Louis Stokes Alliance for Minority Programs, Northeast LSAMP: Recruiting STEM Majors

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Introduction

The College of Engineering at URI joined with Northeastern University, WPI, UConn, and UMass-Amherst in a joint proposal to NSF to fund the Northeast Louis Stokes Alliance for Minority Programs. UMASS-Amherst is the lead institution. The proposal was funded for a five-year period beginning October 1, 2001 and then for a second five year period in 2006. The purpose of the project is to increase minority enrollment in the Science, Technology, Engineering and Mathematics (STEM) programs. There are two major tasks. These are activities that focus on both recruiting and retention.

The recruitment effort includes a five Saturday science and engineering project during the regular semesters and summer bridge projects, as well as a series of other activities. Undergraduate student mentors help, our laboratory technicians and the department chairs are essential to making these efforts successful. The URI student societies of Hispanic Professional Engineers (SHPE) and the National Society of Black Engineers (NSBE) have been invaluable in this recruitment program. The other major ingredient is to form partnerships with the schools. We partner with high schools and a middle school. Very helpful in these partnerships is the link to teachers and principals in these schools. These projects are academic and each lab has outcomes that we try to meet. About 100 students participate in these academies each year. This includes academies each semester and in the summer.

Recruitment of Students

The number of students is limited by laboratory size in the College of Engineering. About 25 students are chosen to participate and most of our labs can accommodate that number. Usually all the students are from one high school. There have been exceptions. The major limitation is the time on the bus. Picking students up at more than one school can add up to one half hour to the travel time. Up to five different schools have participated in one year. The focus of recruitment is the inner cities in Rhode Island. There are five identified demographically by the census. These include Providence, Central Falls, Pawtucket, Woonsocket, and Newport.

Criteria for Participation

The teacher or principal helps to screen and/or evaluate student participants by using some of the following conceptual questions include asking:

1. Are you interested in math and science?
2. Are you interested in understanding how math and science are a key part of being an STEM major.

3. Do you want to experience some of the fun of being in a lab and doing experiments?

Informally they also look for the better students in math ans science. The cooperation of some teachers and administrators is essential to these programs. They act as champions and advocates to encourage the students to consider going to college and choosing STEM majors.

We develop a brochure for the school of each individual academy. The brochure given to the students gives a brief discussion about the University of Rhode Island and the LSAMP program. Included is mention that these are hands-on laboratory sessions and that the University of Rhode Island has math, science, and engineering faculty and facilities, wants to help you to see just how exciting your future can be. These hands on sessions will show you how interesting science and engineering can be, while you explore the options in engineering and learn valuable tools for success. The brochure also includes the following: The University of Rhode Island's College of Engineering has eight undergraduate programs There are also mathematics and computer science programs as well as physical, chemical, and biological science programs at URI.

Description of Bridge Programs-Academy Programs
The Saturday projects are held all day starting at 9am and running until 3:30 pm. The LSAMP funds pay for the buses which pick the students up about 8 am and return them to their school grounds about 4:30 pm. The program also pays for the student lunches.

The following activities are included:

- Interactive workshops in different programs of engineering.
- Participate in real hands-on experimental activities.
- Interact with teachers and students from the University of Rhode Island.

Activities focus on hands on laboratory projects including commercial kits. For example the students assembled an AM radio in an electrical engineering laboratory, built a balsa wood bridge in a civil engineering laboratory and examined exothermic and endothermic reactions in our chemical engineering laboratory. In addition when data is taken in a laboratory experiment we use the computer lab to produce EXCEL spreadsheets and graphs. We also include a day trip to the Museum of Science in Boston, which included a show in the Omni Theater or a trip to the Harvard Peabody Museum. Note that the Academy programs are academic.

The specific projects vary from one Bridge program to another. For example for the major disassembly project worked with lawn mower engines one semester (donated by faculty and staff) and with used ink jet printers another semester (donated by a computer store). In both cases the introductory lecture varied. One lecture described the parts of a gasoline engine and how it worked. The other lecture described the parts of an ink jet printer and how an ink jet printer works. During the construction of an electronic circuit, one semester the students built a voice changer and during another semester the students built a wheel of fortune. These were both kits ordered from an electronics catalog. In both cases the electric

components were discussed and identified. Soldering was introduced before assembly of the device and safety of using a hot soldering iron was discussed. College undergraduate mentors were prepped earlier on how to solder and to guide the assembly.

Other presentations worked into the schedule include brief descriptions of each STEM major. The Admissions Office cooperates by making a presentation of the admission process and requirements.

Student Success

The students invariably show some important traits. Motivation is very high. They are eager to learn the material and pay attention to both the lectures and instructions for the laboratory exercises. They also are eager to be successful in accomplishing the specific objectives of the experiments. Enthusiasm lasts from the first period on Monday to the last period on Friday. The following two pictures depict some hands-on activities of an LSAMP Academy.

Figure 1. Preparing the trebuchet for shooting.

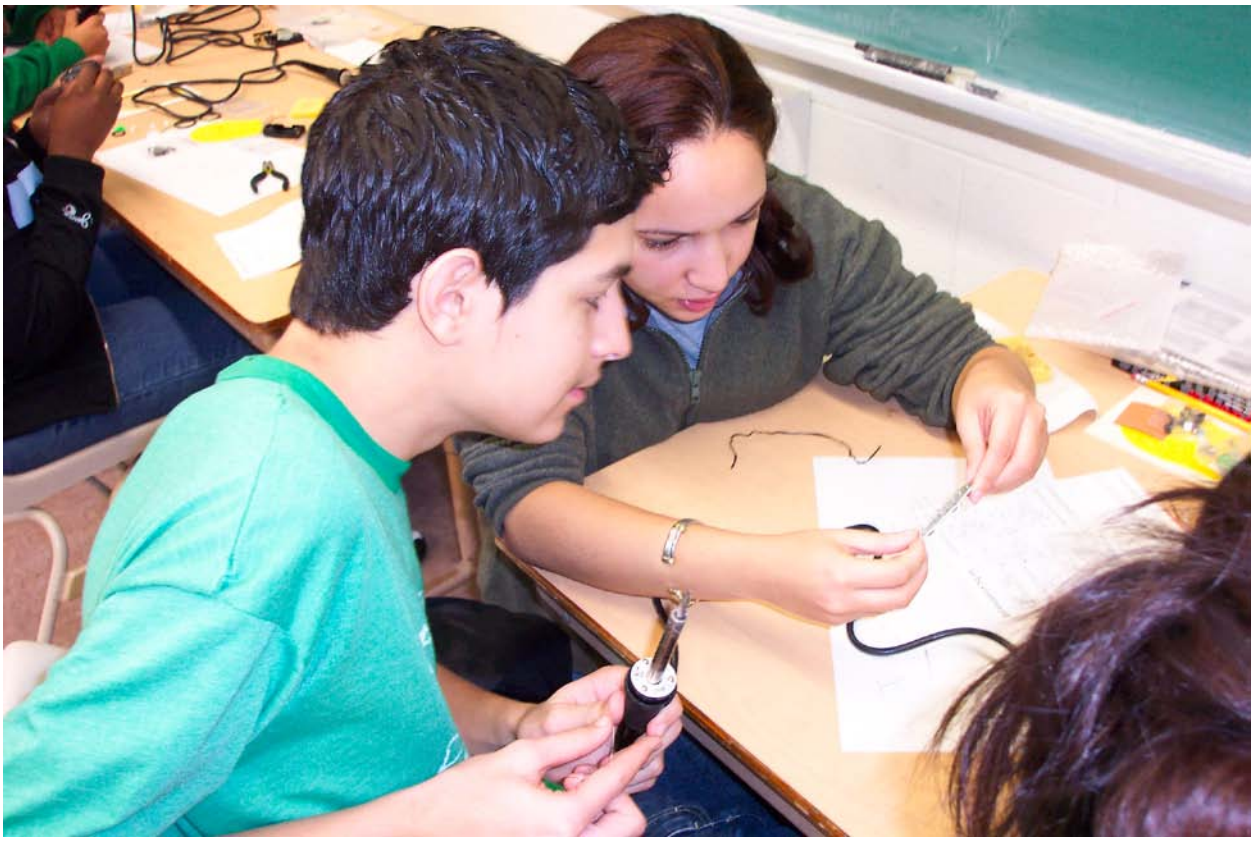

Figure 2. Two LSAMP high school students preparing to construct an electronic kit.

Detailed Schedule of the Saturday Bridge Academy
The following is a detailed schedule of a week-long Bridge Academy:

Bridge Program Details
Saturday ACTIVITIES
LUNCH in student union
ARRIVE 9 AM *Leave* 3:30 PM

Session 1: May 15, 2010

- Snack
- Major Disassembly Project
- How does it work
- Surface Tension of Water
- Chemical Polymers/Plastics
- Make Boroslime

Session 2: May 22, 2010

- Snack
- What is Engineering?
- What is Design?
- What is Solar energy?
- Solar Power
- Solar Energy Application
- Clean Water
- Water Testing

Session 3: May 29, 2010

- Snack
- What is Science?
- Forces and Weights
- Pressure and Friction
- Pulley experiments
- Rotational Speed and Linear Velocity
- Stroboscope and Velocimeter
- EXCEL Graphing

Session 4: June 5, 2010

- Snack
- Electrical Circuits
- Use of a Multi-meter
- Construct Electronic Circuit
- What is Color and what is Light
- Absorption, Reflection, Transmission
- Chemical Reactions
- Chemical Reaction Experiments
- Certificates

Session 5: June 10, 2010

- Harvard Labs and Museum Natural History
  Cambridge, MA
- Lunch

PowerPoint Presentations

Nearly all the presentations are given using PowerPoint slides. The activities in the labs are written up in laboratory report style.

Conclusions

We have found these academic projects to be very helpful in recruiting students to our URI STEM programs. Our minority enrollment of students in the College of Engineering has increased from about 3 % eight years ago to 9.4 % this year. Also total minority enrollment

has more than doubled at the University. By working with the same school over a three year period the applications in the three years was none, then four and then 19. Admission during these same three years went from zero to four to thirteen. Another major result was the hiring of a full time counselor at the University to help counsel undergraduate minority students.

Forming high school and junior high school partnerships can lead to success because of the focus that can be made on the school, including students, teachers and principal. It can also lead to writing follow on grants and help to emphasize mathematics and science and their importance to the engineering curriculum.

Credits

National Science Foundation, Louis Stokes Alliance for Minority Programs.
University of Rhode Island President's Office
University of Rhode Island College of Engineering
University of Rhode Island Admissions Office

Comments

To obtain a typical program and /or powerpoint presentations of the academies and/or a laboratory assignment send a request by Email to Knickle@egr.uri.edu.

References

www.NSF.gov
www.NSBE.org
www.SHPE.org

Biography

The author has taught at the University of Rhode Island for more than 40 years. During that time he has taught more than 40 different undergraduate and graduate courses. Recently he has introduced three nuclear engineering courses and is developing a minor in Nuclear Engineering at the undergraduate level with Dr. Nassersharif. His current research areas include fuel cells and clean water. Other research areas over the years have included fish protein concentrate and coal liquefaction. He served his community be being a school board member for 16 years in the City of Warwick. He served the University of Rhode Island by being Associate Dean of Engineering for a number of years. He has served as a member of the National Board of ASEE representing the New England Section and has been Chair, Secretary Treasurer, and Treasurer of the New England Section. He will be looking for a job starting in July 2011.