

# Assessment of the NC-LSAMP project: A longitudinal study

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## Abstract

The North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP) project is an ongoing project aimed to substantially increase the number of underrepresented minorities who will contribute significantly in science, technology, engineering and mathematics, engineering, and technology (STEM) areas, especially in graduate degree programs. The NCLSAMP includes eight UNC system partners (four minority institutions and four majority institutions) with North Carolina A&T State University, a Historically Black University, as the leading institution. As part of the assessment effort, a longitudinal study is being and will continue to be conducted at North Carolina A&T State University. Although this project is ongoing, it has the potential to significantly impact the retention and graduation rates of underrepresented STEM students.

## Introduction

Recent years, studies have indicated a significant shortage in minorities, and more specifically, African American work forces majoring in science and engineering<sup>1</sup>. Consequently, this may have serious impact on the nation's capability to compete economically with other industrialized countries<sup>2</sup>. Further, the shortage of minority doctorate students is even a bigger problem<sup>3</sup>. While African-Americans, Hispanic/Latinos, and American Indians comprise 23% of the US population, they make up only 4.5% of those holding scientific doctorates<sup>4</sup>. The National Science Foundation's Louis Stokes Alliances for Minority Participation (LSAMP) program was established to solve this problem. LSAMP is a comprehensive, multidisciplinary, undergraduate program designed to increase substantially the quantity and quality of students; especially African American, Hispanic, and Native American students; who successfully complete science, technology, engineering, and mathematics (STEM) baccalaureate degree programs, and increasing the number of students interested in, academically qualified for and matriculating into programs of graduate study<sup>5</sup>.

The North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP), funded by the National Science Foundation, formed a partnership between eight institutions (four minority schools and four majority schools) within the University of

North Carolina system. Partner institutions include North Carolina A&T State University as lead campus, Fayetteville State University, North Carolina Central University, North Carolina State University, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, University of North Carolina at Pembroke and Winston-Salem State University.

The primary goal of the NC-LSAMP project is to substantially increase the number of minority students earning B.S. degrees, and subsequently pursuing M.S. and Ph.D. degrees in science, technology, engineering, and mathematics (STEM) disciplines. The Alliance is achieving this goal by systematically enhancing recruitment, retention, access, and opportunities to education, internships, and research in these fields. So far, the combined efforts of partner institutions have resulted in a variety of programs and activities geared towards enhancing overall student success. Major initiatives include supplemental instruction, bridge programs, undergraduate research, and internships. In addition, an annual research conference sponsored by the Alliance showcases faculty-mentored research projects completed by students.

The lead institute, North Carolina Agricultural and Technical State University (NCA&T), was established in 1891 and is a public, comprehensive, land grant university committed to fulfilling its fundamental purposes through exemplary undergraduate and graduate instruction, scholarly and creative research, and effective public service. NCA&T is a Historically Black College and University (HBCU), located in Greensboro, North Carolina and enrolls over 10,000 students with about 89% of them being African Americans. It is the leading producer of African-American engineers in the nation. NCA&T a The university offers programs at the baccalaureate, masters and doctoral levels with emphasis on engineering, science, technology, business, education agriculture, and other academic areas. As one of North Carolina's three engineering colleges, the University offers Ph.D. programs in engineering. Basic and applied research is conducted by faculty in university centers of excellence, in inter-institutional relationships, and through significant involvement with several public and private agencies. The university also conducts major research through engineering, transportation, and its extension programs in agriculture.

### **Project Description**

Currently, the project is in phase III. During this phase, the program implementation continues its focus on nurturing and supporting students through their undergraduate studies in STEM curricula through the institutionalization of “best practices” learned during Phases I and II, and places new emphasis on the attainment of M.S. and Ph.D. degrees in these disciplines. Phase III priorities include expanded undergraduate laboratory research opportunities, community college recruitment and transfers, a school to college summer bridge program, science and mathematics teacher preparation for graduate students as well as preparation for graduate school through mentoring and peer group activities.

Together the Alliance institutions continue to play a significant role in producing minority research scientists and faculty to meet the needs of the country. The partners are committed to maintaining and strengthening this successful “alliance” by embracing institutions with unique and diverse strengths and resources.

NC-LSAMP Summer Bridge activities were conducted at six Alliance institutions, serving one hundred six (106) underrepresented minority students. These activities provided intensive course study with college credit being given to students in mathematics and calculus. Additionally, students were orientated to the college campus experience through faculty and student mentored activities including group rap sessions, extracurricular activities, and industry tours. NC-LSAMP funding provided Alliance institutions the opportunity to increase the number of participants and facilitated the successful recruitment of highly talented minority high school graduates.

NC-LSAMP students participated in Summer Research activities at Alliance institutions and national laboratories. North Carolina A&T State University, North Carolina State University and the University of North Carolina at Chapel Hill supported LSAMP and other STEM students for summer research on their campuses. Students participated in faculty-mentored research projects for six or eight weeks on each campus and prepared oral or poster presentations for the end of the program and at the annual NC-LSAMP Undergraduate Research Conference.

The North Carolina Louis Stokes Alliance was awarded the Bridge to the Doctorate supplemental grant to support graduate students in their pursuit of a Masters degree in a STEM field. North Carolina A&T State University has been designated as the lead institution for Cohort 1 of this project. Ten students have been awarded for 2003 through 2005.

### **Project Outcomes**

Total minority STEM enrollment has grown since the baseline year from 4,632 in fall 1994 to 6,230 students in fall 2000, reflecting an increase of approximately 35%. Since the baseline year, spring 1995, B.S. STEM degree production has been augmented for underrepresented minority students from 799 to a total of 1,034 in 2001.

For program year 2003, the number of bachelor degrees conferred to underrepresented minority STEM students increased from 841 to 916; Masters degrees increased from 162 to 177; and Ph.D. degrees increased. The collective total of STEM enrollment for underrepresented minority students increased from 5,588 to 5,858. The number of bachelor degrees conferred to underrepresented minority STEM students increased from 841 to 916; Masters degrees increased from 162 to 177; and Ph.D. degrees increased from 22 to 25. These figures illustrate that the NC-LSAMP program significantly enhances the recruitment, retention and subsequently the graduation rates of underrepresented minority students at Alliance institutions.

For program year 2003-2004, targeted programs, activities, and services as listed below continue to attempt to improve retention and graduation rates for underrepresented minority students in STEM disciplines across the Alliance.

- Supplemental Instruction and Tutorial Services in “gatekeeper”
- Mentoring
- Peer Study Groups
- Summer Research Programs
- Faculty Mentored Research
- Summer Bridge Programs
- Industry and National Research Laboratory Internship
- Career Advisement
- Stipend Awards
- Conferences and Seminars

In year 2003-2004, 80 undergraduate students and 12 graduate students participated in the NC-LSAMP project. There were 53 males and 39 females. Three of the students were Native American, whereas 89 of the students were African Americans. Figures 1 through 6 represent the student distribution based on gender, race, major, category, cohort and activities they were involved in.

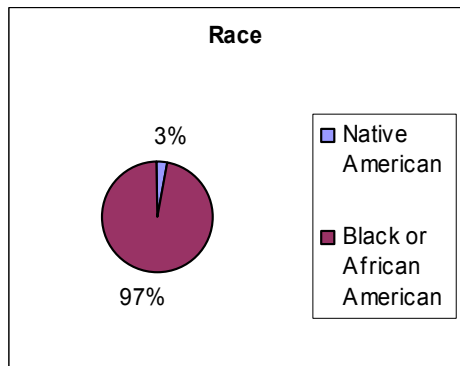


Figure 1. Student Distribution by Race

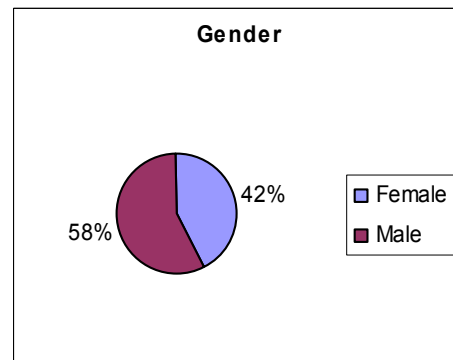


Figure 2. Student Distribution by Gender

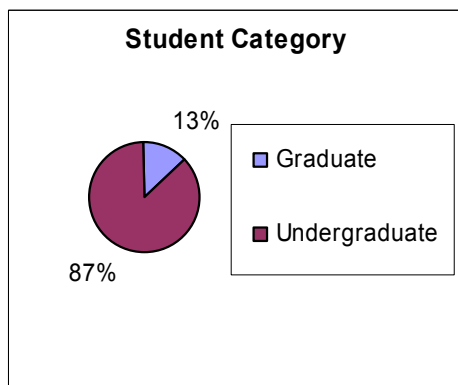


Figure 3. Student Distribution by category

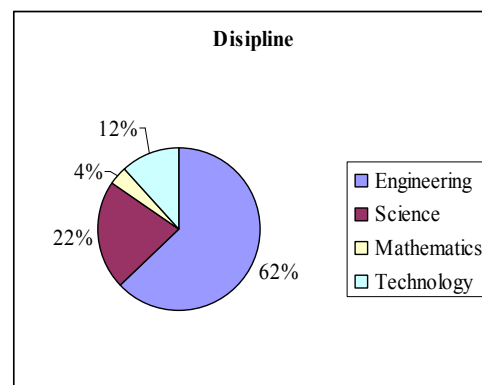


Figure 4: Student Distribution by STEM Discipline

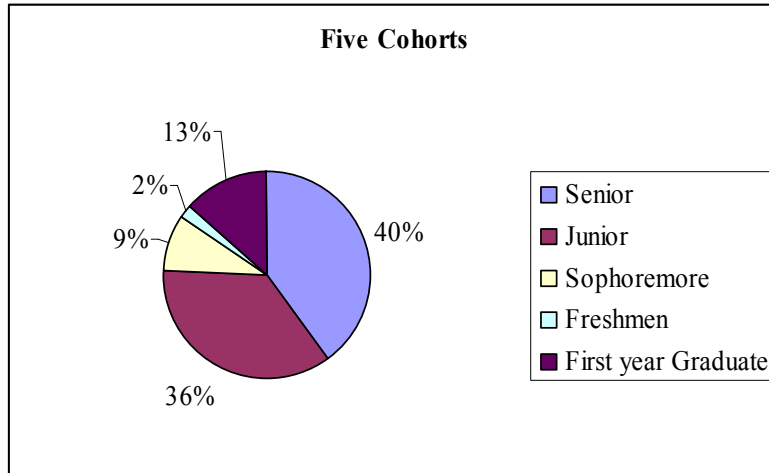


Figure 5. Student Distribution by Five Cohorts

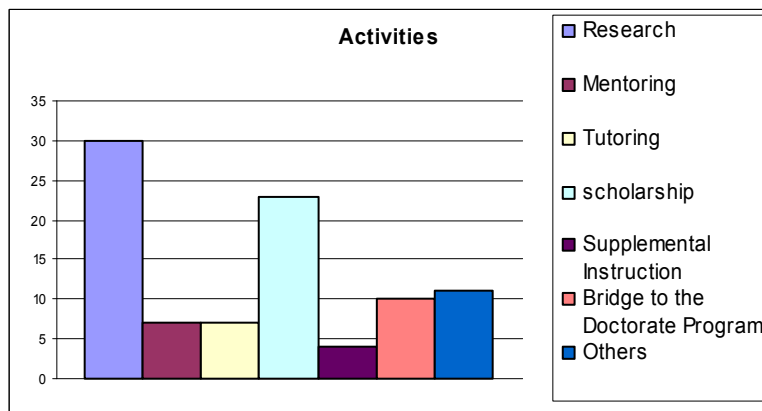


Figure 6. Student Distribution by NC-LSAMP Activities

## Project Assessment

As part of the assessment effort, a longitudinal study is being and will continue to be conducted at NCA&T. In this study, five separate cohorts will be tracked over a five-year period – Freshmen, Sophomore, Junior and Senior class undergraduate students and first year graduate students.

In order to track student performance, a database with 5 tables has been developed using Microsoft Access to help collect, store and analyze the longitudinal data in the future. Figure 7 shows the relationship among the five entities.

Demographic information such as age, gender, and race; and academic information such as SAT score, High school GPA as well as GPA for each semester of all students participating in the project has been entered to the database. Furthermore, for each year of participation, details of NC-LSAMP activities involved have also been recorded. Upon completion of the project, this database will provide required information and data for statistical analysis and assessment.

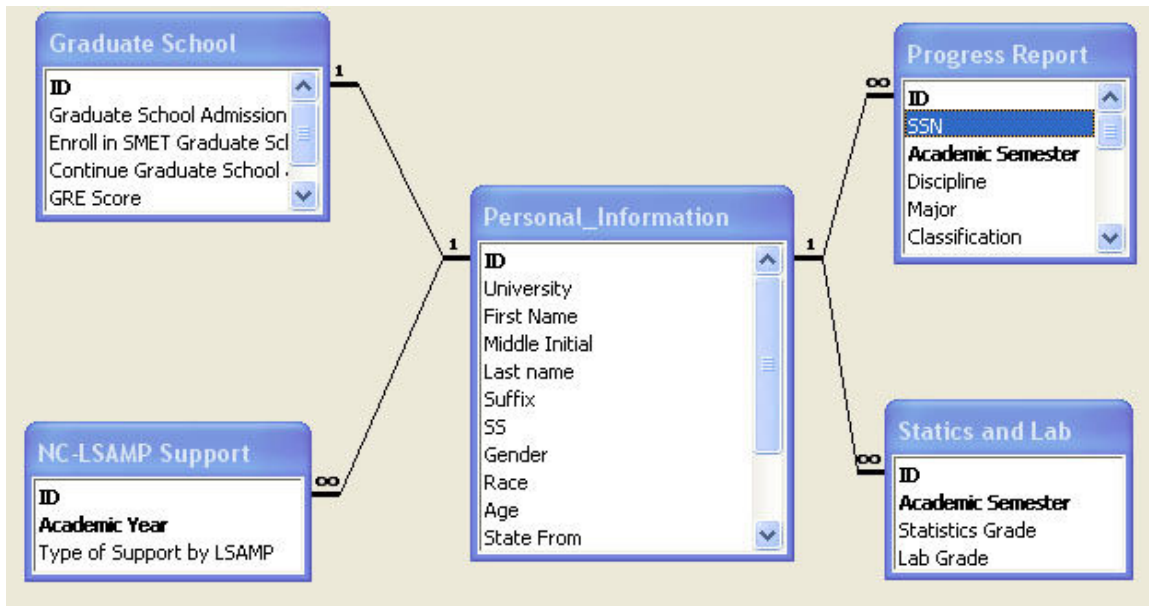


Figure 7. Entity-Relationship Diagram for the NC-LSAMP Database

In order to effectively evaluate the outcome of the NC-LSAMP project, a control group has being carefully chosen to match the experimental group which includes all minority students who receive direct services and/or support from the project and are enrolled in any STEM program. Demographic data similarities between the two groups will be established using the Fisher’s Exact Test while academic credentials similarities will be compared using the Wilcoxon rank-sum test. The following variables are being tracked for each student in each cohort:

- type of service received from Alliance activities
- number of course credits completed in each year
- persistence in their selected STEM curriculum
- course grades in gatekeeper courses
- overall college GPA.

In order to facilitate the assessment work, student background and performance data will also be stored in the database for the control group. Key factors will be identified for the assessment and evaluation.

The longitudinal data will be used to test the following hypotheses:

- whether students in the experimental group have a higher rate of successfully completing STEM undergraduate degrees in a timely manner and
- whether students in the experimental group have a higher rate at which they decide to enter and continue in graduate STEM programs.

## Conclusion

Although the NC-LSAMP project is still ongoing, it has the potential to significantly impact the retention and graduation rates of underrepresented STEM students. Furthermore, this project will have positive impact on the number of underrepresented STEM students who enroll in the graduate programs.

## Acknowledgement

We would like to acknowledge the National Science Foundation for supporting the NC-LSAMP project.

## References

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## Biographical Sketches

### Xiaochun Jiang

Xiaochun Jiang is an Assistant Professor in the Department of Industrial and Systems Engineering at North Carolina A&T State University. He received his Ph.D. in Industrial Engineering with a minor in experimental statistics from Clemson University in 2001. He is a member of ASEE, IIE and HFES.

### Sanjiv Sarin

Sanjiv Sarin is the Associate Dean of the College of Engineering at North Carolina A&T State University . He received a B.Tech. in Chemical Engineering from the Indian Institute of Technology, New Delhi and a Ph.D. in Industrial Engineering from the State University of New York at Buffalo. He is a member of ASEE and IIE, and is a registered Professional Engineer in North Carolina .

### Marcia Williams

Marcia Williams is the Coordinator of Sponsored Programs for the College of Engineering at North Carolina A&T State University and Statewide Coordinator for the NC Louis Stokes Alliance for Minority Participation (NC-LSAMP). She received a B.S. in Industrial Technology (Manufacturing) from North Carolina A&T State University, and a MBA from Wake Forest University. She has sixteen years of experience in sponsored program administration.

### Lee Young

Lee Young is the Vice chancellor of Academic Affairs at North Carolina A&T State University.