

## **Recruitment and Retention of 2-year Degree Students into 4-year Programs in Engineering, Math and Computer Science**

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### **Abstract**

A new project at Southern University entitled “**Recruitment, Retention, and Advancement Initiative for Student Excellence (RAISE)**” has been funded by the National Science Foundation. The need for this program at Southern University is crucial due to new admission standards, which threatens the enrollment numbers in all departments, including Computer Science, Engineering, and Mathematics (CSEMS disciplines). As students who do not meet admission requirements are encouraged to attend community college programs, a solution to the student drain is the active recruitment of students obtaining associate degrees. The scholarship program can also help improve retention rates for capable students in CSEMS fields. The program is designed to support approximately 30 minority and/or female student participants per year. Scholars will be selected from students who have or will receive associate degrees in science and technology and who express intent to major in one of the CSEMS disciplines. Scholars will be selected based on financial need and academic achievement. Students will be co-advised by academic mentors. They will be required to participate in structured mentoring programs and various student development seminars/workshops. Selected students will also receive benefits from participating with other academic enhancement and training activities. Thus, the main objectives of this project are to (1) increase successful recruitment of students with associate degrees from two-year community colleges into baccalaureate degree programs in CSEMS disciplines, (2) improve retention to degree completion and increase graduation rates, and (3) improve professional development, job placement and further higher education placement of two-year-to-four-year transfer students.

### **Introduction**

State supported schools in Louisiana have recently adopted policies that establish stringent requirements for admission. Southern University, which has long been characterized by an open

admissions policy, also began selective admissions in the Fall 2001 semester. Historically, incoming students who have displayed achievement below certain standards were allowed to take non-credit developmental classes in mathematics and language/reading to bring them up to speed. Now, those students who need to take remedial classes can take them at the community college level. In the Fall 2000 semester, there were 428 freshmen admitted to Southern who declared a major in one of the CSEMS disciplines. Of these, 133 students did not meet the new admission criteria. While selective admissions could mean smaller classes with better-prepared students, it almost inevitably means reduced numbers of graduates in CSEMS fields. This is especially a problem for HBCUs that are the major generator of minority graduates in CSEMS fields of study. Southern University, for example has produced 55% of all African American Engineering graduates in the State of Louisiana (*SU College of Engineering Annual Report, 2000-2001*). Community colleges normally have high minority and female enrollments<sup>1,2</sup> (Hendley, 1997 and Wolcott, 2001) and are thus prime for recruitment of underrepresented groups.

Information supports that articulation agreements, which guarantee full transfer of credits from two-year programs, between community colleges and four-year colleges can increase transfer success rates. Such agreements can alleviate students' burden to prove course equivalency or to retake classes. They also ensure that there is no disparity in preparation between students who enter with transfer status and those primarily attending the four-year institution. As an example, data presented in a report compiled by the National [Great Britain] Committee of Inquiry into Higher Education (NCIHE 1997)<sup>3</sup> on the role of and background to higher education in the USA shows that for three states—Florida, Maryland, and New York—bachelor-degree-program enrollments at state schools doubled where articulation agreements were mandated. Southern University has embarked into an articulation agreement with the Baton Rouge Community College (BRCC). According to BRCC Enrollment Services, in the Spring 2001 semester there were 365 students with declared majors in Technology (124 students) and General Science (241 students) enrolled in associate degree programs. These students are to be the number one target group.

Statistics also show that many students who take the community college route often do not continue in school beyond the associate degree. Various reasons may be cited, but according to David Hata<sup>2</sup> (Hendley, 1997), chair of the American Society for Engineering Education (ASEE) Two-Year College Constituent Committee, the main difficulty community college students face in transferring to a four-year college/university is finance. Also, according to the NCIHE (1997) study<sup>3</sup>, completion rates for two-year as well as four-year colleges were reported to be low due to “the need for students to work at the same time as they studied in order to meet the costs of their higher education tuition fees and subsistence.” In most instances, tuition is low at community colleges, a feature that attracts many students. But when making the transfer to a four-year institution, tuition increases may be up to 50% or much higher. Many students are thus discouraged because they cannot shoulder the increased financial burden.

According to Hendley,<sup>2</sup> there is no group that compiles national statistics on the academic performance of transfer students. There is not much information on success rates although it has been shown that these students do succeed. For example, Shields and Pietroburgo<sup>4</sup> presented

results from a program designed for two-year to four-year transfer students in engineering. They found that students performed equally as well as those who transferred from other four-year schools and achievement was within the same range as so-called “native” students. Success rates are enhanced by a support infrastructure that provides additional training and mentoring to transfer students. Employing innovative pedagogical instruction techniques also enhances retention.

Therefore, the objectives of this project are to fight the decrease in overall student enrollment in CSEMS disciplines due to selective admissions, encourage continued/increased enrollment by targeting two-year college students/graduates by providing financial assistance, and providing mentoring support to students to ensure their acclimation to and success in the baccalaureate programs. As mathematics and technology are becoming increasingly important in the pursuits of professional engineers, close interaction between students and faculty will increase the levels of understanding for both. This project will expand the learning community and provide a unique way to enhance students’ academic, social and personal success at SU. The investigators have confidence that this educational program will be a successful national model to assist students in succeeding in studies towards B.S. degrees and encouraging graduation, job placement/graduate school placement, and overall excellence of students in CSEMS disciplines. Students will gain educational skills needed for industry and graduate studies through various sponsored educational activities including: (1) Retention, (2) Professional Development and Employment, and (3) Graduate School Seminars.

## **RAISE Program**

In order to enhance the educational levels of the student participants, the following activities are planned: (1) Retention, (2) Professional Development and Employment, and (3) Graduate School Counseling. All selected scholars will be required to attend monthly seminars, at least four academic advising sessions per semester, and a yearly evaluation session. All other educational activities will be encouraged while not mandatory. Through participation in this project, including involvement in training and enhancement seminars and workshops, exposure to graduate school opportunities, alone and in conjunction with other programs, SU can significantly change the picture of the state and national workforce, making it a more diverse and competitive entity. The activities are explained below.

### **Recruitment**

The principal investigators are coordinating with other campus recruitment efforts to carry out recruitment. Because of the location and the existing articulation agreement between the two campuses, the local Baton Rouge Community College will be the main target group for recruitment into the RAISE program.

The student population at community colleges is largely female. According to Moore<sup>5</sup>, women earned 61% of all associate degrees in 1997. Thus, it is anticipated that in addition to the expressed goals of the proposed program, the percentage of women receiving bachelor’s degrees in CSEMS disciplines will also improve.

## **Retention**

Students recruited into the program must participate in activities developed to keep them in school and performing well. The following outlines the planned activities in this area.

### **Mentoring**

“Systemic mentoring is the coupling between quality teaching and quality learning on one hand, and between quality teaching and quality research on the other. Student retention, on-time graduation, and attendance and success in graduate school, according to the integrated law of human performance, are not ‘magical events.’ They are natural consequences of exposure to the proper content and skill, in the proper sequence, at the adequate scope and depth, in a fashion that guarantees adequate practice -- including research participation” –D. Bagayoko<sup>6</sup>

Each student participant will choose a faculty, graduate student or industry mentor. All mentors and students will follow the mentoring model of the Timbuktu Academy<sup>6</sup>, an NSF funded and nationally recognized systemic mentoring program at SU.

### **Academic Enhancement Workshops**

Students will be informed of activities that will enhance their academic performance. Activities such as Academic Excellence Workshops, Supplemental Instruction courses, Study Skills Workshops, Collaborative Learning and Peer Tutoring seminars, Test Taking Workshops, Time Management Workshops, etc. Some of these activities will be incorporated as a part of mandatory monthly seminars, while the remainder will be optional, but highly encouraged. Linkages with other NSF funded programs will be used to support this activity.

### **Computer Training**

Students will be encouraged to attend SUBR and Office of Technology and Network Services Computer Workshops and Training Sessions. Workshops are available focusing on the following topics: How to use Computer Based Training, Adobe Photoshop, An Introduction to Digital Imaging, Introduction to HTML, Microsoft Access 1 & 2, Microsoft Excel 1 & 2, Microsoft PowerPoint, Microsoft Word 1 & 2, Surf the Web 1- An Introduction to the Internet, Surf the Web 2-More Advanced Topics, Web Design using Front Page, Windows 95/98, Computer Basics and Windows NT Workstation. Some of these topics will be incorporated as a part of mandatory monthly seminar, while the remainder will be optional, but highly encouraged.

### **Student/Departmental Organization Involvement**

Students will be encouraged to become involved in student/departmental organizations. The benefits that students can receive as members of these organizations are numerous. To list a few, these organizations provide a mechanism for students to meet their own personal and academic needs; they strengthen the educational environment; they provide students with an opportunity to develop their leadership, interpersonal and teamwork skills.

## **Advancement-Professional Development and Employment Activities**

### Conferences/Site Visits

During each semester, scholarship recipients will tour industry, national laboratories and/or other professional facilities to explore the value and practical applications of computer science, engineering and mathematics education in the workplace. Students will learn more about the real world problems that engineers encounter daily. Students will also visit Innovative Emergency Management to learn about problems resulting from the release of gases into the atmosphere. Stipends of up to \$200 per student will be offered to those students who choose to attend/participate in professional conferences with a faculty mentor/research professor.

### Internships/Laboratory Experiences

During the summer session of each year, students will be encouraged to participate in an internship program or a National Laboratory research program. Through current partnerships with the IT Group and Lawrence Livermore National Laboratory, students will have the opportunity to be placed according to their interests.

### Monthly Seminars

As a component of the monthly seminar, meetings will be devoted to professional development and employment. Speakers from industry will be invited to assist in this area. Suggested topics include: (a) Resume Preparation and the Job Interview: an employer's perspective, (b) Business Professionalism, Ethics and Etiquette, (c) Leadership, Teambuilding, Motivation and Initiative, and (d) Career Opportunities pre- and post-graduation (Internships, Co-operatives, Externships, Research Experiences and Professional Employment). As mentioned above, some seminars will be incorporated in the Academic Enhancement Workshops and Computer Training activities.

### Graduate School Activities

One of the (mandatory) monthly seminars will be devoted to graduate school issues to inform student participants of the wide variety of choices for furthering their education through graduate school. Some seminar topics could include: (a) The advanced degree: What's in it for me? (b) How to secure steady financial assistance, (c) The graduate school admissions process, and (d) Career opportunities for graduate school students and graduates.

Students will also be provided information on graduate programs via the monthly seminars, as well as be encouraged to seek additional information on their own. If students express interest in graduate school, they will be encouraged to (a) visit at least one other university to learn about their graduate programs (many graduate schools are willing to pay the expenses of the student's trips), (b) attend seminars on selecting and working with graduate faculty, mentoring, and grant writing, and (c) place their resumes with the Career Services Office to keep current on the employment needs of the industry.

## Assessment of Outcomes

Each student participant will be required to participate in all mentoring and evaluation activities. The program will be regarded as a success if the following criteria can be met:

*GPA* -- It is expected that the average GPA of the student participants will be increased in comparison to the average GPA of student participants before entering the program. The minimum requirement for entering the program is an overall 2.8 (GPA in various majors may be higher, at least 3.0). The average GPA of student participants is expected to be approximately 3.1. The average GPA for student participants is expected to increase by 0.2 points during the course of the program.

*Retention* -- All student participants, with the exception of one or two, are expected to continue their studies through graduation.

*Graduation* -- All student participants will be full time students, taking at least 12 credit hours per semester (full time definition) towards the graduation requirements in their disciplines.

*Jobs or Graduate School* -- It is expected that at least 90% of the selected students will have jobs or will have entered graduate school within 6 months of their graduation.

## Summary and Conclusions

To summarize, the scholarship program has been described along with its major components. It remains to be seen what impact it will have on the student participants and the CSEMS programs and enrollments at SU. The first students will join the program in the Fall 2002 semester. The project principals will monitor the students and disseminate any quantitative or qualitative results as they become available.

## References

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Dr. Crosby currently serves as an Assistant Professor of Mechanical Engineering at Southern University. Her research interests involve many areas related to advanced engineering materials including modeling material behavior, microstructural and property characterization, and performance analysis. Her research experiences have included studies of ultra-low carbon steel, polymer and metal matrix composites, and aluminum-lithium alloys. Dr. Crosby is a registered Engineer-in-Training in Louisiana.

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