize the importance of their role in recruitment and retention of women students and faculty. Participation of teams from each school and the use of action plans to focus participants on the needs of their own institutions increased the probability of continued attention after the conference.

PARTICIPATING INSTITUTIONS

Universities were invited to participate in the LEAP conference based on their perceived interest in gender equity and readiness to commit to action on the issue. Participants included Arizona State, Carnegie Mellon, Duke, Georgia Tech, Johns Hopkins, Michigan State, MIT, North Carolina A&T, Penn State, Princeton, Purdue, RPI, Smith College, Southern Methodist University, Stanford, Texas A&M, Tufts, University of Arizona, University of California Los Angeles, University of California Merced, University of Florida, University of Illinois, University of Michigan, University of New Mexico, University of Texas Austin, and University of Washington.

FOLLOW UP ACTION

Conference organizers are in the process of finalizing the workshop proceedings that will be available to participants and other interested parties through the Tufts University Center for Engineering Educational Outreach. Contact Meredith Knight at the address shown on the first page of this paper to obtain a copy of the conference proceedings. Consideration is also being given to tracking implementation of the initiatives identified in the action plans and ways to expand the focus to include additional institutions.

REFERENCES

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