

AC 2010-1809: AN OVERNIGHT VISITATION PROGRAM FOR INCOMING FEMALE ENGINEERING STUDENTS

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AN OVERNIGHT VISITATION PROGRAM FOR INCOMING FEMALE ENGINEERING STUDENTS AT THE UNIVERSITY OF LOUISVILLE

Abstract

The United States continues to lag far behind other developed nations in producing professional engineers, including starkly low numbers of female engineers. This employment shortage is a national problem that must be addressed in a more strategically focused manner (Chubin, May, & Babco, 2005). Exposing more young women to educational opportunities and assisting their integration into the college environment is a vital step to recruiting more females into this field. This paper presents a program that invites incoming female engineering students to campus for an overnight visitation program before fall classes begin. The session provides information about how this low-cost activity has been embraced by the students and has served to recruit and retain young women for the engineering programs at the University of Louisville J.B. Speed School of Engineering.

Introduction

When analyzing the current enrollment and degree completion trends of higher education, one thing becomes evident - men no longer dominate the postsecondary landscape as they once did (Choy, 2002). In fact, between 1970 and 2001, women shifted from being the minority to the majority in the U.S. undergraduate population, increasing their representation from 42 percent to 56 percent of undergraduates (Choy, 2002; Freeman, 2004; as cited in Peter & Horn, 2005).

While women have increased their representation on college campuses, they continue to represent 60 percent or more of students with characteristics that place them at a disadvantage of succeeding in postsecondary education (Berkovitz & O'Quin, 2006; Landry, 2003; Peter & Horn, 2006). For example, women comprise 60 percent of college students in the lowest 25 percent income level, 62 percent of college students age 40 or older, 62 percent of students with children or dependents (among married or separated students), and 69 percent of single parents. These are characteristics associated with lower rates of persistence and completion in postsecondary education (Berkner, He, & Cataldi, 2002; Levin & Levin, 1991).

Moreover, exposure to and enrollment in higher education varies greatly by gender, especially when considering certain academic disciplines. Despite recent enrollment gains in aggregated or overall enrollment, women remain underrepresented in science and engineering (S&E) undergraduate programs compared to their male counterparts (National Science Foundation, 1999). Traditionally a male-dominated field, significantly fewer females choose engineering as an academic path, both at the national level (National Science, Foundation, 1999; National Center for Education Statistics, 2004) and the University of Louisville (Office of Institutional Research and Planning, 2010).

It is vital for colleges and universities to develop strategic recruitment initiatives, especially for under-represented minorities (McAnulty, Crawford & Johnson, 2008), including females in engineering. This article highlights a post-orientation program for incoming female engineering students at UofL by providing details of the program which could serve as a model for other engineering schools seeking a low-cost overnight visitation program for admitted students.

Related Literature

For over 160 years, institutions of higher education have focused activities on first year programming and specialized recruitment efforts (Levine, 1991; Colton et al., 1999). Previous studies have found initiatives such as orientation programs and first-year induction events integral in introducing new students to the institution and to the academic and social facets of student life, in addition to their subsequent persistence to degree completion (Pascarella & Terenzini, 2005). In this article, persistence is defined as continued university enrollment (retention) while working toward completing a program or degree (Kentucky Council on Postsecondary Education, Retention, 2007). As noted in Figure 1, from 1966-2004 women nationally earned substantially more bachelor's degrees in non-S&E fields than did men. This finding has financial implications as it is well noted that graduates of programs in the STEM fields (science, technology, engineering and math) earn higher salaries than those in non-STEM fields (Digest of Labor Statistics, 2008).

There have been various studies conducted that have investigated college student retention and persistence to degree completion. Sociologist Vincent Tinto's (1975) Student Interactionist Model is the most cited theoretical model related to student persistence. Tinto's model includes numerous sociological and psychological factors to examine why students leave college. Tinto's interaction theory proffers that once a student enrolls in a postsecondary institution, the student's background, in addition to campus interactions, influences newly admitted college students' integration into the campus environment.

Student integration consists of two types of integration, social and academic. Social interaction can occur primarily through formal and informal peer-group associations, semi-formal extracurricular activities, and interaction with faculty, staff and administrative personnel. Additionally, social interaction can be facilitated among peers and faculty members through efforts such as orientation and first year programming (Rogers, 2005; Tinto, 1975, 1993).

The second type of integration, academic integration, can be understood as intellectual factors such as student and faculty interaction and intellectual development. Academic integration can be enhanced by student formal and informal interaction with staff, faculty, and advisors concerning academic matters and mentoring (Tinto, 1975; Pascarella & Terenzini, 1979, 1980). Moreover, Tinto postulates that the further a student is integrated socially as well as academically into the fabric of the college campus, the greater chances of institutional commitment, which increases the likelihood of that student's persistence.

As the pressure continues to increase for public postsecondary institutions to improve retention and degree completion, many institutions have implemented various innovative initiatives structured to provide anticipatory socialization settings for incoming students. Anticipatory socialization is a process or set of experiences through which individuals learn to anticipate correctly the values, norms, and behaviors they will encounter in a new social setting (Pascarella, Terenzini, & Wolfle, 1986). To the extent that such anticipatory socialization is effective, previous studies have found that students exposed to these experiences are more successful in becoming integrated into an institution's academic and social systems during the freshman year than their counterparts not exposed to such activities. Thus, many engineering programs at colleges and universities around the nation are devoting greater attention on the front-end of the postsecondary educational pipeline.

Program background: The University of Louisville's approach

The University of Louisville (UofL) was founded in 1793 and became part of the state system in 1970. The J.B. Speed School of Engineering offers BS, MS and PhD degrees in seven disciplines (bioengineering, chemical, civil and environmental, computer engineering and computer science, electrical and computer engineering, industrial, and mechanical). Fall 2009 engineering enrollment included 1,468 undergraduate students (University of Louisville, 2010). Overall undergraduate enrollment at UofL for fall 2009 included 15,619 students, 51 percent of whom were female.

However, as is the case with most institutions of higher learning across the country, the number of female student pursuing degrees in engineering has been relatively low. Figure 2 shows that from 1995 through 2005, UofL was below the national average for full-time, first-year female enrollments in engineering. The undergraduate engineering enrollment for fall 2007 was 1,293 students and only 218 were female (16.86%). Overall enrollment of female students at the Speed School has averaged 18 percent since 2006 and finally rose to 20 percent for fall 2009. National statistics reflect the same patterns.

For more than 20 years the Speed School has had an active chapter of the Society of Women Engineers (SWE) with the Director of Student Affairs serving as its long term faculty advisor. Various programs have been conducted to introduce young women and other under-represented minorities (URMs) to careers in engineering with varied amounts of success. In 2005, the president of the SWE chapter approached the faculty advisor with a new idea – the notion of inviting incoming female students to an overnight visitation program two months before the start of fall classes. The program was designed with the following objectives:

1. to provide young women already admitted to the University of Louisville's engineering program with the chance to meet other incoming female students
2. to enable incoming female students to meet and interact with female students currently enrolled in the University's engineering degree programs

3. to hear from panels of faculty members – both female and male – who will be providing instruction and mentorship in their classes
4. to engage in community-building activities designed to make the incoming students feel more comfortable about starting classes at the University
5. to introduce the incoming young women to the Society of Women Engineers

Participants and program

Letters of welcome and overnight visitation program applications are sent in early spring to all female students admitted to the engineering school for the following fall semester, including Kentucky residents and non-residents. Event organizers realize that many of these young women may have also been admitted to other universities so the hope is that participation in the overnight visitation program will strengthen their commitment to the University of Louisville.

The schedule for the overnight visitation program is provided below:

Day 1

4:00 – 4:40pm	Check in and “ice breakers”
4:40 – 5:00pm	Session about campus programs and offices conducting activities for women
5:00 – 5:30pm	Panel of Speed School faculty members
5:30 – 6:00pm	Panel of professional female engineers
6:00 – 7:00pm	Dinner
7:00 – 8:00pm	Panel of current Speed School students
8:00 – 11:00pm	Social activities (scavenger hunt, movies, etc.)
11:00pm	Conclusion of organized activities for Day 1/Free time

Day 2

7:00 – 8:00am	Breakfast
8:00 – 9:15am	Calculus class and labs

9:30 – 11:00am Program assessment, group photos, door prizes,
11:00am Optional campus tour/departure

Transportation to and from campus is arranged by the participants. Maps and parking permits are provided. Because the students actually bring sleeping bags and pillows and sleep on the floor in a large open space, the only cost to participants is \$15 per person which helps defray the meal expenses. Table 2 provides an estimated budget for the program.

Outcomes

Overnight Visitation Programs have been held at the Speed School for incoming female students since 2005. Eighty young women have participated and all of those students subsequently enrolled in the engineering school. Ten of the early participants have completed degrees from U of L (nine in engineering, one in business). All of the aforementioned engineering graduates are now pursuing graduate degrees at the Speed School. Of the 80 students who participated in the overnight visitation program, only seven have withdrawn from the University. Two of those had transferred out of engineering prior to leaving the University.

The overnight visitation program has consistently received high marks from the students. Activities were led by members of the Speed School student chapter of the Society of Women Engineers (SWE) and 18 of the participants have become active members of that national student organization.

Given the enthusiasm expressed by the students at the end of the overnight visitation program, University of Louisville personnel contend that activity has been highly successful. At the completion of the program, each participant is asked to complete a brief evaluation form. Comments are routinely very positive and the students have often rated the program as “very successful.” The following responses are representative feedback from program participants when asked the question, “*What did you like best about this program?*”

“getting to know new people and getting to know who will be in some of my classes”

“ I liked meeting other students and listening to current faculty and students”

“the personal time after the actual program. It was easier to talk to everyone and I got more questions answered this way 1:1”

“meeting older students who can help you get through the first year”

The vast majority of the students indicated that they would indeed recommend that their friends participate in this program. When asked why, remarks were made such as:

“to get familiar with Speed before coming and committing to the program”

“to help them make an easier transition to the Speed School”

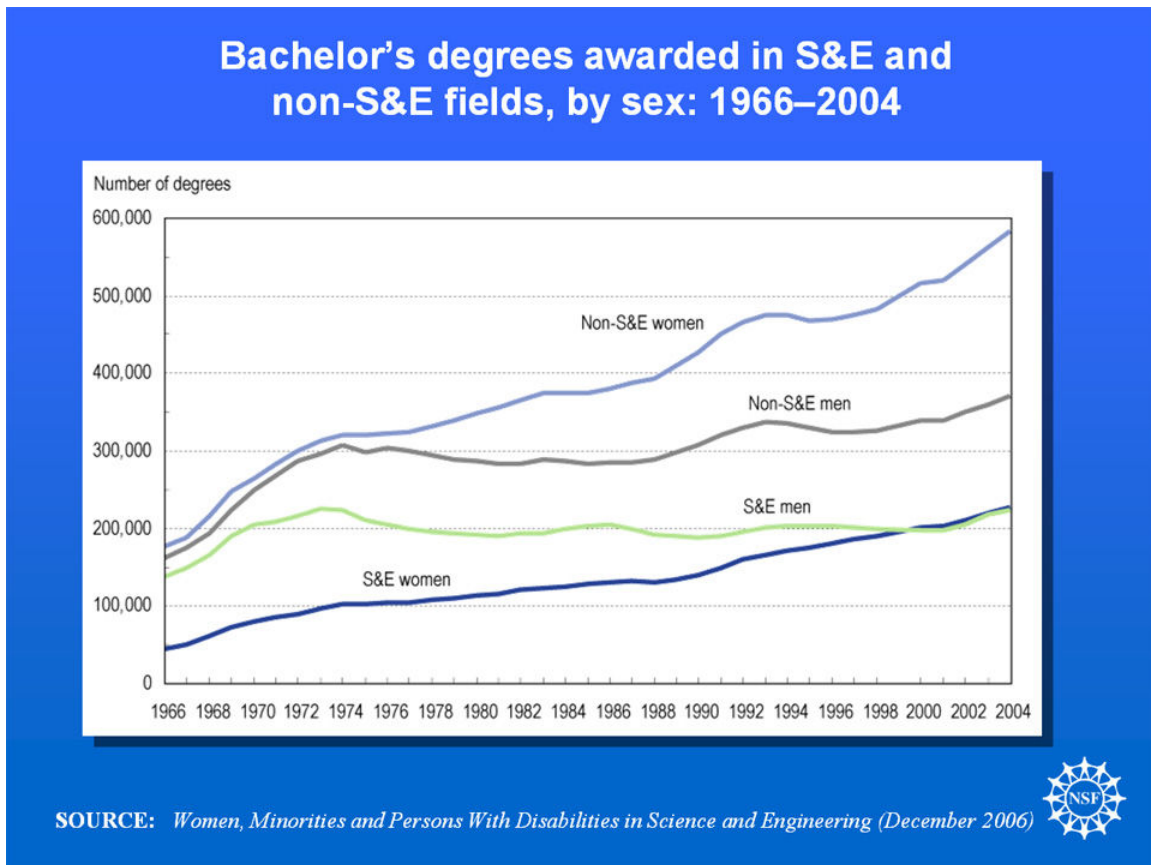
A database has been created of the overnight visitation participants. By working with personnel in the University’s Office of Institutional Research the authors will be able to create a comparison group and compare graduation rates and academic performance between those young women who participate in the program to those who do not.

Conclusion

The general purpose underlying most induction programs is to facilitate incoming student’s successful integration into a new and unfamiliar academic and social setting. The approach discussed in this article used the overnight visitation program induction approach as a potential facilitator of successful anticipatory socialization for incoming freshmen (Pascarella & Terenzini, 2005). Underscoring Tinto’s framework regarding student integration into both the academic and social constructs of campus life, the overnight visitation allows incoming female engineering students a venue to connect with one another along with currently-enrolled female students before the start of their collegiate experience. The program also allows incoming students to meet engineering faculty members to explore such things as different areas of research, concentrations within engineering, and professional opportunities once engineering degrees have been attained. With student leaders from the SWE chapter coordinating the program and leading most of the activities, this program also gives incoming students an early introduction to a vibrant student organization which many elect to join. Free time is factored in so the students can explore the campus and interact informally – all in order to make the students feel comfortable and ease the transition when they actually enroll in classes.

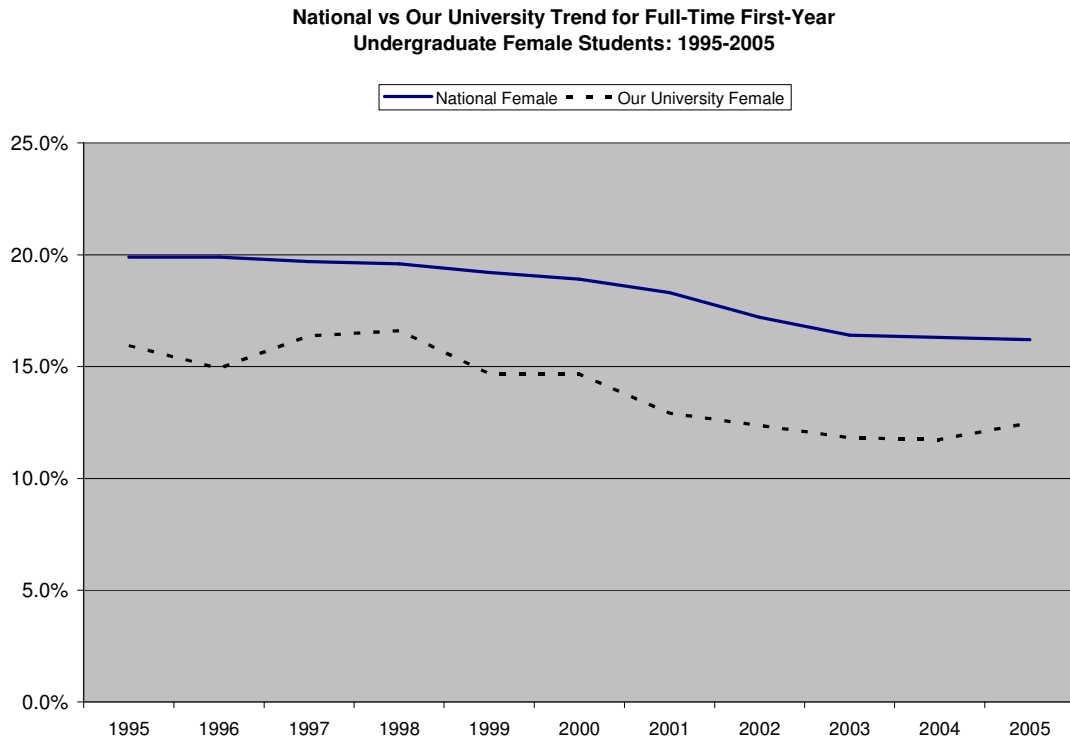
In summary, this article presented a model of a low cost, 1 ½ day, post-orientation program that targets female students admitted to an engineering school at UofL. This program could be easily adapted by other university administrators and can serve to recruit and retain female students into engineering and related STEM fields, thus helping address national efforts to increase employment of underrepresented minorities in these areas.

Figure 1. S&E versus non-S&E Awarded Degrees by gender: 1966-2004



SOURCE: National Science Foundation, Division of Science Resources Statistics, special tabulations of U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey, 1966–2004.

Figure 2 National versus University of Louisville Full-Time, First-Year Undergraduate Females in Engineering: 1995-2005



Sources: Engineering Workforce Commission (EWC), Engineering & Technology Enrollments, fall 1995 through fall 2005 and University of Louisville, Office of Institutional Research and Planning. (2005)

Table 1. Program Estimated Costs (for 35 attendees)

Item	Cost
Dinner (catered)	\$280
SWE tee shirts (\$12 x 28 students)	336
Snacks during check-in and ice breakers	35
Folders, pens, small pads of paper	35
Token gifts for panel members (\$8 x6 persons)	48
Miscellaneous (postage, copying, etc.)	25
Total	759

Note: Minus participants' fee of \$15 each (\$300)– thus, overall cost of the program is approximately \$459.

*** Attendees included incoming students, currently-enrolled students, panelists, advisors, etc.

*** As noted in the body of the paper, the young women attending the program bring sleeping bags and pillows and sleep on the floor. This eliminates the housing/dorm costs.

If the 28 young women slept in university housing the cost would be approximately \$30 per student, thus increasing the budget by \$840.

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