AC 2009-2178: PROMOTING DIVERSITY IN GRADUATE ENGINEERING EDUCATION: THE STUDENT PERSPECTIVE

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Promoting Diversity in Graduate Engineering Education:
The Student Perspective

Abstract

In this presentation we continue a several-year focus on effective methods for encouraging greater diversity in graduate engineering education. As was the case when we began our discussions in 2004, the percentages of women and minorities earning engineering graduate degrees still lag behind the percentages earning bachelor's degrees. In our discussions we have looked at reasons why this continues to be so and we have also examined policies and activities which can help to increase diversity. Here we focus specifically on how students themselves rate the effectiveness of diversity initiatives in graduate engineering programs and on what additional strategies they would recommend to attract a more diverse group of students to continue their engineering studies beyond the bachelor's degree. We also describe some student initiatives designed to encourage graduate study and to support graduate students.

Introduction

This presentation continues a discussion begun in 2004 on the specific problems of increasing diversity in graduate education. This presentation supplements a 2009 ASEE Conference panel session on diversity cosponsored by the Corporate Members Council, Women in Engineering, Minorities in Engineering, and the Graduate Studies Division. Previous discussions in this series focused on:

- showcasing exemplary programs for graduate students and for encouraging undergraduates to choose graduate study (at Arizona State University, University of Puerto Rico-Mayaguez, University of Washington, Mercer University, and University of South Florida)

- defining underlying issues affecting diversity at the graduate level

- articulating a holistic approach for dealing with the issues identified

- achieving a multilayered approach to encouraging diversity, with modifications for environments which can provide different levels of support

- reviewing the literature on diversity in graduate education and describing, for each group of stakeholders in the process of graduate education, policies and activities that have been presented in the literature and that have emerged during our discussions that can help to overcome some of these obstacles.

In the 2009 discussion we turn our attention to the students who have been targeted by these programs. As noted in our 2004 discussion, while there has been an increase in the percentage of women earning masters’ degrees in engineering, the percentages of students
earning degrees has remained stable for all other groups at the masters level and for all groups at the doctoral level. The main questions that need to be addressed are:

- How do perceptions of today's students agree with or differ from those reported in previous studies?
- From the students' point of view, what strategies to promote diversity in engineering graduate education have been most effective? Which have been least effective?
- What issues do the students identify as needing more attention if diversity in graduate engineering education is to be increased?

This presentation does not claim to answer these questions. Rather we seek to use our discussion to stimulate further study.

**Diversity in Graduate Programs**

Increasing the number of underrepresented students in graduate programs is inherently more difficult than at the undergraduate level. Many undergraduate programs are administered at the college level, where resources for supporting diversity can be used more efficiently and assessment can be supported more easily. At the graduate level, admission decisions and support for developing study groups or other community activities are more likely to be focused at the department level or even at the level of an individual professor's laboratory, so it may be more difficult for students in underrepresented groups to meet one another and to develop support structures. And resources for assessing the effectiveness of programs that are in place may be unavailable.

Thus, while it may be the case that programs which have been established to increase diversity at the graduate level are slowly having an effect, it is likely that these programs could be strengthened or given higher visibility. It is also possible that effective remedies for the lack of diversity that have been identified are not available at many institutions or that, even when they are available, do not reach their target audience. In the current period of declining resources and cost-cutting which many universities are experiencing, it is important to maintain programs that are successful and to continue to identify and promote new strategies for increasing diversity, while at the same time making sure that resources that are available are used as effectively as possible.

One potential source of information on the effectiveness and availability of available programs is the student participants themselves. Several obvious question arise:

- How likely is it that an effective program will be available to an eligible student?
- How likely is it that students will take advantage of these programs?
How do participating students rate these programs?

Are there gaps in the services these programs provide?

How could they be made more effective, from the students' point of view?

Can students themselves initiate and sustain effective programs?

In this discussion we will attempt to begin to answer these questions.

Student Initiatives

In discussing programs for students, it is important to note that students themselves have developed initiatives to support students from underrepresented groups or to support graduate students in general. Important examples include:

- The Notherian Ring, originally established in 1991 by women graduate students to support women in mathematics at the University of California, Berkeley, and which now also has a chapter at Princeton University, with a focus on mentoring undergraduate and graduate women in mathematics.

- The University of Michigan ASEE Student Chapter, which for a number of years has sustained activities to improve the climate for all graduate students in engineering at the University of Michigan.

- The ASEE Student Constituent Committee, which was created in 2007 to provide information and which now sponsors several activities for students, including sessions at the ASEE Annual Conference.

- The mentoring program developed by student members of the National Society of Black Engineers chapter at Florida A&M University to encourage African-American students to apply to graduate school and to assist them in preparing successful applications.

Many other examples of student-initiated and student-run programs exist, but the above are notable both for the diversity of activities they support and for their potential for sustainability. Many good student initiatives do not last beyond the graduation date of their organizers, but the initiatives we have listed here either have already lasted a number of years or have the potential to be sustained indefinitely.

Student Views of Quality and Availability of Programs

Surveying student attitudes directly can be an important tool. An excellent example of this is the now classic survey by Seymour and Hewitt, which studied undergraduates' reasons for dropping out of science majors and which found, for example, that scientific ability was not a significant factor in a student's decision to leave the sciences. For the
issues we are discussing here, one thorough study, conducted in 1996\textsuperscript{13}, explored student-driven and institutional factors on anticipated academic outcomes among first-year graduate students at the University of Michigan. This study found, for example, that while race and gender did not affect academic outcomes, there was a significant difference in how majority and minority students viewed the importance of these factors. Moreover, students who perceived their race to be a liability were more likely to have lower grade point averages. Consistent results appeared in a more recent study\textsuperscript{14}, which found that feelings of inclusion, often related to ethnicity, were a significant factor in women engineering students' persistence in engineering careers.

As for academic programs, one large study\textsuperscript{15} surveyed over 4,000 Ph.D. students from a variety of disciplines in 1999 to get their perspective on doctoral education. Results indicated that students were often dissatisfied with the doctoral programs they were in and did not think that their training really prepared them for the jobs they were seeking. Thus for these programs the perceptions of the faculty and of the students were very different. A recent study conducted by the University of California\textsuperscript{16} indicated that faculty careers, in engineering or other disciplines, are not very attractive to current doctoral students. It may be that such attitudes are more strongly held by minority engineering students, particularly women.

Information is also needed about the availability of programs. For example many programs providing research experiences for undergraduates and encouraging interest in graduate school have been established recently. But it is not clear how accessible these programs are to minority groups in engineering in general or how likely such students are to apply to these programs. Mentoring programs have also been established, including national programs such as MentorNet\textsuperscript{17}, but again it is not clear how widely available these are or how effective the student find them.

Conclusion

In this paper we have tried to highlight some of the issues of diversity in graduate engineering education from the student perspective. There are now many programs to promote diversity in graduate engineering education, but the number of women and minorities pursuing graduate engineering degrees is not changing significantly. Understanding why this is the case and finding even more effective strategies will require more input from students and potential students themselves.

Bibliography


