

**AC 2008-2406: RETENTION AND MENTORING OF UNDERREPRESENTED
MINORITY STUDENTS FOR ELECTRICAL AND COMPUTER ENGINEERING
PROGRAMS**

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Retention and Mentoring of Underrepresented Minority Students for Electrical and Computer Engineering Programs

Abstract

Overcoming the four principal barriers to success: lack of preparation, cost of education, isolation on campus, and low faculty expectations, are the focus of attention for underrepresented minorities in the field of electrical and computer engineering. This paper describes the efforts and results of a plan for actively retaining minorities and women students in undergraduate computer engineering programs at Historically Black Colleges and Universities (HBCU). It also describes a series of activities aimed at producing leaders for tomorrow in industry and academia. Such programs for the retention of women and minorities are critical to the country's efforts to increase the number of engineering professionals, and are a priority at larger institutions and HBCUs.

Introduction

For decades, one of the top priorities for America's higher education leaders has been to raise the number of students enrolling in college [1,2,3]. The second priority has been to graduate students that are competent in their field of study. These priorities are of particular importance in the field of Engineering. The number of engineering degrees has declined during the past decade [4]. This decline, coupled with the continued globalization of our economic markets, bears serious implications for the economic development and prosperity of the nation. The national decline in engineering degrees has been greater for minorities. In a recent national study, only two of five minority students who enroll in engineering programs graduate with a baccalaureate degree in engineering, as compared to two of three non-minority students [5]. Another national study found that 54 percent of students entering four-year colleges in 1997 had a degree six years later, with an even lower percentage for Hispanics and Blacks⁶. To minimize the impact of this disturbing trend, a priority must be set to establish a strong academic foundation for students pursuing an education in the field of engineering.

In an effort to address these issues, The College of Engineering at Prairie View A&M University, has established the Academic Enhancement and Enrichment (AEE) Program. The mission of the AEE Program is to offer services that will advance student independence and self-reliance within the College of Engineering community. The AEE Program promotes and enhances students' academic skills through individual and drop-in tutoring, study groups, workshops, and special sessions designed to develop and expand professional skills.

Major Goals

The Department of Electrical and Computer Engineering curriculum is structured to provide each student with a sound background in the basic and engineering sciences and a thorough foundation in Electrical Engineering for the analysis and design of electrical and electronic circuits and systems. The curriculum provides courses necessary for technical competencies as

well as courses and seminars on professional ethics and the responsibilities of the engineer. The program is offered with four areas of emphasis: Computer Engineering, Communications and Signal Processing, Microelectronics and Power Systems, Control System.

The AEE Program goals are to ensure that the students receive the best education and have an area with helpful resources within their department; to enhance the academic performance of all students; and to strive for unparalleled excellence in serving the educational need for students

History

The Electrical Engineering undergraduate program at Prairie View University had an enrollment of over 500 students in 1991. In 2001, our enrollment had decreased to 250 students. By 2004, our enrollment had increased to 307, however the next year we were able to maintain above 300.

The enrollment of the Electrical Engineering program from 2001 through 2006 is shown in Table 1. The enrollment has been broken down in terms of (a) Entering students, (b) Progressing students, (c) advanced student. Table 2 shows the gender and ethnic breakdown of students in the Electrical and Computer Engineering programs for the Fall 2004 semester.

Table 1 Enrollment of Electrical and Computer Engineering students

Year (Fall)	Entering Students		Progressing Students		Advanced Students		Total
	EE	CompE	EE	CompE	EE	CompE	
2005	65	35	98	21	80	5	304
2004	92	30	82	18	85	0	307
2003	87	10	99	5	60	0	261
2002	94	0	89	0	72	0	255
2001	90	0	90	0	70	0	250

EE and CompE stand for Electrical and Computer Engineering, respectively. The Computer Engineering program started in June 2003.

Table 2 Ethnic and Gender Breakdown of Students during Fall 2004 semester

Program	African Amer.	American Indian	Asian Amer.	Caucasian	Hispanic	Foreign	Male	Female
EE	228	1	5	5	6	14	200	59
CompE	45	0	1	0	2	0	40	8
Two Progs.	273	1	6	5	8	14	240	67
Percent 2 progs.	88.93%	0.32%	1.95%	1.63%	2.61%	4.56%	78.18%	21.82%

Project Description

The College of Engineering at Prairie View A&M University established the AEE Program in Fall 2007 to increase retention and aid the performance of College of Engineering students. The program was formed to serve the students enrolled in sophomore and junior level electrical and computer engineering courses. A total of ten (10) courses were supported by the AEE Program. The program consists of a Program Coordinator, an Assistant Program Coordinator and ten (10) Enrichment Advisors. A College of Engineering graduate student was selected to serve as the AEE Program Coordinator and is assisted by an undergraduate honor student. College of Engineering undergraduate honor students were employed as Enrichment Advisors. In addition to high academic performance, effective communication skills were used as a criterion during the selection of each of the program staff members. Professors worked with the advisors to create design examples targeted for specific problem areas for students.

Course Portfolio

During the Fall 2007 semester, a portfolio was developed to serve as a guide for future Enrichment Advisors. The portfolio outlines course goals and the overall mission of the AEE Program. The portfolio includes a lesson plan as well as a brief description of the range of skill levels of students attending the open sessions and the work reviewed in each of the ten (10) subjects. Other items in the portfolio include the Enrichment Advisor's current work schedule, a copy of the professor's class role, tutorial session attendance sheets, and copies of the weekly problems solved in each Enrichment session during the Fall 2007 semester of the relevant course. In addition, each week the Enrichment Advisors will receive a weekly course grade average to monitor the progress of the students in the course.

Responsibilities of Enrichment Advisors

To operate a successful program, the AEE Program Coordinator has the responsibility of organizing and implementing the order of operations. At the beginning of each semester the coordinator holds a mandatory meeting with the Assistant Coordinator, Enrichment Advisors, and the Director of the AEE Program. The objective of the meeting is to inform the staff of the program's mission, goals and to review the Enrichment Advisors' job description for the semester.

The AEE Program Coordinator is also responsible for organizing and implementing a college-wide meeting at the beginning of each semester. The purpose of the meeting is to inform students of the program services, introduce staff members, and field questions students and faculty may have about the program.

To guarantee that the AEE Program is operating correctly and beneficial to students, Enrichment Advisors are held to a specific set of requirements. The advisors are required to meet with all Professors of their subject at the beginning of each week in an effort to remain aware of the materials which are to be covered in each class and tutorial session. Enrichment Advisors are required to submit a weekly roll sheet along with a lesson plan describing the areas covered in their session to the Program Coordinator. Failure to comply with the weekly report will result in

loss wages for each week a report is not turned in. Enrichment Advisors are also required to attend a mandatory weekly meeting. Additionally, Enrichment Advisors are subject to random attendance by the Coordinator and Assistant Coordinator of weekly tutorial sessions. The random attendance by the Coordinator and Assistant Coordinator serves as training and performance enhancement opportunities for Enrichment Advisors.

Results

Information gathered from the Fall 2007 Enrichment Program is shown in figures 1-4. In Fall 2007, we studied and watched 2 courses as students participated in the Enrichment Program. According to Figure 1, students mid-term grades percentage ranged from 4% to 57%, where 8% received an “A”, 12% received a “B”, 57% received a “C”, 19% received a “D”, and 4% received an “F”.

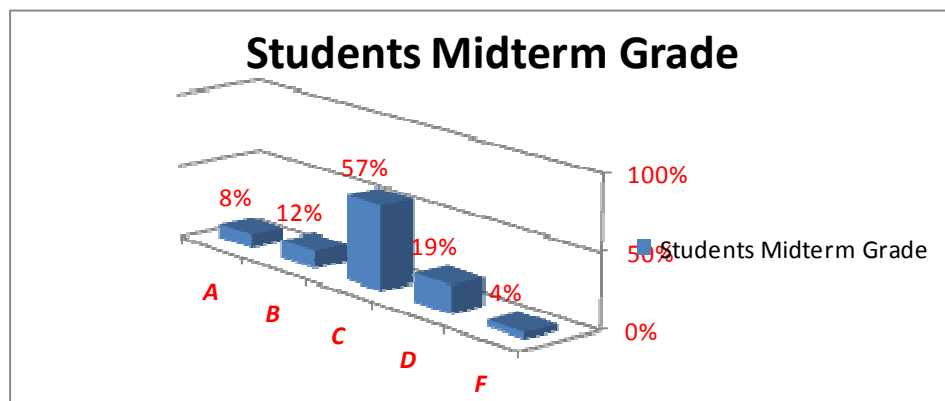


Figure 1

With the Enrichment Program in full effect, for the midterm period thru the final grade period, we took the difference in students’ final grade compared to the midterm grade as shown in Figure 2.

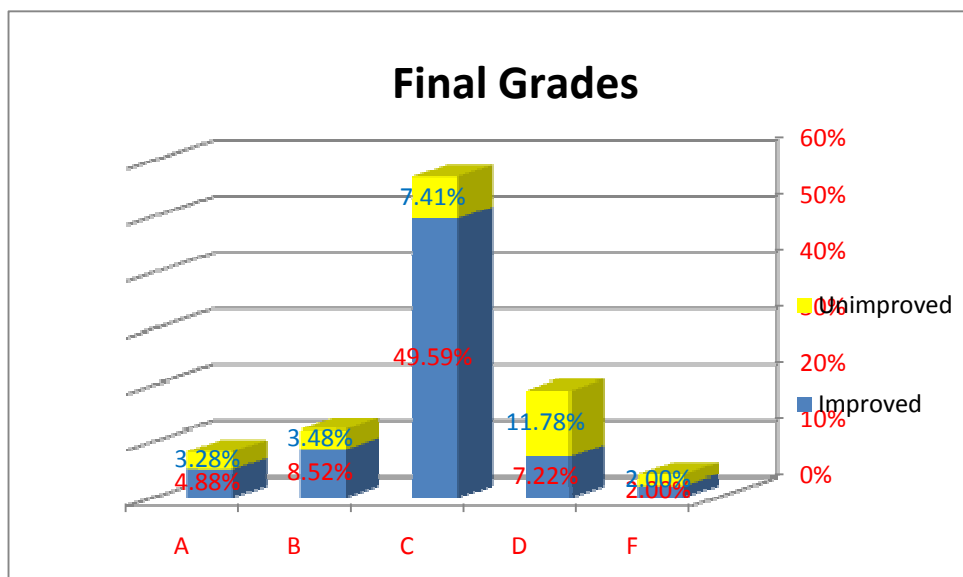


Figure 2

In Figure 2, it shows the range of students' improvement. As you can see about 72.21% of the class grades improved after the application of the Enrichment program.

The same was studied from another course in the department as shown in Figure 3, data as followed: 6% received an "A", 19% received a "B", 42% received a "C", 26% received a "D", 7% received an "F".

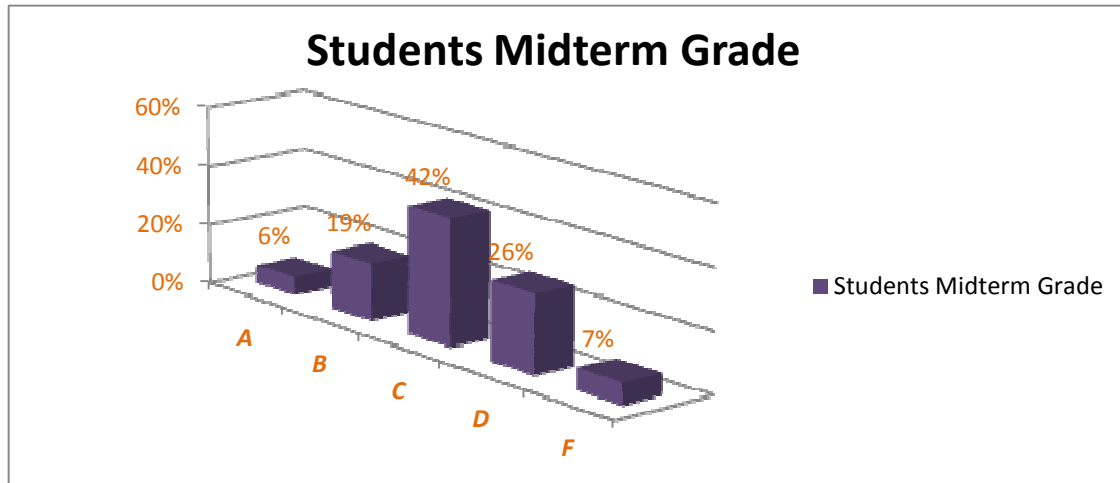


Figure 3

With the Enrichment Program in full effect, for the midterm period thru the final grade period, we took the difference in students' final grade compared to the midterm grade as shown in Figure 4.

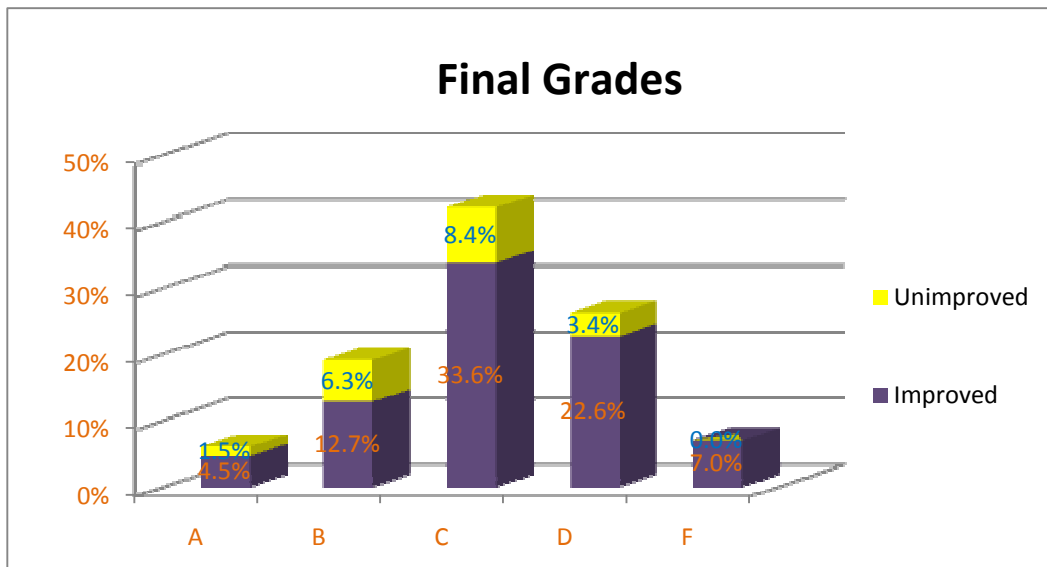


Figure 4

The results were conclusive, and approximately 80.4% of students grades improved. In an effort to further study impacts we plan to add information regarding classes that did not use the program.

Summary

As a ABET accredited program it is important that colleges and universities strive to enhance the academic performance of all students. This program illustrates a successful method to enhance and improve the scores and grades of our future Engineers. To maintain a functional program a survey will be conducted to rate the overall semester and provide an opportunity for students and faculty to give feedback on how we can improve our Enrichment Program.

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6. Associated Press, (2005, November 15). U.S. college drop-out rate sparks concern: Educators turn attention to getting students all the way to graduation. Available online. <http://www.msnbc.msn.com/id/10053859/>.