Evaluating A NACME Academic Scholarship Program

Mary R. Anderson-Rowland\textsuperscript{1} and Dana C. Newell\textsuperscript{2}

Abstract - Arizona State University was one of 13 schools that received a five-year block grant in 2003 from the National Action Council on Minorities in Engineering (NACME) to increase the number of underrepresented minority students who receive a Bachelor’s degree in Engineering or Computer Science. The first cohort of freshmen students began the academic scholarship program in Fall 2003 and the second cohort in Fall 2004. The students are required to take a two-hour Academic Success course in their first fall semester and to attend a one hour workshop every other week during the following spring semester. During subsequent years, until graduation, the NACME students meet five or six times each semester. This paper evaluates the NACME program in terms of demographics, student evaluations of the course and instructors of the Academic Success course, and the students’ academic achievement, including retention, and observations of the instructors of the program. Lessons learned and several changes made in the Academic Success course for the second cohort are examined for possible influence on the students. These changes include a different type of classroom, the use of name placards, more activities for the students to get to know each other with icebreakers and in-class group time, and a handout each class of a summary of the evaluations and questions from the preceding class. Also, changes to continue to improve the program are discussed.

Index Terms – Academic Scholarship Program, Retention, Undergraduate cohorts, Underrepresented minority students.

INTRODUCTION

Arizona State University was one of 13 schools that received a five-year block grant in 2003 from the National Action Council on Minorities in Engineering (NACME) to increase the number of underrepresented minority students who receive a Bachelor’s degree in Engineering or Computer Science in the Ira A. Fulton School of Engineering. In the fall of 2003, the first cohort of 21 minority freshmen NACME Scholars was selected. As a condition of the NACME Scholarship, the NACME scholars were required to take a two-hour credit Academic Success course in the fall of their freshman year.

Student retention is a major challenge facing engineering faculty and administrators. Nationally, less than 50% of engineering freshmen graduate in engineering with a large percent leaving after their first year [1,2]. In the last ten to fifteen years there has been a concerted effort by many engineering schools to study and to improve undergraduate engineering retention, especially for first year students [2,3,4]. Efforts include using upper division students to improve a first-year curriculum [5], engineering seminars [6], integrating service learning into freshman engineering courses [7], inclusive learning communities [8,9], mentoring [9], academic centers [10], and many combinations of these [10].

The graduation percentage for underrepresented minority engineering students is even worse, estimated at about 33% [11]. Accordingly, there have been targeted efforts to increase the recruitment and retention of underrepresented minority engineering students [12]. Effective retention models for minority freshmen include: summer bridge programs [13], year-long bridge programs [14], minority engineering programs [15, 16], and academic scholarship programs [17].

The Fulton School held Minority Summer Bridge (MSB) programs regularly for over 12 years [18]. For most of those years the MSB students each earned a scholarship for their freshman year, which required enrollment in a two-hour credit Academic Success class during the fall semester, with an optional one-hour credit class in the spring. The NACME Academic Success class was loosely patterned after the successful MSB class.

The purpose of the NACME Academic Success course and subsequent meetings of the NACME Scholars is to help them build knowledge, skills, and peer support among the members of the cohort that will help ensure their graduation. A secondary goal is build an interest in graduate school since so few minority students consider and go to graduate school. The NACME Academic Success class has been described in a previous paper [19]. The class met 4:40-6:30 each Wednesday evening and did not count toward the student’s graduation. The course included an engineering success book from which readings and homework were assigned [20], a video series on good time management and study skills [21], individual presentations, a team project based on the student’s major including a midterm and final presentation, academic information, and evaluations. Answers to questions, as well as oral feedback on the evaluations of the meeting before were a part of every class. In addition, the instructors each gave a presentation on themselves that included why they were working in engineering and the opportunities and benefits of an engineering degree, in addition to barriers they had each overcome to be where they were today.

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During their second semester, the NACME cohort met every other week for one hour with the NACME director, one of the two fall Success class instructors. In subsequent semesters, the NACME cohort meets five or six times per semester for one hour each meeting until graduation. In Fall 2004, the second cohort of NACME students began the program. Fourteen freshmen NACME students were joined in the Academic Success class by nine additional minority students, most of whom had attended the MEP Summer Bridge during the summer of 2004. The fourteen NACME Scholars were composed of 10 minority students plus two Caucasian women and two Asian men. NACME funding was supplemented by Fulton School funds for the students and NACME funding only supported minority students. The inclusion of students in addition to African American, Hispanic, and Native American for the second cohort was the result of extended discussions with ASU’s legal counsel [22].

Lessons learned during the first year of the NACME program were discussed in a second NACME paper [22]. This paper will compare the first two cohorts after their first semester in the program.

**DEMOGRAPHICS OF THE FIRST TWO COHORTS**

Students were accepted into the NACME program first come, first served as long as they met the basic criteria for selection. In order to be selected for the NACME Scholars freshmen cohort, the student must have achieved at least a 3.0 high school GPA, qualify for financial need via the FAFSA, and submit a statement of purpose and two letters of recommendation, at least one from an academic instructor. It was assumed that if the student had been admitted into the Fulton School of Engineering, that the student was capable of succeeding. Therefore, applicants were not further screened for potential success in the program.

Research shows in general that the high school grade point average is one of the best indicators of effort and therefore of success in college. In Table I we see that the unweighted high school grade point averages (GPA) of the two cohorts were similar, as were their Arizona Board of Regents (ABOR) GPAs, which count only basic classes such as English, math, and science. We also calculated the average high school GPA of the 10 minority students in cohort II separately and see that there was only a small difference between that average and the average of all 14 Cohort II students. The range of GPAs was from 3.11 to 3.92 for Cohort I and from 3.12 to 3.79 for Cohort II.

**SESSION S2E**

A possible factor in the performance of the cohorts could have been the percentage of students that were first generation in their families to attend college. In Cohort I, 7 of the 21 (33%) students were first generation students and in Cohort II, 4 of the 10 (40%) minority students were first generation. Since the first generation percentages are relatively close and the numbers are small, we would not expect this to be a factor that would differentiate the two cohorts. In addition, none of the entering freshmen in Cohorts I and II had experience in a research position and no student in cohort I and only one student in cohort II had internship experience.

**BASIC DIFFERENCES IN COHORTS I AND II AND THEIR PROGRAMS**

Although the two cohorts seemed to have had approximately the same academic preparation, the two groups seemed to have distinctly different personalities. Some of the differences could perhaps be accounted for by the interaction of the instructors with the class since they were teaching the course for the first time with Cohort I. However, the first cohort appeared to be very shy and several of the students commented that they really did not want to speak up in class. As a result, individual student presentations were made a part of the homework. Each student was required to give a two-minute talk about an interest or hobby of his or hers. The presentations began after the students had viewed a video on how to make a presentation and were encouraged to use a prop. The students in the first cohort did well and seemed to be less shy about participating in class after their presentation. The topics ranged from gymnastics, to scrap booking, to magic tricks, to dog or horse pets. Only a few of the students used overheads as a part of their presentation.

This exercise worked well so at getting the students to know one another that we scheduled the individual student presentations to begin early in the semester schedule for the second cohort, but after they had seen the video on giving a presentation. Much to our surprise, almost all of the students in Cohort II used a quite sophisticated computer presentation with their talks. Some students related that they had taken a course in high school that taught them how to make computer presentations, including the use of video clips. The presentations of the second cohort were also much longer than two minutes. The presentations were often 10 minutes or longer (as compared to 5 minutes for cohort I) and the students seemed to really enjoy giving the presentation as reported on their evaluation form for the day. Topics ranged from roller coasters, to the life of Ray Charles, to a canoe trip in Canada. Because the presentations were longer and being enjoyed by both the presenter and the audience, it was late in the semester before we were able to schedule all of the presentations.

The first cohort initially met in a large classroom for the first few meetings. We then moved the class to the comfortable confines of the Center for Engineering Diversity and Retention (CEDAR). This setting was much more informal with chairs around tables and it was difficult to keep...
students in class throughout the semester seemed to be more formal, the behavior of the students in class throughout the semester seemed to be more mature than the behavior of Cohort I. However, the use of name placards for each meeting may have helped the students become acquainted and to know each other’s name.

At the suggestion of Cohort I, specific ice breakers were held by the student assistant for the first few minutes of the first three class meetings for Cohort II. Perhaps these ice breakers at the beginning of the semester helped to make the students more at ease with each other so that they did not hesitate to speak in class and seemed to really enjoy giving their individual presentations, as well as the team presentations at mid-term and at the end of the semester.

At the end of their first year, Cohort I was asked to identify which NACME program components were helpful to them. Suggestions were not given to the students, so they had to think and recall what had been helpful to them. The students gave the following suggestions on how to make the first NACME year better for the second cohort [22]. Their suggestions included:

1. Keep the presentations, both individual and team
2. Keep stressing time management
3. Keep resume writing
5. Keep the video series, although some students suggested cutting some of the videos
6. Add more guest speakers
7. Give more structure to the group presentations (more directions)
8. Get students together more for group activities, use ice breakers
9. Emphasize working together, keeping tabs on each other, and supporting each other
10. Provide more time in class to talk about other classes
11. Emphasize that you get out of the class what you put in!

Given a vote of confidence that we were doing the right thing with the students, the Academic Success class for Cohort II was very similar to the class given for Cohort I with the following changes:

1. Individual presentations started earlier in the semester as already discussed
2. Time management was stressed again and at the beginning of the second semester this year, both cohorts were given additional information on how to use their “study time” well to get straight A’s
3. Resumes were requested during the fall semester and resumes help from Career Services was given to their individual resumes and to the group during the spring semester
4. The “Engineering Success” textbook was used again, but less homework was assigned than for the first cohort since several of those students thought that the homework was excessive for a two-hour course that did not count toward their major
5. The video series was given in a different sequence, with time management given during the second week, rather than the fifth, and seemed to be generally well-received
6. Guest speakers were added for the second semester
7. Additional instructions were given for the team projects, although students still wanted more
8. Ice breakers were added for the first three meetings and more class time was given for the team project
9. Item needs continual effort
10. More time was taken in class for students to tell “How things are going”
11. Item needs continual effort

Numbers 9 and 11 are suggestions that need continual stressing to the students to be effective. We do stress that the students get into a study group for each of their classes.

Evaluation sheets are given to the students during the last five minutes of each class. The students are asked for the most interesting and most important item they learned that day, as well as for areas for which they need more information. Suggestions for future meetings, as well as comments, and a general rating are also requested. During Cohort I classes, the evaluations were read at the next meeting and questions answered. In order to save class time and also to make sure that all students got the information in response to questions, for Cohort II the evaluation results were listed and summarized, basic questions answered, and the information all handed out to the students at the next meeting. Peers sometimes answered questions in class. This new system seemed to work well. Toward the end of the semester there were fewer questions, which indicated most of the student’s questions had been answered earlier. The classes were usually rated “4=Very Good” or “5=Excellent.”

In each cohort a couple of students could not attend the class both hours. The students met with one of the instructors to make up the work. Attendance was watched with both cohorts and students were emailed to remind them of makeup work due for absences. Students were allowed one excused absence during the semester, but homework was still due.

The expected work from each student for the course is outlined in the syllabus for the course [19]. All of the Cohort I students more than met expectations for the course and received an A for the course. Some of the students who felt that they had put in a lot more work in the course than others were not happy that everyone received an A. For Cohort II, with the new option of assigning “+” and “-” to a grade, the instructors both judged that each of the students had, again, excelled in the course and thus received an A.

During the first semester of the course with Cohort I, one of the instructors became ill and had to miss classes after the first week in November. The other instructor capably carried on, so there should not have been a negative effect on the class.

We now look at the course and instructor evaluations registered by each cohort near the end of the semester that they took the Academic Success course.
Course and instructor evaluations are encouraged of all students for each class. The evaluations are done on-line at the student’s convenience during a period of about a week at the end of each semester. In Cohort I, 14 of the 29 students (48.28%) completed a survey on the NACME course. In Cohort II, 21 of the 23 students (91.30%) completed the survey on the course. Table II compares the evaluations of the two cohorts on the Academic Success course.

### TABLE II

<table>
<thead>
<tr>
<th>#</th>
<th>Category</th>
<th>Fall 2003* Avg.*</th>
<th>Fall 2004** Avg.***</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Textbooks/supplementary material in support of the course.</td>
<td>4.31</td>
<td>3.95</td>
</tr>
<tr>
<td>2</td>
<td>Value of assigned homework in support of course topics.</td>
<td>4.14</td>
<td>3.90</td>
</tr>
<tr>
<td>3</td>
<td>Value of laboratory assignments/projects in support of course topics.</td>
<td>4.36</td>
<td>3.95</td>
</tr>
<tr>
<td>4</td>
<td>Reasonableness of exams and quizzes in covering course material.</td>
<td>4.21</td>
<td>4.18</td>
</tr>
<tr>
<td>5</td>
<td>Weight given to labs or projects, relative to exams and quizzes.</td>
<td>4.50</td>
<td>4.11</td>
</tr>
<tr>
<td>6</td>
<td>Weight given to homework assignments, relative to exams and quizzes.</td>
<td>4.29</td>
<td>4.12</td>
</tr>
<tr>
<td>7</td>
<td>Definition and criteria for grading.</td>
<td>4.36</td>
<td>4.10</td>
</tr>
<tr>
<td></td>
<td><strong>Overall Course Avg.</strong></td>
<td>4.31</td>
<td>4.04</td>
</tr>
<tr>
<td></td>
<td><strong>All 100 level Courses in College for Course Avg.</strong></td>
<td>3.78</td>
<td>3.87</td>
</tr>
</tbody>
</table>

* 14/29= 48.28% participation  
** 21/23= 91.30% participation  
*** 5=Very Good, 4=Good, 3=Fair, 2=Poor, 1=Not Applicable

The second cohort did not judge the textbook to be as supportive of the course as the first cohort. This may have been because less time was spent on the textbook with the second cohort. The second cohort had less homework assigned from the textbook in response to the first group complaining that the course required too much homework for a class that did not count in their major or for graduation. The textbook was provided free to the students so their complaint was not based on money poorly spent. The other largest difference between the two cohorts is that the second cohort did not like the weight given to labs or projects, relative to exams and quizzes. The weighting was the same both semesters. The few exams and quizzes were quite easy, usually take-home, so that a good grade was assured with just a little effort. The team projects had uncertainty in their final grade and an individual could not have full control of the grade as they could in their quizzes and exams. Still, each course was rated higher than the average for other 100-level engineering courses that semester.

Table III compares the rating of the instructors of the Academic Success course for each cohort. Again the ratings of the instructors were higher than the average ratings for instructors of 100-level courses for each semester.

### TABLE III

<table>
<thead>
<tr>
<th>#</th>
<th>Category</th>
<th>Fall 2003* Avg.*</th>
<th>Fall 2004** Avg.***</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>The instructor was well prepared.</td>
<td>4.71</td>
<td>4.76</td>
</tr>
<tr>
<td>9</td>
<td>The instructor communicated ideas clearly.</td>
<td>4.57</td>
<td>4.48</td>
</tr>
<tr>
<td>10</td>
<td>The instructor or assistants were available for outside assistance.</td>
<td>4.29</td>
<td>4.43</td>
</tr>
<tr>
<td>11</td>
<td>The instructor exhibited enthusiasm for and interest in the subject.</td>
<td>4.64</td>
<td>4.90</td>
</tr>
<tr>
<td>12</td>
<td>The instructor’s approach stimulated student thinking.</td>
<td>4.36</td>
<td>4.33</td>
</tr>
<tr>
<td>13</td>
<td>The instructor related course material to its applications.</td>
<td>4.21</td>
<td>4.48</td>
</tr>
<tr>
<td>14</td>
<td>The instructor’s methods of presentation supported student learning.</td>
<td>4.36</td>
<td>4.48</td>
</tr>
<tr>
<td>15</td>
<td>The instructor’s grading was fair, impartial, and adequate.</td>
<td>4.43</td>
<td>4.48</td>
</tr>
<tr>
<td>16</td>
<td>The instructor returned graded materials within a reasonable period.</td>
<td>4.36</td>
<td>4.29</td>
</tr>
<tr>
<td></td>
<td><strong>Overall Instructor Avg.</strong></td>
<td>4.44</td>
<td>4.51</td>
</tr>
<tr>
<td></td>
<td><strong>All 100 level Courses in College for Instructor Avg.</strong></td>
<td>4.05</td>
<td>4.21</td>
</tr>
</tbody>
</table>

The ratings were quite consistent for both classes. The second cohort was correct in question 16 in that the student grader did not always grade the homework within a week. Tables IV and V are added for completeness of the survey and there are no college averages for comparison. It is interesting to note that the students rated themselves equal to or a little less than the course and the instruction. Question 19 is a difficult question for the students since the course was not required for their program of study, but was required for their scholarship. It is difficult to imagine that a student actually spent 8 hours per week on this course, except perhaps the last couple of weeks in preparing for the team presentation. One junior voluntarily took the course and reported that the topics and skills discussed were useful to him. Most of the students attended all of the class meetings.

### TABLE IV

<table>
<thead>
<tr>
<th>#</th>
<th>Category</th>
<th>Fall 2003* Avg.</th>
<th>Fall 2004* Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Overall quality of the course and instruction</td>
<td>4.21</td>
<td>4.24</td>
</tr>
<tr>
<td>18</td>
<td>How do you rate yourself as a student in this course?</td>
<td>4.21</td>
<td>4.10</td>
</tr>
</tbody>
</table>
Next the students were asked what they liked most about the course. The responses are loosely grouped to correspond with those of the other semester in Table VI. The second cohort reported the individual presentations as a positive experience. It was quite evident that the Cohort II students enjoyed talking about their interest, hobby, or trip. Remarks such as “kept me motivated,” “gave me more courage to continue with my major,” and “connecting with other freshmen in same situation” are very encouraging that the program is right on.

The aspects of the course that were disliked were similar for the two cohorts as shown in Table VII. A few students in each cohort would rather not have had to take the class and some students in each cohort disliked the time that the course met. Although two students in the first cohort disliked doing evaluations, no one mentioned the evaluations in the second cohort. Two cohort II students complained about the book and too many assignments even though the text was free and the homework assignments were easier than for the first cohort. The instructors will pay more attention to the assignments with the next cohort.

The last survey question asked for comments about the course and the instructors. Table VIII summarizes that information. There were satisfied customers in both cohorts. The second cohort students seemed to be more touched by the personal stories of the instructors and the students. Comments such as “helped me to fit in as a freshman” are valued since this is a primary objective of the program.
TABLE VIII
Course and Instructor Evaluation Comments

<table>
<thead>
<tr>
<th>Fall 2003</th>
<th>Fall 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>one instructor was sick during second half of semester, but did enjoy her while she was there</td>
<td>great instructor, one of the best instructors I've had</td>
</tr>
<tr>
<td>instructor is a very well prepared woman and knows the material</td>
<td>instructors and assistants did a great job!</td>
</tr>
<tr>
<td>thank you</td>
<td>thank you very much for all your support!</td>
</tr>
<tr>
<td>overall liked the class very much and thought it was a fun course. Keep up the good work</td>
<td>liked class a lot it was a pretty fun course and I definitely enjoyed my time in it</td>
</tr>
<tr>
<td>enjoyed the class greatly and it really helped me to fit in as a freshman</td>
<td>great class it's a good class overall</td>
</tr>
<tr>
<td>looking forward to meeting again next semester</td>
<td>your story was encouraging</td>
</tr>
</tbody>
</table>

END OF FIRST SEMESTER COHORT GPA COMPARISON

All of the students except one in both cohorts performed well in the Academic Success class and continued to be enrolled in the Fulton School of Engineering in the spring semester of their freshman year. The average GPAs at the end of the first semester for each cohort are similar; however the average GPA is higher for the first cohort. A closer look shows that two students in the first cohort were in academic difficulty with less than a 2.0 GPA. However, over 35% of the students in cohort II had a GPA less than 2.6 compared with only 24% of the first cohort. At the same time over 70% of the students in the first cohort had a GPA greater than 3.0 compared to only 20% of the second cohort. Table IX gives a general breakdown of the semester GPA averages for both cohorts.

TABLE IX
GPAs at End of First Semester

<table>
<thead>
<tr>
<th>Cohort</th>
<th>n</th>
<th>GPA avg.</th>
<th>&lt; 2.0</th>
<th>2.0</th>
<th>&lt; 2.6</th>
<th>&gt; 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Fall 03</td>
<td>21</td>
<td>3.04</td>
<td>2 (9.5%)</td>
<td>5 (23.8%)</td>
<td>15 (71.4%)</td>
<td></td>
</tr>
<tr>
<td>II. Fall 04 (all)</td>
<td>14</td>
<td>2.85</td>
<td>0 (0.0%)</td>
<td>5 (35.7%)</td>
<td>5 (35.7%)</td>
<td></td>
</tr>
<tr>
<td>Fall 04 (min. only)</td>
<td>10</td>
<td>2.73</td>
<td>0 (0.0%)</td>
<td>4 (40.0%)</td>
<td>2 (20.0%)</td>
<td></td>
</tr>
</tbody>
</table>

At the end of the first year, Cohort I had 20 students with a cumulative GPA average of 2.895. Only one student had a GPA less than 2.0 and only three students had GPAs less than 2.6.

ONE-YEAR COHORT RETENTION COMPARISON

We will not be able to compare the one-year retention of the two cohorts until after the 21st day enrollment in Fall 2005. For the past four years, the one-year retention of first-time, full-time underrepresented minority students in the School of Engineering has averaged 60.7% in the School of Engineering and 71.1% in the University. The retention averages of the last two years for the Fall 2002 and Fall 2003 first-time, full-time minority students in the School of Engineering are 60.65% in the School and 71.85% in the University. The comparable one-year retention rate averages for non-minority students over the past four years are 66.0% in the School and 80.4% in the University. The one-year retention for the first NACME cohort was 76.2% in the School and 76.2% in the University. It is of interest to note that two of the Cohort I students who did not return for the fall of their second year did return in the spring (another College) so that in Spring 2005, the ASU retention was 85.7%. These NACME retention rates are better than those for all minority students and the NACME School retention rate is better than the rate for non-minority students. [23]

CONCLUSIONS AND FUTURE PLANS

In general, the evaluations of the NACME Program have been very good. The two cohorts appear to be very similar demographically. The average GPAs in high school and at the end of the first college semester are very similar. However, the first cohort had more students in academic difficulty after the first semester than did the second cohort. The students will be continually tracked to see if the first semester grade is a predictor of retention.

Holding the Academic Success class in a formal classroom worked very well. Ice breakers and in-class time for students to talk about what is going on with their studies and for student team meetings will continue. Name placards and class evaluation summaries will be continued. The textbook and video series each received general approval and will be continued. The individual and team presentations will definitely be continued.

The instructors will pay more attention to the textbook in class and the homework assignments from it. We will continue to stress study groups as well as stress items 9 and 11 suggested by the first cohort: work together, keep tabs on each other, and support each other and emphasize that they you will get out of the class what you put in! If possible, we will have some of the “advanced” NACME students attend the Academic Success class and make these points to the class personally. Also, the project directions will be improved so as to reduce some of the stress of the project.

A major difference in the next Academic Success course will be the early addition of the principles of the 4.0 learning system [24]. If the students will get on this plan and take it seriously, the first semester GPAs for Cohort III should increase as well as the retention of the students until graduation. At the same time, since Cohorts I and II were introduced to the 4.0 plan early this spring semester, it is expected that their GPAs will increase accordingly.

Of course, it is always difficult to isolate the influence of one program on a student. Our minority students are encouraged and supported by active minority engineering student organizations of AISES, SHPE, and NSBE, besides SWE and their major student organizations; the MSB program; and our Center for Engineering Diversity and Retention which also holds workshops and programs. All of these resources are available to both NACME cohorts.
The NACME program includes quite a bit of hand holding and support of the students through emails and phone calls to remind them of meetings, especially after the first semester when meetings are no longer every week. Often students do not check their email, the email box gets filled, and they do not receive information on the class or other opportunities such as internships or scholarships. This support is necessary for many students as they make the most difficult transition of their lives, often from an A student who didn’t need to study in high school to an engineering student with many academic challenges. The Academic Success course and the NACME program help to make this transition easier.

REFERENCES


[23] Office of Institutional Analysis, Arizona State University, Tempe, Arizona, 85287