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By Dr. Lisa Tsui

Recruiting Females into Male Dominated Programs:

Effective Strategies and Approaches

Abstract

This study examines the recruitment of women into a heavily male dominated field of study, in this case mechanical engineering. Qualitative data, in the form of interviews and focus groups, were gathered from six undergraduate mechanical engineering programs that enroll and graduate a relatively high proportion of women. Results revealed that 1) more female-focused recruitment efforts are needed as is an expanded representation of the field; 2) community outreach bolsters recruitment; and, 3) undergraduates play a vital role in carrying out outreach and recruitment.

Introduction

Student recruitment is becoming a greater challenge for colleges and universities as both institutional budgetary cuts and competition among schools for new students rise (Woodhouse, 2006). Concomitantly, there are growing calls for not only institutions of higher education (IHEs), but fields of study within IHEs to become more diverse and inclusive. Engineering is one field of study in which gender disparity stubbornly persists. University administrators and staff who are under pressure to enhance or sustain enrollment need to think creatively, given limited resources, about how they can attract more students to their program, especially those that have been historically underrepresented.

Background

While females comprise approximately 56 percent of the undergraduate population, they are a small minority in certain fields of study such as engineering. Thirty years ago women accounted for only one percent of the undergraduate engineering degrees, and today they earn 20 percent of the degrees. Interestingly, vast differences in the presence of women are found across various engineering disciplines. For example, women have reached or are close to reaching parity in such disciplines as biomedical, civil and chemical engineering, but remain severely underrepresented in mechanical, electrical and computer engineering (where women comprise merely 12-13 percent of the enrollment). The imperative to attract more women into the engineering field is clear. In order for the United States to remain a world leader in science and industry, it can not afford to neglect the largely under tapped potential that lies within this substantial segment of the college population. Females are arriving to college equally poised to study science and engineering as their male peers (Hyde, 2008). Moreover, as some have pointed out, because engineering ultimately serves human needs, it stands to benefit tremendously from a diverse workforce—one that reflects those it serves (Chubin, May, & Babco 2005).

Case study site visits were made to the six purposefully chosen programs. A team of researchers conducted in-depth interviews with departmental administrators, staff members, faculty, and female seniors, as well as single sex focus groups with either male or female undergraduates. At each site staff members working in the area of recruitment and/or outreach were interviewed.

Purpose of Study

The purpose of this study is to identify factors that facilitate the recruitment of female students into engineering, a field that is marred by long-standing gender disparity. Studying six engineering programs that have a relatively high percentage of women enrolled sheds valuable light on effective recruitment strategies and approaches.

Design and Methodology

The data presented here are drawn from a recent national study of women in engineering, funded by Research on Gender in Science and Engineering at the National Science Foundation (Tsui et al. 2008). In the larger study the status of women in engineering is examined via a newly compiled national dataset, and critical factors within the overall program environment are explored through case studies of six exemplary programs. The study here draws mainly on the case study data, and focuses on key factors surrounding female recruitment.

The six sites were selected because national data showed that these programs enroll and graduate a relatively high percentage of women in comparison to other mechanical engineering (ME) programs nationwide. Because of the vast differences in gender composition found across engineering disciplines, and to control for disciplinary influence, the case studies all involve a single engineering discipline. ME was chosen because it is heavily male dominated and accounts for a large portion of overall engineering enrollment. The participating ME programs are situated at Cornell University (NY), Michigan State University (MI), Southern University (LA), Tuskegee University (AL), University of California, Los Angeles, and University of New Mexico.

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Analysis

Interviews were audio taped, with permission from participants, and later transcribed verbatim. Data from each interview were excerpted and organized into a large multi-tab matrix to facilitate data synthesis and analysis. After repeated review of all transcripts and the matrix document, key response categories were generated. The data were coded by keywords, and then patterns were searched for across sites. In addition to producing individual case study writes-up, a cross-case analysis was performed.

Findings

A Need to Refocus Marketing

The case studies reveal that on the whole, even this group of exemplary ME programs did not exhibit a great deal of female-focused recruitment efforts. It was not uncommon to find school officials across the various sites who expressed surprise that their program was selected to participate, for many felt there was ample room for improvement and that their program could be doing much more in terms of attracting females. It is worth noting that the most common and substantial female-focused recruitment activities taking place, such as visits to K-12 classrooms and career fairs, campus visitation events, and Shadowing Day (a high school student follows an engineering undergraduate around for the day), tend to involve female-oriented student groups (e.g. Women in Science and Engineering and Society of Women Engineers).

School officials across the sites argued for the need to refocus discussions with prospective female students because though it is easy to talk about airplanes and fast cars within the ME context, women tend to be less interested in these topics and more interested in the helping aspects of engineering. As pointed out by many interviewees across the sites, ME in general attracts few women because it tends to be seen in a very limited light. Conveying a sentiment shared by many interviewees, one dean ex-

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plained, "The truth is that all the engineering fields help people... we are just not portraying it right. Students get here and they get a barrage of math and physics—it is hard to tease out of that that you are studying something that will make society better." As noted by several school officials interviewed, most students graduate from high school with little knowledge about the field of engineering and even less about differences between the various engineering disciplines. Many interviewees seem to share the opinion expressed by the professor who noted that freshmen selecting a major within engineering tend to do so "with a great deal of ignorance."

A number of school officials across sites indicated that female recruitment is advanced by efforts to emphasize topics that particularly appeal to females such as the link to medical science areas and the existence of engineering student groups that focus on humanitarian concerns. One associate dean and former director of engineering admission reported that substantial strides were made in increasing the proportion of entering female freshmen at her school through deliberate changes in the admission process and the representation of the engineering college so that it is portrayed more authentically rather than as a "macho place." This included, for instance, the highlighting in admission publications of not only the racecar and robotics teams but other student groups such as Solar Decathlon (designing and constructing a solar-powered home) and Engineers for a Sustainable World (working on global challenges such as safe drinking water, food security and energy).

Importance of Community Outreach

K-12 outreach is critically linked to recruitment. Across the six sites substantial outreach efforts can be found, though much of this tends to be diffused rather than centralized and coordinated. Outreach activities were apt to be a mixture of individual efforts carried out by various student organizations, research centers and lone faculty members. Common outreach activities conducted by IHEs and targeting high school and middle school students included the hosting of Engineering Day, participation in science competitions and the offering of research internships in campus laboratories. In addition, all six sites offered established precollege summer program for underrepresented students (girls and/or underrepresented minorities) that appeared to be highly valued by students and school officials alike. Some of these reported that a significant share of precollege summer program participants later returned for college enrollment.

At each of the sites examples were found of engineering outreach that affects teaching in K-12 classrooms; some of these efforts are spearheaded by faculty and others by students. At one site modification of educational modules from a college engineering course were made so that it could be used by high school science teachers. At another site college administrators and professors became active in a local magnet high school by serving on the school board, making presentations, judging science fairs or teaching a computer/engineering course. At a third site the dean of engineering created an Engineering and Science Corps in which undergraduate volunteers provide online tutoring to K-12 students three times a week in subjects that are precursors to college engineering studies.

Contributions of Undergraduates

Clearly emerging from the case studies is the invaluable service that undergraduates perform in volunteering their time to participate in recruitment and outreach efforts. Many school officials involved in student recruitment noted that it is advantageous to involve undergraduates

because they are better able to relate to younger students than are older adults. Moreover, it is reported that prospective students are very interested in gaining the perspective of current students. This is likely to be especially applicable in the case of underrepresented students.

The case studies reveal that much of the student volunteer work in the area of outreach and recruitment occurs via student organizations, usually a student chapter of a professional engineering group. For example, at one site undergraduates from the Society of Automotive Engineers embarked on a project in which they team up with local teachers to instruct fifth graders in carrying out mini engineering projects. At another site volunteers from Encourage Young Engineers and Scientists work on developing project based math and science lessons and experiments that are taught in local schools and after school programs. At a third site the outreach and recruitment coordinator noted that the Society for Women Engineers student chapter on campus usually has two or three outreach coordinators and essentially serves as "the backbone of K12 outreach" efforts.

Generally speaking, even at these six sites, where relatively high proportions of women are enrolled, there is not a great deal of female-focused recruitment effort taking place, especially at the department level. Administrators, staff and faculty working in male dominated fields can help boost female recruitment by ensuring that their departmental program is not represented in a gender biased manner.

Discussion

Generally speaking, even at these six sites, where relatively high proportions of women are enrolled, there is not a great deal of female-focused recruitment effort taking place, especially at the department level. Administrators, staff and faculty working in male dominated fields can help boost female recruitment by ensuring that their departmental program is not represented in a gender biased manner. The general public, and even incoming college students interested in majoring in engineering, seem on the whole to be poorly informed about engineering. Though the engineering field has historically been gendered a masculine domain (McIlwee & Robinson 1992), it has expanded and changed vastly. The engineering profession is not marketed well for it is represented too narrowly. It needs an "image overhaul" and, in fact, there are campaign efforts underway to raise public awareness (Loftus 2007). Individuals working in academia can do their part to attract more females through highlighting those areas and connections that are known to be of greater interest to females such as its impact on human welfare (Grandy 1997; Seymour 1995; Strenta et. al 1994).

This study's findings underscore the important link between recruitment and outreach. The six sites are doing a great deal by way of community outreach, in some instances affecting K-12 curriculum and teaching. To effect substantial enrollment changes in male dominated fields, however, intervention efforts must target young students. IHEs can play a vital part by getting faculty, staff and students involved. The six sites illustrate how a substantial amount of recruitment and outreach activities can be spearheaded and anchored by student volunteers, often by way of student organizations (as many of these have a community service component). The female students interviewed displayed a high level of interest in helping to broaden participation in the field. Because student interest in such volunteer work exists, institutions need to make sure that mechanisms are in place to facilitate this kind of student involvement. For example, at one of the sites there is a full-time staff position devoted to recruitment and outreach within the engineering college, and this person has created a Student Organization Engineering Council to centralize and coordinate the school's many outreach efforts. In this way, the school is better able to link up with community needs, leverage institutional resources, and deploy student volunteers effectively and efficiently.

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Recommendations

Highlight areas of female interests. Departments need to be mindful of how they portray their discipline. Because certain fields of study, and in fact higher education itself, have historically been largely a male domain, lingering sex biases must be guarded against. To attract females to male dominated majors, we need to ensure that career fields are not represented in a narrow and outdated manner. Attempts should be made to identify and effectively communicate those aspects of the field that would be especially appealing to women.

Increase, centralize and coordinate outreach. To successfully close the gender gap in male dominated fields, significant outreach targeting girls must be conducted. IHEs can play a vital role in this effort. Colleges and universities need to recognize this responsibility, and to elevate the service component within the faculty reward structure. Schools that are conducting a significant amount of outreach can optimize their effectiveness by centralizing and organizing their efforts. Such coordination will facilitate and enhance student participation in outreach.

Promote and reward student involvement. Students make up the ground forces that carry out much of the outreach and recruitment work emanating from university campuses. Student participation should be encouraged and rewarded. For example, departments can compensate students who perform substantial community outreach through student organizations by subsidizing their annual membership fee.

Conclusion

Currently severe gender enrollment disparity can be found in various disciplinary majors across campus. Colleges and universities can help address this by ensuring that disciplinary programs are represented in a gender equitable manner. This study's findings suggest that greater female recruitment efforts are needed. An especially promising approach is early outreach to affect K-12 curriculum, teaching and students. In this endeavor, college students are a valuable asset. Student contributions in this area ought to be supported, recognized and rewarded.

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