

Retaining Underrepresented Minority Freshmen in Engineering: A Two-Credit Class

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Abstract

In 2003, Arizona State University was one of 13 universities in the nation to receive a NACME block grant to increase the numbers of minority engineering and computer science students. In Fall 2003, 21 underrepresented students, mainly freshmen, were selected for this program in the Ira A. Fulton School of Engineering. The students were supported by a scholarship and attended a two-credit Academic Success Workshop. Additional minority freshmen also attended the class.

The students meet for two hours each week. The primary purposes of the Academic Success Workshop are to help with the adjustment to being a university freshmen, to ensure that the students have someone to talk to should any problems arise by becoming acquainted with School staff, to assist in forming a support network for the student, to help teach teamwork, to sharpen presentation skills, and to have an enjoyable experience.

This paper discusses the program elements including a video tape series on making good grades, individual and team assignments, and assessment of the class which is done weekly. All of the students were retained to the spring semester. Students reported that the class was enjoyable and helpful in networking, improving presentation skills, and in giving tips on being a good student.

Keywords: Freshmen Retention, Underrepresented Minorities, Scholarship Program, Academic Success Workshop

I. Introduction

Since 1974, NACME (the National Action Council for Minorities in Engineering) has provided leadership and support for the national effort to increase the representation of successful African American, American Indian, and Latino women and men in engineering and technology, math- and science-based careers. NACME believes in the concept of the “learning organization,” a community in which each member is encouraged and assisted to grow and develop. With the support of corporations, foundations, government agencies and individuals who share their vision, NACME conducts research and analyzes trends, advances policies and practices that support the development of a diverse workforce, uses the Internet and a variety of communication tools, develops and sustains a rich portfolio of education and scholarship programs, and delivers a range of professional development programs.¹

In the spring of 2003, an invitation was extended to President Michael Crow for Arizona State University (ASU) to apply to become a National Action Council for Minorities affiliate through the NACME Block Grant Program. This invitation was extended to all engineering schools in the nation. Blessed by letters of support from the President and Dean Peter Crouch, a proposal was submitted from the now Ira A. Fulton School of Engineering at ASU. ASU was named one of the 13 institutions selected from 110 applicants to be NACME partners. We are very proud of this distinction since we do not yet qualify as a minority serving institution. However, we do have 762 underrepresented minority students (African American, American Indian, and Hispanic) enrolled as undergraduates in the Fulton School. We, along with NACME, are very concerned that these minorities are very underrepresented in engineering enrollment, engineering degrees, engineering academia, and in professional engineering careers.

The NACME Block Grant Program has very precise guidelines for use of the money, all of which must go to support minority students. The two-hour credit class discussed in this paper was held in Fall 2003 for the first set of NACME scholars supported under the grant by the Fulton School of Engineering NACME Scholarship program.

II. Background for the Class

Research has established the importance of early support for the retention of underrepresented minority students in engineering and computer science.² The adjustment of freshmen to university life is a challenge for all students, but especially for students who may be first-generation, who have attended small high schools, who may be a long way from home, and who find themselves in a minority population. Concerted efforts to recruit and to retain underrepresented minority students have been in place for over ten years in the Fulton School of Engineering. During that time the percentage of underrepresented minority students has increased from 13% to 17.7% in Fall 2003. At the same time, increased retention efforts have helped to increase the retention of minority freshmen over 10% during the same time.

The increased minority enrollment and retention can be partially attributed to the introduction of a Summer Minority Bridge, a two-week residential program, which began in 1996.³ During the Summer Bridge program, the students competed for scholarships for the next year. A condition of the scholarship was that the students attend an Academic Success Workshop the following fall for two hours of credit.⁴ The minority students who have gone through this program have consistently been retained after one year at a higher rate than minority students who do not attend the program, as well as non-minority students who enter at the same time. This increased retention is true both within the University and within the Fulton School.

In planning a retention program to support NACME Scholars, we proposed that we would include the NACME Scholars with the Summer Bridge students in the two-hour Academic Success Workshop course they were required to take in Fall 2003. However, between the time of the proposal submission and the Fall 2003 semester, a decision was made to no longer hold the Academic Success Workshop for the Summer Bridge students. Therefore the PI of the NACME Block Grant took the leadership to establish a two-hour credit course for the NACME scholars. Summer Bridge students were also encouraged to attend ASE 194: MEP Academic Success which had already been listed for the fall semester. Twenty-four students were selected

for NACME Scholarships; three declined, although one of these three did attend the Academic Success class. Eight of the NACME Scholars had attended the two-week Summer Bridge program. The 21 NACME Scholars were joined by 8 additional minority students, most of whom had attended the Summer Bridge Program.

III. Course Structure

The NACME Grant PI, the Associate Dean of Student Affairs, and the Associate Director of Recruitment and Retention designed and co-taught the NACME course which met from 4:40-6:30 every Wednesday. The two credits did not count in the students' Program of Study, but the course grade was counted in their college GPA. The class began meeting in an assigned classroom and then moved to the Center for Diversity and Retention (CEDAR) conveniently located near other engineering classes. In addition, the CEDAR Center provided a relaxed atmosphere for the class as well as making all of the students aware of the Center and its resources that were available for them.

Office hours were posted for the course in the CEDAR Center. The only required material was a three ring binder and colored tab dividers. The text chosen for the course was "Engineering Success," Second Edition, written by Peter Schiavone.⁵ The text was provided to each student.

The primary purpose of the Academic Success Workshop was to help with the adjustment to being a university freshmen, to ensure that the students had someone to talk to should any problems arise by becoming acquainted with College staff, to assist in forming a support network for the student, to help teach teamwork, to sharpen presentation skills, and to have an enjoyable experience.

A handout was given to the students at the beginning of the semester with all of the essential information about the course including course goals, grading, activity participation, the notebook, and the tentative class schedule topics. The students were told in this handout that the purpose of the course was to assist and to prepare each student to succeed in their academic endeavors as engineers. The course curriculum was outlined as: academic development, personal development, utilizing resources, building community, and professional development. The course grade was based on the completion of the following components:

Class attendance	20%
Activity participation	20%
Homework/reading assignment	20%
Class notebook	15%
Presentation and quiz	35% = (5% for quiz, 10% midterm presentation, 20% final presentation)

Attendance was taken every class period. Group projects were graded according to the average of the grades for each individual in the group.

The Activity Participation consisted of attendance at CEDAR events designed to enhance the student's education experience. For example, attendance at the Diversity Evening with Industry

(DEWI) event held locally in September counted as 30 points. The DEWI event is sponsored by CEMSWE, the Coalition of Engineering Minority Societies (CEMS=American Indian Science and Engineering Society-AISES, the National Society of Black Engineers-NSBE, and the Society of Hispanic Engineers-SHPE) and the Society of Women Engineers (SWE). Attendance at two CEDAR Resume workshops in September counted 5 points each. Activities were also to include attendance at all four fall semester general body meetings of one of the following organizations: AISES, NSBE, SHPE, or SWE for 10 points each. A total of 100 points could be earned and counted for 10% (half of the activity grade). If the student attended meetings for another of the four organizations listed above, the student earned 5 extra credit points for each meeting attended.

In addition, Activity Participation also consisted of the group activity portion of the class when the students interacted with each other. Each student was assigned to a group by major interest. Once in a group, the student had the opportunity to choose a research activity from a list provided by the staff or the student could create their own research activity. This activity counted for the other 10% of the grade. A log of the student's role in the group, the meetings, and all the work done were kept in the notebook. The grade was based on this information and the instructor's feedback on the group participation.

A group notebook was graded on its own and counted for 20% of the notebook grade, which counts for 15% of the total grade. In addition, each student group had their own notebook. The notebook contained minutes from every group meeting, the task assignment log for each member, research sources, i.e. bibliography or web site log, and other activities and information collected for the project for the team. The group had to meet outside the four designated group meeting times during class.

In addition to the textbook, the students were given handouts of other material on engineering, and also were presented with a six-tape series, "Where There's A Will There's An 'A'."⁶ This tape series gave the students valuable information on how to be a good student, how to take notes, how to manage time, how to give presentations, how to take examinations, and other topics. A handout for each tape was provided to the students.

IV. Class Schedule

Week 1	Introductions, syllabus, general information, Where There's a Will There's An 'A', Part 1
Week 2	Chapter 1: Studying Engineering: The Keys to Success, Where There's a Will There's An 'A', Part 2
Week 3	Chapter 2: Introduction to Engineering and Engineering Study, Where There's a Will There's An 'A', Part 3, group activity 1-group assignment, activity choice
Week 4	Engineering student panel-CEMSWE leaders Quiz 1, Where There's a Will There's An 'A', Part 4
Week 5	Chapter 3: The Role of the University, review quiz, Where There's a Will There's An 'A', Part 5-ASU Guidance Center Presentation on Test taking skills

Week 6	Chapter 4: Learning the University Environment, Where There's a Will There's An 'A', Part 6, group activity 2, guest speaker, ASU Fulton Scholarship Office on Time Management
Week 7	Chapter 5: Key Strategies for Maximizing Performance in Engineering Courses, Guest speakers-CEDAR staff and CEMSWE Leaders Presentation on "What We Wish We knew as Freshman"
Week 8	Midterm presentations-group activity process to date
Week 9	Chapter 6: How to be Successful on Examinations, review midterm presentation feedback
Week 10	Chapter 7: Procedures for Effective Problem Solving, class activity
Week 11	Chapter 8: Mathematics, class activity
Week 12	Group activity 3, Mock Interviews, (CEDAR Staff) Quiz 3
Week 13	Chapter 9: Developing Engineering Skills, class activity and Chapter 10: Looking to the Future: What's After Graduation? Industry Panel
Week 14	Group time-Thanksgiving Holiday
Week 15	Group activities and notebook finalization
Week 16	Last class-notebooks due Final

V. Assessment

Each class period the students were asked to evaluate the day's activities. These evaluations also gave students a chance to write down any questions they may have had that did not get answered during class. The instructors then reviewed the evaluations and addressed questions in the next session. On a scale from 1 to 5 the students, 5 being very useful, the student gave the overall class a 4.5 average score. Their comments included such things as:

- "This course helped me to meet people to form study groups with and friends in other classes"
- "This course was a great way to keep me on track this semester. Can we take it again?"
- "I really enjoyed the tapes and guest speakers. The group project allowed me to see a greater use for engineering"

Consensus on the tapes is that we would show them again.

The average of the 2003 Fall Semester grades for the 29 students in ASE 194 was 2.79. The breakout of the grades according to whether the students were in the NACME program or attended the Minority Summer Bridge program is shown in the following table.

	Bridge	n	Non-Bridge	n	Ave.
NACME	2.98	8	3.04	13	3.02
Non-NACME	2.925	2	1.96	6	2.20
Average	2.968		2.70		2.79

Table 1. Average Fall Semester Grades

The grades ranged from 1.13 to 4.0 for the 29 students. Since the numbers are small, we can only observe that for the students in the NACME Program, all of whom had an Arizona Board of Regents high school average of at least 3.0 or the equivalent, there did not seem to be any difference if they had attended the Minority Summer Bridge Program or not. For those students not in the NACME Program, the average semester grades were higher for those students who attended the Bridge. However, because the number of students is so small, this is a trend that we will want to watch in the future.

VI. Discussion

The tape series was new to the instructors, so using them in this class was an experiment. In general, the tapes were very well received and gave the students good ideas on how they could help improve their academic performance. A few of the students were not impressed with any of the tapes. The textbook was also new to the instructors and our general conclusion is that the book is the best that we have seen for the course we wanted to give.

At the beginning of the semester most of the students were very shy about speaking in class. Several noted in their class assessment that they did not want to have to talk in class and were very uncomfortable doing so. After watching the tape on communication in which tips were given on giving a presentation, including the use of props, we gave the class an extra credit assignment of a two-minute talk on any topic of their interest and props were encouraged. This assignment met with great success. Some students used a PowerPoint presentation as a prop. A woman who spoke about "Scrap booking" showed her high school scrap book and then passed it around for all to see. Another told about horses and showed pictures of his horse that he rode on his reservation. Another student talked about her experience in competitive swimming. The students really enjoyed learning about each other. The students also seemed to enjoy telling about an interest of theirs. This exercise helped each of the students to become quite comfortable in speaking before a class.

Near midterm, students in the group were having trouble with Chemistry. The students were asked if they were in a study group. None were, even though the value of study groups had been emphasized since the beginning of the semester. The students were urged to get together and form one or two study groups. The four students, who took CHM 114, with a prerequisite of high school chemistry, averaged 3.25 in their semester grades in the course. The six students who completed CHM 113 (no high school prerequisite required, but course is required for Bio, Chemical, and Materials Engineering), averaged 1.5 in their semester grades and an additional three students dropped the course. In the future this is a course that we should watch to make sure that the students are taking advantage of tutoring and study help which are available free.

At midterm, each of the assigned groups gave a practice presentation. This was a most worthwhile exercise. Through the presentations some groups learned that they had misinterpreted parts of the assignment. Other groups learn that they were far behind the other groups in their work. Other groups learned that their presentation to date was very poor. The students also benefited from a practice presentation in front of the class. At midterm, three of the groups were graded at A and two of the groups at B. The final group presentations were all of A caliber.

A challenge for the course was finding a time when all could meet. Most of the students had already registered for their courses before they learned that they were in the NACME Program and required to attend the class. The schedules were worked out for all but three of the students. One student came to an instructor for private tutoring on the course, watched the tapes, and did all of the homework. One student could only attend the first of the two hours and one could only attend the second hour. They both completed all of the assignments.

A big advantage of the course is that it was held in the CEDAR Center for a very comfortable setting. One of the co-instructors is the Director of CEDAR and has her office there. In this way, the students were very aware of the resources available in the CEDAR Center and where to go for help. The other instructor's office was located very near the CEDAR Center. The students also especially enjoyed hearing more about each of the instructors. Each gave a 15-20 minute talk about themselves and their life and career in one of the classes.

VII. Conclusion

The students were very enthusiastic about the course. The students rarely missed class and completed all of the assignments. Since the students all met our expectations, they each earned an A in the course. This might not be the case in the future, but this seemed to be an exceptional group of students. When asked during the spring semester about their general assessment of the fall class, the students reported that the class was enjoyable and helpful in networking, improving presentation skills, and in giving tips on being a good student.

We are pleased with the course outcomes and continued to meet with these students on a regular schedule (one hour every other week) during the spring semester to be able to continue to encourage and to support them. We offered the spring class twice each meeting to accommodate the students' schedules. The early meetings focused on the resources available through Career Services and on developing their own resume.

From an instructor view, it has been particularly rewarding to have weekly interaction with such a dedicated group of future engineers. Their enthusiasm for the field of study and their commitment to their studies was inspiring. Both instructors enjoyed teaching the course.

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Biographical Information

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