

**NASA-SURE Program at North Carolina A&T State University for
Engineering Recruitment and Training**

Kenneth L. Roberts
Department of Chemical Engineering
North Carolina A&T State University
Greensboro, NC

Ajit Kelkar and Samuel P. Owusu-Ofori
Department of Mechanical Engineering
North Carolina A&T State University
Greensboro, NC

and

Eric A. Cheek and Joseph Monroe
College of Engineering
North Carolina A&T State University
Greensboro, NC

Summary

The NASA Summer Undergraduate Research Experience (SURE) program was established in the College of Engineering at North Carolina A&T State University from a NASA Partnership Award for the Integration of Research into the Mathematics, Science, Engineering and Technology into Undergraduate Engineering Education (PAIR) in 1998. The SURE program has trained under faculty/mentor guidance 23 pre-engineering students alumni which have included several African-American and Native-American students, out of approximately 110 applicants. Eight of the SURE alumni are currently enrolled in engineering programs at North Carolina A&T State University, the Georgia Institute of Technology and North Carolina State University. The NASA-SURE program is currently schedule to continue through 2003.

Reasons for the SURE Program

There is an increasing demand for a highly-skilled technical workforce in the United States for the 21st Century. Because of the changing demographics of the United States, there is also a need for increased gender and racial diversity in the advanced science, mathematics, engineering and technology career paths for the next century. For many mathematics, engineering, science, and technology (MSET) academic programs engaged in NASA-supported research there are limited mechanisms for the integration of cutting-edged NASA research into the undergraduate MSET student training experiences.

North Carolina A&T State University has been recognized as being the largest producer of African-American engineers and scientists at the B.S. and M.S. levels in the United States and a top ten producer of African-American engineers at the Ph.D. level. The University was recently cited to be a leader in the training of future female engineers and scientists by featuring departments such as the Chemical Engineering which have consistently matriculated students classes containing 60%+ female students since 1994 (1). The North Carolina A&T College of Engineering features well-established dual degree relationships with several majority, women-serving, Native American-serving and HBCU institutions across the Southeastern United States.

The College of Engineering at North Carolina A&T State University is designated as a NASA Research Center of Excellence in Aerospace Technology Development and possesses a strong track record in undergraduate engineering education. Approximately 14 North Carolina A&T State University faculty in the areas of science, mathematics, engineering, and technology faculty conduct research on supported NASA projects. In 1998, the North Carolina A&T College of Engineering was recently selected as a site for a NASA Partnership Award for the Integration of Research into MSET Undergraduate Education (PAIR). The North Carolina A&T NASA-PAIR program has been under the direction of Dean Joseph Monroe since 2000. Drs. Eric A. Cheek and Ajit Kelkar serve as Education and Research Coordinators, respectively, for the program. The NASA Summer Undergraduate Research Experience (SURE) Program at North Carolina A&T State University is coordinated by Dr. Kenneth Roberts and the computer/manufacturing workshops for the SURE program are facilitated by Dr. Samuel Owusu-Ofori. The NASA-SURE Program selected its first class of students in 1999.

Participants in the SURE Program

Student participants in the NASA Summer Undergraduate Experience (SURE) Program are selected from several partner institutions in the Southeastern United States which include Barton College (Majority Institution), Benedict College (HBCU), Bennett College (Women-Serving and HBCU), Livingstone College (HBCU), Morehouse College (HBCU), Morris Brown College (HBCU), Saint Augustine's College (HBCU), Shaw University (HBCU), Spelman College (Women-Serving and HBCU), the University of North Carolina at Pembroke (Native American-Serving) and Xavier University of Louisiana (HBCU). Each of the partner institutions have an existing dual degree engineering relationships with the College of Engineering at North Carolina A&T State University. Each student participant is chosen by means of a competitive process which categorizes each student based upon the applicant's home institution, discipline of study, academic standing, grade point average, academic honors and awards, professional and technical experience, and professional references.

Student participants for NASA-SURE are typically enrolled in pre-engineering areas of study such as mathematics, chemistry and physics at their home institutions. Several SURE students have also been selected from related areas such as biology and computer science. The NASA-SURE program selects approximately 12 to 15 students for each

year's program. The students finalists are paired with faculty mentors from the College of Engineering and the College of Arts and Science at the North Carolina A&T State University. The students work on NASA-supported and NASA-related research projects for 8 weeks during the Summer. The students are paid a stipend (\$2,500) and the costs of housing, meals, health services, parking and travel reimbursements are covered by the SURE program.

SURE Program Components

The NASA Summer Undergraduate Research Experience Program begins initially with a first day orientation and housing check-in for all student participants. All SURE students are introduced to their respective faculty advisors, program expectations, registration requirements, and campus life/city information. SURE students are also provided weekly feedback meetings with the program coordinator every Wednesday of the program.

While students are expected to work a minimum of six to eight hours per day during the eight weeks of the program, SURE students are also provided opportunities for professional and personal development. The students take part in biweekly professional development lectures which begin on the first Friday of the SURE Program. Lecture topics include technical writing, preparing for graduate school, technical presentation skills, relationships between science and engineering, etc. SURE participants receive training in computer technology workshops on useful presentation and calculation software, such as MS Powerpoint and MS Excel, and computer-aided manufacturing software. Students are also invited to program dinners and social outings which have helped to build life-long relationship between SURE participants. SURE Students also take part in industrial tours to sites such as the Research Triangle Institute in Research Triangle Park, NC and the Novartis Crop Protection Company, Inc. in Greensboro, NC. SURE participants have also toured two NASA research facilities, NASA – Langley Research Center in Langley, VA and NASA-Marshall Space Flight Center in Huntsville, AL.

At the end of the program, students are required to write a technical report which completely documents the activities of the participants during the eight weeks of the program. SURE participants are also required to present their research at the NASA-SURE Symposium Series. The final day of the program SURE participants, faculty advisors and mentors are recognized at the Annual SURE Closing Banquet.

Current Results of SURE Program

In its first two years, the NASA-SURE program has produced 26 alumni. Eight (30.8%) of these students are currently enrolled in engineering programs at North Carolina Agricultural and Technical State University (5), the Georgia Institute of Technology (2) and North Carolina State University (1). Thirteen other SURE alumni are currently matriculating in mathematics and science programs at their home institutions. These students have expressed an interest in continuing their studies in engineering. The

remaining SURE alumni (5) have backgrounds in the fields of biology and computer science and are currently continuing their studies at the undergraduate and graduate levels. Several SURE alumni have given technical presentations at regional and national undergraduate research meetings. Other SURE alumni have been awarded internships with the Department of Chemistry at the University of Alabama and with the North Carolina Department of Transportation.

In Table 1, the demographic data for each of the NASA-SURE classes is provided. In Table 2, the classifications of the SURE faculty mentor types shows that the majority of SURE participants were graduate students and faculty members. The remaining mentors were a smaller group of postdoctoral staff and upper-level undergraduate students. Table 3 shows that a slight majority of the SURE mentors have been male, however the significant number of female mentors (46.2%) is comparable to the number of female SURE participants (61.5% of total).

Table 1 - Student NASA-SURE Participants, 1999 – 2000

Year	Total	Male	Female	African-American	Native American	Other ¹
1999	9	4	5	7	1	1
2000	17	6	11	14	1	2

1 – Other students include U.S. Resident non-citizens supported by the College of Engineering at North Carolina A&T State University.

Table 2 – NASA-SURE Faculty Mentors by Classification, 1999-2000

Mentor Type	Percent - %
Faculty	23.1 (6/26)
Postdoctoral Staff	19.2 (5/26)
Graduate Students	46.2 (12/26)
Upper-Level Undergraduate Students	11.5 (3/26)

Table 3 – NASA-SURE Faculty Mentors by Gender, 1999-2000

Mentor Type	Percent - %
Male	53.8 (14/26)
Female	46.2 (12/26)

Challenges and New Initiatives for the SURE Program

There have been several challenges in maintaining the NASA-SURE program. The first of these challenges comes when SURE alumni who are sophomore pre-engineering students do not choose to complete their three-year commitments at their home

institutions and begin their engineering studies as transfer students. Two students who have started their early engineering studies are currently enrolled in engineering programs. Because of these developments, preferences were given to junior and senior pre-engineering students who had completed all commitments to their home institution for the 2000 NASA-SURE program. SURE students were also presented the option of continuing directly to a graduate engineering program after obtaining a B.S. in mathematics or science with full paid tuition, monthly stipends, and the option of graduate CO-OP opportunities.

Another challenge is the full participation of all partner schools. Currently three institutions have not sent participating students to the NASA-SURE program, Barton College, Clark Atlanta University and Morris Brown College. Possible reasons for this may have been caused by higher competition for eligible SURE students at these institutions. The existing engineering programs at Clark Atlanta University may also have caused some difficulties in recruiting SURE students from this institution. Another challenge to recruitment at these institutions is the lack of direct internet accessible information for mathematics and science faculty on their institutional web pages. Personal recruitment trips to these institutions will be carried out in order to attract student candidates for the 2001 SURE program. Other challenges include the recruitment of SURE alumni to M.S. and/or Ph.D. programs in engineering, science, mathematics and/or technology areas, the integration of more SURE activities into year-round research projects, and the production of technical publications from SURE projects.

Proposed new initiatives include the introduction of NASA-specific research/technology development areas to the program. These topics would possibly include a student design contest for microgravity shuttle/space station experiments related to the SURE projects, earth science awareness activities, and modern aerospace science and technology presentations. These NASA-related activities would be directly connected to existing NASA laboratories and connected NASA-sponsored internship programs. New workshop topics would include advanced professional development, resume/ mock interviews, pre-faculty preparation and new commercial opportunities in space science and technology.

Conclusions

The NASA Summer Undergraduate Research Experience (SURE) program was established in the College of Engineering at North Carolina A&T State University in 1998. The SURE program has trained under faculty/mentor guidance 23 pre-engineering student alumni out of approximately 110 applicants. Eight of the SURE alumni are currently enrolled at North Carolina A&T State University, the Georgia Institute of Technology and North Carolina State University. The NASA-SURE program is currently schedule to continue through 2003.

Acknowledgements

The authors would like to acknowledge the support of the NASA-PAIR and NASA-SURE Programs at North Carolina A&T State University by the NASA-MURED Office at NASA Headquarters, Washington, D.C.

Bibliography

- 1.) 21st Century Workforce Commission, “A Nation of Opportunity, Building America’s 21st Century Workforce”, Final Report, pp. 12-13, Washington, D.C. (2000)
- 2.) Department of Chemical Engineering, North Carolina A&T State University, “Annual Report”, Greensboro, NC (2000).