AC 2007-2785: START: A FORMAL MENTORING PROGRAM FOR MINORITY ENGINEERING FRESHMEN

Tony Mitchell, North Carolina State University

Dr. Tony L. Mitchell, Lieutenant Colonel United States Air Force, Retired, received his B.S. degree in Mathematics from North Carolina A&T State University, the M. S. in Information and Computer Science from Georgia Tech, and Ph.D. in Electrical and Computer Engineering from North Carolina State University. Currently he is Assistant Dean, Engineering Student Services, Director, Minority Engineering Programs, and Associate Professor of Electrical and Computer Engineering at North Carolina State University in Raleigh. Previous educational assignments include Professor and Chairman of Electrical Engineering at NC A&T State University in Greensboro, and Associate Professor and Deputy Head of Mathematics at the United State Air Force Academy in Colorado Springs, Colorado. He worked for one year on educational sabbatical to the National Science Foundation. His teaching and research interests include control systems, high-speed packet and cell switching networks, multicast routing, and image and data compression of full motion color images. Tony L Mitchell retired after 20 years in the United States Air Force, winning the 1988 United States Air Force Research and Development Award for his work on computer network topologies for the National Aeronautics and Space Administration Space Station.

Angelitha Daniel, North Carolina State University

Angelitha L. Daniel graduated from the University of Pittsburgh with a Bachelor of Science Degree in Materials Science and Engineering. After graduation, she was hired as the Coordinator of Minority Recruitment for PECAP, Pitt's Engineering Career Access Program (formerly known as the IMPACT Program) from July 1998 until June 2003. Ms. Daniel currently works as the Assistant Director of Minority Engineering Programs at North Carolina State University in Raleigh. She is responsible for the planning and implementation of programs that assist the college in recruiting, retaining, and graduating underrepresented students.

START: A Formal Mentoring Program for Minority Engineering Freshmen

Abstract

Our College of Engineering attracts some of the most talented students from across the United States. Each year, an entering freshman class of approximately 1250 new engineering students includes approximately 18% female and 20% minority students. Approximately 13% of our undergraduate student population is an African-American, Native-American, or Hispanic-American. Annually, a new freshman class of engineering students includes about 140 under-represented minority students.

Nationally, undergraduate engineering programs at traditionally white institutions which are successful at sustained recruitment, enrollment and graduation of under-represented students are constantly seeking innovative strategies to help meet these objectives. One such program administered by our Office of Minority Engineering Programs is Student Advancement and Retention Teams, or START. START is an early intervention and peer-mentoring program whose purpose is to help create a receptive, familial environment that helps ease the transition of new under-represented freshmen into our College of Engineering.

In 2003, we received a small grant from a local foundation that allowed us to run a two-year pilot that expanded START through the mentees' sophomore year. This paper reports on the procedures, challenges and successes associated with START. After describing START mentors selection and mentees assignment procedures, the paper reports on activities and outcomes associated with the traditional first-year only program. We will then describe our motivation for extending START through the sophomore year, and offer details on unexpected challenges associated with this expansion. The paper concludes with lessons learned from this two-year expansion pilot, and with explanations of why we have returned START to its original mode of assigning mentors to entering under-represented student freshmen only.

Introduction to the Diversity Challenge

As a land grant university as designated by the United States federal government, our university has a mandate to provide practical education to the citizens of this state, while maintaining nationally ranked and recognized research programs. Through its responsibility as a land grant university our College of Engineering seeks to recruit the highest achievers while maintaining a diverse and inclusive campus community. Our enrollment rates of under-represented students (African-Americans, Hispanic, Native-Americans), have shown steady progress over the past twenty years. Our Minority Engineering Programs Office was established in 1982 to address the needs of a growing number of students attending the university, with particular emphasis on under-represented engineering student success. As success was proved with our engineering model, it was replicated across campus in other schools and colleges. Research has shown that first year student success is highly dependent on support services and programs, particularly for minority students[1, 2].

On our campus, student diversity is enhanced by increasing the numbers of African-American, Native-American and Hispanic students (together referred to as minority or under-represented

students). These three groups are designated under-represented by the US federal government because the rate at which they seek college degrees in science, technology, engineering and mathematics, is disproportionately lower than their percentages in the general US population.

Our College of Engineering attracts some of the most talented students in the United States of America. The majority of these minority students are members of the under-represented minority populations that include African-Americans, Native-Americans, and Hispanic-Americans. The entire College of Engineering undergraduate and graduate enrollment of 7600 students comprises 18% women and 20% minority students.

Attracting minority students to rigorous engineering programs is a challenge that colleges and universities across the country continue to face. This challenge is even greater for traditionally white institutions (TWI) in comparison to Historically Black Institutions (HBCUs)[3]. Efforts to recruit and attract African-American, Native-American, and Hispanic-American students must be effective in making the student feel "comfortable" in an environment where familiar faces are few. Our Minority Engineering Programs Office continues to seek innovative programs to recruit and ultimately enroll students in our engineering programs. In order for these programs to be effective, the student as well as their family must be embraced[4]. START, our formal minority engineering student mentoring program, and the focus of this paper, plays a key role in the success of our lower-division minority engineering students.

Current National Minority Engineering Student Status

According to the most comprehensive research data released by the National Action Council for Minorities in Engineering [NACME], Inc., freshman enrollment, the gateway through which minorities enter the engineering profession, was considerably lower at the end of the period studied. From a peak enrollment of 15,181 African-American, Hispanic-American and Native-American freshmen in 1992-93, minority freshman enrollment declined 8.2 percent, dropping to 13,929 in 1997-98. Nationally, that downward trend continues to the present day. Not surprisingly, for both African-Americans and Latinos, losses were concentrated among engineering institutions enrolling the largest numbers of, and providing the greatest access to, minority students[3]. Also, many studies have proven that under-represented minority under-graduate students drop out of engineering at a higher rate than their white and Asian peers[4–7]. African-Americans are only half as likely to graduate as their white counterparts[8].

For decades several programs at the national and local levels have been developed and attempted to help meet the projected shortage anticipated in an ever-increasing high-technology work force. In 1998, Bowen and Bok published results of a comprehensive longitudinal study of one specific, significant thrust at addressing minority student success: affirmative action. Their study[9] provides defensible, concrete proof of the positive impact affirmative action has had not just on minority participants, but also on society as a whole. While such results are notable from a historical perspective, anyone serious about minority student success will quickly acknowledge that there remains tremendous work to be done in reaching a point where access to education, and a diverse, well-prepared work force pool, is assured. Many under-represented minority students do not see engineering as a career for them[7]. They know few minority engineers

themselves, and need to be exposed to programs and activities that increase their awareness early into their undergraduate education career.

Brief Background on Our College of Engineering

Our land-grant University is the largest state-supported school of the sixteen-campus University system. Our College of Engineering is among the best in the country, offering outstanding degree programs and preparing students for exciting and rewarding careers. Our graduates are heavily recruited for positions in a variety of settings, including business, construction, transportation, hardware and software development, and design. The College comprises 12 departments offering 18 BS, 17 MS, and 14 Ph.D. degree programs and conducts the largest undergraduate and graduate engineering education and research programs in the State. The College continues to rank among the nation's leading colleges in the total number of degrees awarded, the number of degrees awarded to women and minorities, the quality of the graduate programs, and research and extension activities. Our fall 2006 undergraduate enrollment was 5,810, approximately 25% of our total university undergraduate enrollment. Total campus enrollment at all levels approaches 30.000 students. We have the second largest African American engineering undergraduate enrollment of all non-Historically Black Colleges and Universities (HBCUs) in the nation. Among non-HBCUs, we award the second highest number of Bachelor of Science in engineering degrees to African-Americans[10].

Student Advancement and Retention Teams: START

Background

During early fall 2003, our Director of Minority Engineering Programs received an unsolicited electronic message inquiring about the existence of programs and activities designed to help facilitate the success of minority students seeking engineering degrees. The sender indicated that he headed up a local private foundation and was interested in funding small pilot projects supporting student diversity. He also extended an invitation to explore this matter further. The MEP director did not recognize the e-mail sender and so was skeptical about the inquiry. The director periodically receives SPAM e-mail from individuals usually claiming to be in Africa, who are looking for partners to help move millions of dollars into legitimate US stateside accounts. So the MEP director initially assumed this unsolicited inquiry was a variation on that theme. However, on the outside chance that the sender was legitimate, the MEP director decided to respond to the e-mail by providing summary information on our minority engineering programs.

After a couple of weeks and no response, the director shrugged the initial e-mail off as being another hoax. About the third week, the sender responded with an apology for not getting back to the director sooner, and established a luncheon meeting to discuss the matter further. After meeting with this individual, the MEP director discovered that not only was he legitimate, but the potential donor was one of the original founders of a very successful software company that had recently gone public[11]. This former executive retired from that company at a very early age, and was looking for meaningful ways to invest a portion of the gains realized from his former company's public offering. This potential donor explained that as he rose through the former company, leaving as vice president, he had not once seen the resume of a female or

underrepresented minority come across his desk as a new hire. He had earned his undergraduate degree from our College of Engineering, and so knew we had outstanding minority students in our programs. After explaining several ideas I had for a couple of pilot programs, he asked me to send him a brief e-mail request explaining what I wanted to do, and he would take my request to his foundation's board of directors. Subsequent to this lunch meeting, the MEP director received $40,000 to conduct two pilots: $10,000 to host two under-represented minority students recruiting weekends[12], and $30,000 to expand our formal minority student mentoring program, START.

Program Purpose and Procedures

The START Program is an early intervention and peer-mentoring program aimed at creating useful partnerships among minority engineering and computer science students in our College of Engineering. During each spring academic semester, our Office of Minority Engineering Programs solicits applications for START mentors. START mentors are required to have at least a 2.5 GPA at the time of their application and must maintain at least a 2.5 to continue as a mentor with the program. An email targeting all engineering and computer science students with GPA's of 2.5 and higher is sent to solicit prospective mentor applicants. Mentors have to complete and submit an application and participate in an interview with the Assistant Director of Minority Engineering Programs. Mentors are selected based on their ability to serve as role models for lower-division minority engineering students. Those selected are paired with new MEP students who enter our College of Engineering the following fall. Depending on the number of mentors projected for the next academic year, a START mentoring pool of 25 – 50 students are selected. Selection criteria include prior mentoring performance of any applicant wishing to continue for another year, availability to carry out expected responsibilities, and of course, academic performance. These students are then assigned 5 – 7 minority engineering students each as mentees. They are expected to make contact with their mentees within the first week of the fall semester. Prior to the arrival of new students, the MEP office e-mails each contact information for their assigned mentor, and alerts them to expect a phone call or e-mail from the mentor.

During the academic year, START activities include formal back to school social gatherings, at least one joint outing to a fall football game, formal tutorial sessions, and weekly contact or other activities hosted by the mentor for his/her START group. Each mentor is paid $500/academic semester to insure she/he has funds should the group want to go to a movie, bowling, ice skating, pizza parties, etc. In exchange for the funds to support START groups, mentors sign a formal contract agreeing to several key program components. These include, but are not limited to attending mandatory START training at the beginning of the program, bi-weekly mentor meetings, meeting in person at least twice a semester with mentees, and making weekly contact electronically or telephonically. Mentors are required to submit bi-weekly e-mail reports on mentees' contact and progress, and volunteer for several upper division student panels that are a part of our formal, one course credit, new MEP freshmen fall orientation course. So these START mentors act as big brothers/sisters to a group of approximately six to eight mentees.

At the end of the fall semester, the START Program Coordinator and Assistant Director, Minority Engineering Programs, evaluate all mentors. At that time, if any of the mentor

expectations are not met, the Minority Engineering Programs Office can terminate the relationship and replace the mentor at the beginning of the spring semester.

Motivation for Program Expansion

Prior to the 2003-2004 academic year, the program focused on freshman students only. A donation from a local foundation allowed us to expand the program through the mentees' sophomore year. Rationale for the expansion was since our engineering students are placed in their intended academic department during the sophomore year, that the MEP office would continue the close monitoring of rising sophomores until that matriculation occurred. Prior to the expansion, mentees were dropped after their freshman year since the funds were needed for the next entering freshman class. The expansion of the START Program allowed us to continue close contact and nurturing of entering minority students through the point of matriculation into their intended engineering major. Students are paired with an upper-class minority engineering student by major, demographics, or both. START teams meet on a regular basis to discuss a variety of issues, from what classes to take to how to get an internship. These meetings take on added value as mentees move into early major courses in the sophomore year. Social activities are held to allow START Mentors to interact with their mentees in a non-academic setting. Through the second year, at least two academic workshops and one social event are held each semester for both mentors and mentees.

First Year Expansion

For the 2003 - 2004 academic year, there were 14 mentors and 120 entering minority freshmen. Each mentor was assigned 8 or 9 mentees. Seven of the 2003 - 2004 mentors continued with the program for the 2004 - 2005 academic year. The other seven mentors graduated and thus could not continue with the program. The mentees assigned to the seven returning mentors were left with that mentee. This method accounted for 58 of the 120 (48%) rising sophomores that would be in the first year expansion pilot. The remaining freshmen/rising sophomores were sent an email asking if they would like to have a mentor assigned to them in their sophomore year, only two students indicated they would in fact like a mentor for their sophomore year. In looking at the first year pilot in terms of final numbers, we had 60 rising sophomores along with 175 entering freshmen for the 2004-2005 academic year. The cost of expansion came as a result of having 29 mentors for 2004-2005 versus 14 in 2003-2004. The first group activity was a trip to Jillian's, a local restaurant with games. Seventy-three mentors and mentees attended the event at a cost of $361.00. One academic workshop was held focusing on exam preparation. Mentors met on a bi-weekly basis to discuss upcoming events and issues/concerns with their mentees.

Second Year Expansion

Forty mentors (nine were continuing mentors from 2004 - 2005) were hired the second year of expansion. In terms of numbers, 120 incoming freshmen and approximately 160 rising sophomores were paired with a mentor, total 280 mentees. The year began with a seven hour mentor training workshop. Thirty- six of the 40 mentors attended the training. The training was intended to give the mentors all the tools necessary to be a good mentor, and incorporated lessons learned from the first-year expansion. The first group activity was a back to school

cookout held a local park. One hundred and five students participated in the event. Students played games for prizes donated by local bookstores. The total cost of the event was $1000. Two academic workshops were held titled: *What's Your Motivation* and *Student Organizations and Summer Internships*. Both workshops had over 40 students in attendance. An attempt was made to secure football tickets for all 280 mentors and mentees utilizing the student lottery system. One of four START groups (consisting of ~80 mentors and mentees each) was not selected therefore we did not attend a football game. Twenty mentors were treated to dinner at a local restaurant for their hard work this semester, at a cost of $208.00. Additionally, bi-weekly meetings were held to plan START activities.

Table I is a summary of START participation over the past five years. Table II represents a five year history of undergraduate enrollment of our minority engineering students.

Table I. Five-Year START Participation History.

	2002 -03	2003-04	2004-05	2005-06	2006-07
No. Mentors	15	14	30	40	25
No. Mentees	140	120	232	276	144
Total	155	134	262	316	169

Table II. Five-Year Engineering Undergraduate Minority Enrollment History.

UNDERGRADUATE URM ENROLLMENT: 2001 - 2005

	2001		2002		2003		2004		2005		Total By Gender		Total
	M	F	M	F	M	F	M	F	M	F	M	F	
Native American	29	11	32	11	33	8	39	6	44	2	177	38	215
African American	313	127	311	125	304	119	312	128	301	111	1541	610	2151
Hispanic American	115	37	109	37	115	39	122	41	136	38	597	192	789
Total	457	175	452	173	452	166	473	175	481	151	2315	840	3155
Grand Total	632		625		618		648		632		3155		

Program Outcomes and Lessons Learned

We encountered difficulty when trying to secure a sufficient number of mentors for 235 incoming freshmen and rising sophomores in the first year expansion. At the beginning of the fall 2004 semester, we were still seeking mentors. Mentors/mentees assignments did not take

place until early November. The first group activity (which is normally a kick off event welcoming the students to campus) did not take place until the beginning of November. With Thanksgiving and Christmas breaks approaching, mentors did not have enough time in the semester to actually bond with their mentees. In the absence of the Assistant Director, two mentors (one senior and one grad student) were appointed to oversee weekly activities of the program for spring 2005. These two factors played an integral part in the success of the program.

It was determined from evaluations given to mentors and mentees that a Minority Engineering Programs staff person should oversee the program. This would ensure that mentors followed through with scheduled activities and thus mentees would take the program more seriously. A key problem was that academic workshops were scheduled in the spring 2005, and were cancelled an hour before mentees expected them to begin. This disappointment was a big hurdle we had to overcome with the sophomore students in the second year expansion.

The first year expansion was not as successful as we hoped it would be. The fall 2005 semester (first semester of the second year semester) was very successful but the sophomore participation was very minimal. Evaluations show that the program has now regained lost momentum. Many mentees look at their mentor as a vital resource as they navigate the NC State system. Mentees indicated that they talk to their mentors daily. Several freshmen have indicated that they wish to be a mentor. We still have some students (mainly sophomores) that do not utilize their mentor because they feel they have a good handle on their academics and campus environment.

Future Plans

Mentors for the next academic year will be selected prior to the students leaving for summer break. It is imperative to have all the mentors hired before the start of the semester to ensure that the mentors have the opportunity to meet their mentees as early in the fall semester as possible. The first group activity will be scheduled in the middle of August but no later than the middle of September to allow for the mentors and mentees to meet and begin communicating early in the semester. Selecting the mentors before the beginning of the school year was the true reason why the program has regained its momentum. The Assistant Director will continue to oversee the daily operation of the program with program support from the mentors. Bi-weekly meetings will continue to aid in keeping the program on track. Depending on the availability of funds, more social activities (possible trip to King's Dominion) will be scheduled, per request from mentors and mentees.

We have decided to revert to first-year only mentoring, thereby returning to the earlier model that existed prior to running the pilot expansion program. Primary reason for this decision is that sophomores believe they are above the type constant care and monitoring afforded them as freshmen, so are extremely reluctant to participate voluntarily. Continued academic monitoring of this population shows they are not correct is this assumption, but since the program depends quite heavily on willing volunteers, we have no choice in this decision. Another minor consideration supporting this decision to revert to freshman-only mentoring is funding. Cost is approximately ½ for one year as it is two since on average, we use about half the number of

START mentors. We should add though, that had the expansion pilot been successful, we are confident we could have found funds to continue with the expansion.

National Profile of our College of Engineering

At our University, we have developed a student success model that is contributing towards our goal of increasing student diversity in the engineering and computer science professions. We know we are on the right track because our College of Engineering has been honored three times in the short history of a national mentoring awards program. In 2000, we received organization recognition by being selected for the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring[13]. Two of our African-American engineering professors won individual Presidential Mentoring awards in 1998 and 2003 for their contributions to the success of under-represented minority students earning engineering graduate degrees[14, 15].

For over 10 years, our Minority Engineering Programs Office has been evolving as a national model for engineering student success. Refereed paper presentations on our model have been made in recent years at annual conferences of the American Society of Engineering Education[16], Frontiers in Education[17], the International Conference on Engineering Education [18-24], the International Symposium of IGIP/IEEE/ASEE[25], and the Annual Conference of the National Association of Minority Engineering Program Administrators[26].

Concluding Comments

According to the Black Issues in Higher Education, through 2005, our University consistently ranked in the top five nationally in undergraduate engineering degrees awarded to African-Americans[10]. This accomplishment is even more significant when one considers that the engineering program on our campus comprises only about 25% of the total student population, and African-Americans comprise approximately 9% of our total undergraduate engineering student enrollment. Further, across the United States, there are nine Historically Black Engineering Colleges, all of which are over 90% African-American. In any given year, only a few of these nine produce more African-American undergraduate engineers than our university[10]. The success of programs such as START will insure we continue to be a national leader in the quest to help increase the quality and diversity of the nation's engineering workforce.

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