RETAINING STUDENTS THROUGH FACULTY INVOLVED PROGRAMMING

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Abstract – *This paper will focus on the need of diverse retention strategies for the retention of diverse female students. The goals of this paper are to challenge women in engineering practitioners to think beyond the traditional female engineering retention programs by co-creating programming, with faculty for the classroom and move strong cornerstone (community building and mentoring) programs into the classroom. Faculty inclusion in the creation, implementation and evaluation of these programs holds great value. Exploration and sharing of innovative college-wide retention programs such as, programming for students based on their first test grade (First Test Check) and assisting students in assessing their Engineering experience (Challenging Aggies to Succeed in Engineering Sciences, CASES), including faculty roles and involvement will occur.*

Index Terms – Diversity, faculty interaction, retention

Introduction

The U.S. Department of Education's Research and Development Report [1] showed that all students, regardless of gender and race were more likely to complete an engineering degree if their parents had an education of college-level or above, family provided dependable support, high self-confidence & aspiring for degree, received financial aid, or attended private colleges. This study also showed that high level of aspiration and intellectual confidence could help mediate that difference of family background for students whom did not have parents with a high level of education. Additionally, the study showed for students of color, academic preparation and level of effort crucial for success. Finally, the study showed that relative to men, women in the programs are not poorly prepared, but they face difficulties of a largely psychocultural nature.

Current retention strategies for many women in engineering and science programs include mentoring, community building and academic preparation/assistance. These strategies help address some of the issues listed above. All of these and other strategies, not mentioned, are important to the retention of women in the engineering sciences. Yet the number of women obtaining a degree in engineering has not improved greatly in the past ten years. In 1992 women earned 15% of the engineering degrees. This has increased to 20.6% in 2001[2]. Although this increase is significant and important it does not compare to increase of graduates in other science fields [3].

Vital work is occurring in the colleges and universities. Engineers continue to develop and create innovative technology. Yet universities and colleges are failing to provide diverse engineers into the engineering pool. Some might argue that the problem is not enough potential engineers are being moved through the pipeline [4]. As this is part of the problem, not enough emphasis is put on the number of students, regardless of race and gender, admitted into engineering programs yet fail to obtain a degree. An "open door" that acts like a "revolving" one will not improve the issues of under representation [5].

The need for different retention strategies is evident. What is being done in the field, while important, is not working, at least not well enough. Practitioners must move to take greater risks and utilize different types of strategies.

Building Diverse Retention Strategies

Retention Strategies must be diverse to obtain diverse engineers in the field. On one hand, common sense tells us that what works for one student might not work for another. Yet, research consistently shows that programs that foster and build community, explore engineering career opportunities and provide mentoring improve retention for women, minorities and men. Thus providing different strategies that utilize similar themes, such as mentoring and community building, are critical in reaching more students, in particular female students.

Moving programming from outside to inside the classroom is a crucial step. Faculty involvement, while I doubt anyone would argue its' benefits, is often overlooked. New models to be developed for involving faculty members in strategies to increase the participation of undergraduate women in science and engineering. Faculty participation needs to have an impact in terms of promotion and tenure review within these models [6].

Faculty and administration need to have buy-in and programs need to be emphasized within the classroom by faculty. Having faculty promote a program that can be related to the classroom experience, such as time management is much more of a powerful experience than an email notice or flyer advertising the same program.

Texas A&M University's Look College of Engineering is creating programs that were initiated by informal faculty dialog, working with these ideas with the faculty and involving faculty as the presenters and facilitators of the programs and utilizing faculty to integrate programs as part of the class, the curriculum.

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First Test Check

The First Test Check Program's goals are 1). Identify students who made a C, D or F on their first math, physics or engineering tests and 2). Provide programming geared at those students. The First Test Check was developed in the Fall 2001 as an initiative to outreach to potential switchers before they made the decision to switch out of engineering. In the past students were identified at the mid-term mark yet many students had already made serious decisions regarding their place in engineering.

Engineering faculty and the Physics and Math Department Heads all agreed to the potential effectiveness of this program and agreed to provide the students' name and test grades for all engineering students. During the Fall 2001, the following sections of engineering students and their grades where provided:

- Math 151 & 152: All sections submitted
- PHYS 218: 21 out of 39 sections
- PHYS 208: 12 out of 37 sections
- ENGR 111: 8 out of 40 sections
- ENGR 112: 10 out of 21 sections

These students were entered into a database and tracked in accordance to when they attended the First Test Check sponsored programs and College of Engineering tutoring programs. Table I shows the number of students who made a C, D, or F on their first test.

Students were unaware of this tracking. Faculty brainstormed program ideas and publicized programs in class. Programs were open to all students while students who made a C, D, or F on their first engineering, math or physics test(s) were strongly encouraged to attend. Many engineering faculty offered students extra points to attend the programs. Two topics were presented: "Putting It Into Perspective" and "Time Management." All programs were facilitated by first year Engineering Faculty.

"Putting It Into Perspective" was offered once, one week after students received their first test grades. The goal of this program was to explore how grades in college differed from high school, what the first test grade meant, and what students should take from this test grade (positive and not so positive ways to react). The program also touched on exploring engineering as a career choice and goal setting.

"Time Management" was offered two times in the fall. This program explored goal setting, prioritization and the importance of scheduling time for different activities such as study, sleep, and extra-curricular activities. Participants received a booklet to assist them in improving their time management skills.

Look College provides several tutoring opportunities at no charge to the student. Tutors for engineering, physics and math are available for students for over 35 hours each week. Tutors are upper-class students who have excelled in the particular course they are tutoring. Physics and engineering tutors attended the classes in addition to providing tutoring hours.

Two hundred seven (207) students attended at least one of the programs, including tutoring. One hundred thirty-five (135) students attended one activity while seventy-two (72) students attended two or more activities. As the number of activities students attended the amount of improvement in the student's final grade also increased. Table II shows the amount of grade point improvement between the students who attended at least one activity and those who did not attend any activities.

Outreaching to students after their first test, when their self-confidence may likely be tested for the first time has proved to be beneficial. The actual tracking of students proved to be extremely time consuming and surprising to the number of students who actually did receive a C, D or F on their first test. Tracking is no longer occurring although programming continues. Future developments include the possibility of the Time Management Seminar becoming mandatory requirement for all Engineering 111 students to attend and continued statistical analysis. Currently the First Test Check is being incorporated into the Learning Communities program based on its' high success.

TABLE I
NUMBER OF C's, D's AND F's ON FIRST TEST*

	ENGR 111	ENGR 112	MATH 151	MATH 152	PHYS 218	PHYS 208
C – First Test	78	49	220	19	49	25
D – First Test	32	14	141	24	31	31
F – First Test	8	4	182	70	52	85
Total First Tests Below B	118	67	543	113	132	141
Number stayed in class	108	59	402	89	119	123

* all scores are raw scores where: 0 - 59.9 = F, 60 - 69.9 = D, and 70 – 79.9 = C

TABLE II
OVERALL GRADE IMPROVEMENT COMPARISON BETWEEN STUDENTS WHO ATTENDED ACTIVITIES[1] AND THOSE WHO DID NOT*

	ENGR 111	ENGR 112	MATH 151	MATH 152	PHYS 218	PHYS 208
Did Attend	1.80	----------	1.25	1.67	1.00	----------
Did Not Attend	0.89	----------	0.43	1.06	0.66	----------

[1] Activities include tutoring, time management seminar, and goal setting seminar.

Challenging Aggies to Succeed in Engineering Sciences (CASES)

CASES spurred from undergraduate advisors feedback on outreaching to Texas A&M students, otherwise known as Aggies. Due to Look College of Engineering's enrollment management many academically viable students leave the college. Administration at the College believes these switchers leave without important information regarding other fields of engineering, technology and computer science that could influence their decision to stay in the College.

As a result CASES was developed to provide information to first and second year students regarding different fields of study within the College of Engineering and to explore switching majors. A general information brochure was created and sent to all first and second year students in addition to being available in each department for students. The brochure explores engineering options by highlighting experiences that many students have. Additionally, the brochure provides contact information for every undergraduate advisor and many helpful websites. The brochure really encourages students to talk with other students, faculty and industry and to make strategic decisions regarding their career choices.

In addition to the brochure, CASES provides a series of informational sheets called "Did You Know?". This series explores different things you can do with each of the engineering majors offered in the College. Currently the series is projected on a computer screen, which is in the lobby of one of the engineering buildings. This area of high student traffic provides a visible place for information.

Future plans for CASES are to explore less passive ways to make contact with students.

Conclusions

Changing the face of the engineering environment, particularly the classroom is a significant challenge. Yet if changes are truly to occur, making classroom changes is a large step that must occur. Utilizing current and valuable cornerstone tactics, such as mentoring, and community building, while moving these tactics into the classroom setting is a direction retention programs need to move toward. Involving faculty in the development, implementation and evaluation of programs led to greater faculty involvement and ownership, thus allowing programs to be created with greater ease into for classroom. Through these tactics we will be able to make the impact that we want.

While there is not one formula that we can use to retain a greater portion of females in engineering, the above tactic is the most obvious of where women in engineering programs need to move. In turn, making the engineering field more diverse and better and improving society.

References

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