



Reaching Out in the Name of Science

It's called *lagniappe*—something given or obtained gratuitously or by way of good measure.

In the case of the 11 high school students attending a six-week summer science camp, it was *Lagniappe* with a capital L: They expected to learn more about science. They didn't expect it to result in life changing decisions, most especially for three of the 11.

All were enrolled in the *Summer Experience for High School Students (SEHS)*, one of seven 2006 summer workshops focusing on the science, technology, engineering or mathematics (STEM) disciplines offered by the Education and Outreach program of the Center for BioModular Multi-Scale Systems (CBM²).

All had above average grades in math and science; their average sophomore/early junior year ACT score was 26. The majority had completed most graduation requirements and had the opportunity to advance their standing or placement in a college by scheduling advanced math and science courses. Instead, several planned to take jobs in their senior year and three didn't plan to go to college.

But that was before they attended SEHS, a pilot program specifically designed to address the attitudes and objectives of those students and the many others like them.

During the SEHS program, the students were required to work on a STEM focused research project for a minimum of five weeks, to

CBM² is the centerpiece of a 2004 \$9 million National Science Foundation (NSF) EPSCoR grant that was matched by \$3 million from the Board of Regents Support Fund and \$1.5 million from the participating institutions.

CBM² includes researchers with expertise in microsystems, engineering, materials, chemistry and biological systems at Louisiana State University and A&M, LSU's Center for Advanced Microstructures and Devices, LSU Health Sciences Center in New Orleans, Tulane Health Sciences Center, and Xavier University in New Orleans.

serve as mentors and camp counselors for CBM²'s summer camps for elementary students and to attend various teamwork and leadership skills training courses.

After SEHS, follow-up surveys disclosed that all of the students had signed up for additional science and math courses. Several were actively involved in mentoring junior high students and had recommended students to the CBM² program. Two are attending college and plan to major in STEM disciplines; eight have been admitted to a university—three have pre-selected engineering as their major, another three, chemistry, and one, biology. Yet another plans to attend college after his military training.

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Of Bells & Music & Widget Works

Move over "Trivia Pursuit." Make room on the shelf, "Mouse Trap" and "Monopoly."

"Widget Works," a game that teaches science basics to elementary students has proven such a hit that it just may be included in future wish lists of children throughout the nation.

It all began in 2005 with a search for a project LSU sophomore mechanical engineering design students could develop for CBM²'s *Summer Science Adventures Camps* for children ages 5-8 and 9-11.

The result was "Widget Works," a "kind of a mix of 'Mouse Trap,' 'Trivial Pursuit' and 'Monopoly,' that has building two 'factories' as its goal," says CBM² Education and Outreach Coordinator Ms. Summer Dann-Johnson.

"Teams of two to four students move around the board by answering basic science questions to earn money. Once they win enough, they buy factory mechanical components, such as gears, pulleys, and inclined planes, that they place in colorful pre-determined sections of their clear plastic stand-up factories.

"Once a team's factory is half finished, a bell rings. When the first is completed, a ball runs through the factory and sets off music."

Six engineering design students took on the assignment as part of an independent study course. They, along with a senior graphics design team, designed the game, developed three prototypes, employed the assistance of elementary school teachers to categorized questions, and tested it at a local elementary science class and CBM² summer programs.



Elementary students playing Widget Works at a CBM² Summer Science Adventures Camp.

"Widget Works" made its formal debut in October 2006 at the 5th Annual American Society of Engineering Educators Global Colloquium in Rio de Janeiro. Based on its reception from colloquium attendees and elementary students, the engineering students and their mentors are discussing the possibility of its mass production with LSU Business School and Entrepreneurship Institute representatives.

"Widget Works" meets the Grade Level Expectations for third and fourth grade science students. And, exclaims Ms. Dann Johnson, "kids love it."

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Explaining the basis for the pilot program, CBM² Education and Outreach Coordinator Summer Dann-Johnson says: “Our surveys and conversations with students revealed that many have unrealistic expectations of and/or little understanding of college academic requirements, and naïve knowledge about available career opportunities in science, technology, engineering and mathematics.

“They have also had little or no exposure to a college environment. This is especially true for students from rural areas, many of whom have not been exposed to a broad range of experiences and locations outside of their immediate regions.”

Noting that the need for scientists and engineers is increasing even as the number of students completing traditional science degrees is decreasing, Ms. Dann-Johnson, points out that, according to NSF, from 1980 to 2000 science and engineering jobs increased by 40 percent,” she adds. “Currently, the gap between college graduates and the job market is being filled by international students.”

The other 2006 CBM² summer camps and their accomplishments in addressing that gap follow.

Four one-week ***Summer Science Adventure Camps***, two each for ages 5–8 and 9–11, with three for girls only and one for boys and girls. Hands-on activities made science interesting and fun, an encouragement to take science and math in higher grades and consider science careers. Students conducted experiments, investigated butterflies and materials with a microscope, built robots and went on field trips.

The elementary-age girls increased their knowledge more than any other workshop group and over 75 percent indicated that they want to attend next year. One wrote that her parents made her attend the camp, but “now I love it and want to come back.”

The ***Chemical Concepts and Connection Workshop***, a two-week continuing education workshop for teachers who recommended a high school student to attend the second week. The workshop modeled a hands-on, discovery-first, learning cycle method of teaching that can be transferred to the classroom.

The ***Recruit into Engineering High Ability Minority Students***, an academic enrichment program to prepare high school students with an ACT score above 21 or a B average or higher in their science courses for the challenges of university life. It has been offered for eight years through LSU’s Minority Engineering Program.

Thirty-five high school students participated in this year’s program. The students, who were housed on the LSU campus for three weeks,

CBM² Major Partners

Without the support of its partners, CBM²’s Education and Outreach partners, the program would not have achieved the success that it has in such a short period of time, says E&O Coordinator Ms. Summer Dann-Johnson.

The major partners include the Audubon Council of Girl Scouts, St. Margaret’s Episcopal Church, ExxonMobil, Howard Hughes Medical Institute, Louisiana Tech University’s Center For Applied Teaching and Learning to Yield Scientific Thinking (CATALyST); the NSF-funded, LSU-housed Minority Engineering and Recruit into Engineering High Ability Minority Students Minority Engineering programs, the LSU Centers for Excellence in Learning and Teaching, LSU Cain Center, LSU Health Sciences Centers at New Orleans, the LSU Colleges of Engineering, Basic Sciences, Arts and Sciences; and the LSU Student American Chemical Society Section, Departments of Chemistry and Mechanical Engineering.

attended courses in physics, calculus and chemistry, toured labs and visited NASA in Houston. The average pre- and post-test scores increased from 36 percent, Louisiana’s average National Engineering Assessment Survey performance, to 57 percent.

CBM² faculty and staff also participated in a number of activities and events sponsored by its partners that are geared towards K-12 students and the general public. One of the biggest was “Super Science Saturday,” sponsored by the LSU Chemistry Department, which attracted over 1,000 children and their families.

“As one who experiences the exhilaration and challenges of a scientific career on a daily basis, it is especially fulfilling for me to see the exciting positive results that our education and outreach program has produced in affecting change in the perception of STEM,” says Dr. Steve Soper, CBM² Director and LSU William L. and Patricia Senn Jr. Professor of Chemistry.

“Albert Einstein once said that ‘to raise new questions, new possibilities, to regard old problems from a new angle requires creative imagination and marks real advances in science.’

“I think that’s what we are accomplishing with our education and outreach program: raising new questions and new possibilities for students and teachers and regarding what has become the old problem of fewer students taking STEM courses with angles that are new and creative to students and teachers.”



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