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## Not Your Mama's Science Class

### Cool lessons in hot science delivered by new education symposium

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Back when boomers were driving Pinto hatchbacks to Friday night football games and rocking out to Led Zeppelin on the eight-track, it wasn't cool to like science and math. If you loved physics and others got wind of it, you could suffer for your passion.

Fast forward through the Reagan years and grunge '90s to here and now, and you can actually overhear kids using the words "fun" and "science" in the same sentence.

It could be that building a social life around a Sidekick, iPod and Wii console has triggered a more intuitive understanding of sciences and math. Maybe it's as fundamental as students understanding that many high-salary jobs require specific skills that you learn in geometry or physics, and career success is a good motivator.

One thing's certain—at least part of the evolution in attitude is due to excited, well-trained teachers using new instructional techniques that pull students in and get them excited, too.

At The University of Texas at Austin, the **College of Education's** Center for Science and Mathematics Education is a leader in showing science and math teachers how to prepare a competitive future workforce that also finds science and technology "really awesome!"

For the past 12 years, the center's **Texas Regional Collaboratives for Excellence in Science and Mathematics Teaching** (TRC) program has been building and expanding a powerful statewide network of partnerships between schools, businesses, communities, universities and policy-makers to give teachers and students the tools necessary for success.

"We've constructed a very strong infrastructure," says Dr. Kamil A. Jbeily, founder and executive director of the TRC, "which spans from the Valley to the Panhandle and from the Pineywoods to El Paso. Collaboratives participants are in every one of the 254 Texas counties, and the TRC has provided professional development training to more than 14,000 science teachers and 8,500 math teachers. These teachers have positively affected the learning outcomes of more than one million youth.

"When we offer training to science and math teachers," Jbeily said, "we're not only building their skills but also reaching many additional instructors because these teachers who have attended training are going to return to their districts and share the most current techniques and scholarship with colleagues. Their talents are being leveraged for the maximum good, and it's a very efficient use of finite resources."

This May the center added a new component to its highly successful program, launching the Symposium for Young Scholars in Technology, Engineering, Mathematics and Science (SYSTEMS) for Texas students. First- through 10th-graders in San Angelo Independent School District's (ISD) Gifted and Talented Program were invited to The University of Texas at Austin campus for a day of interactive, discovery-oriented, age-appropriate lessons and activities led by graduate students in science and mathematics education and TRC staff members. Including the San Angelo teachers and administrators, about 150 guests attended the new event.



San Angelo ISD students in the Gifted and Talented Program participated in the first-ever Symposium for Young Scholars in Technology, Engineering, Mathematics and Science. The event was hosted by the Center for Science and Mathematics Education.

"In San Angelo ISD, we have a rigorous, highly competitive program called the Texas Research Institute for Young Scholars (TRIYS)," said Dr. Carol Ann Bonds, San Angelo ISD superintendent. "The goal of TRIYS is to encourage students to develop critical thinking, communication and research skills. Students of all ages work in teams of two to four to conduct high-level scientific research and solve real-world problems, with this year's research theme being the global water crisis.

"The students must work with expert mentors on their projects and present the research in front of a panel of university professors. This year we had 23 student winners who went on to present their research at an international conference at the American

Museum of Natural History in New York City. There were about 1,500 students from around the world in attendance, and the entire conference was designed and presented by youth. The top 134 students from San Angelo who conducted research and received passing scores at the conference were invited to attend the SYSTEMS symposium sponsored by the Center for Science and Mathematics Education."

Symposium sessions open to the precocious future engineers and software developers included a crash course in podcasting for seventh- through 10th-graders that was taught by Dr. Keith Mitchell, TRC coordinator for technology initiatives.



From left to right, Dr. Kamil A. Jbeily, Dr. Carol Ann Bonds and Dr. James P. Barufaldi.

Students learned about podcast formats, how to search for science and math podcasts, use the application iTunes to establish a subscription for free podcasts and access podcasts on a computer or portable device. After learning the "how," students were able to apply their knowledge and create a science podcast of their own that incorporated music, sound effects and interviews

with "audience" volunteers.

To encourage further learning and experimentation with technology, each student who attended the session received an iPod Shuffle loaded with more than 100 science and math podcasts. Mitchell, following the TRC tradition of serving teachers at the local level, arranged to visit San Angelo ISD and provide professional development training in podcast authoring for the teachers.

"When students figure out how to use an information aggregator like an iPod, for example," said Mitchell, "they become more self-sufficient learners. They can easily create material for others to watch and listen to and can access an infinite amount of educational information on their own—this is something that will aid them in school and on into their careers as well."

Sixth-graders were treated to a lesson in CSI-style forensic science that included advanced fingerprint analysis and the trying of a criminal case for which students presented evidence to a jury. The young scientists got into character by donning white lab jackets and working in investigative groups to identify 10-15 points of interest per fingerprint for 10 suspects' profiles. Instructors Amy Moreland and Brian Fortney, who are TRC science education graduate assistants, also introduced them to forensic techniques such as fiber analysis, food analysis, ballistics, handwriting analysis, microscopy and chromatography.

A lesson titled "Habitat, Habitat, Gotta Have a Habitat!" took 40 fifth-graders outdoors onto the grassy, shaded hill in front of the university's Sanchez Building for an energetic simulation of wildlife responses to environmental factors.

Some students assumed the role of deer while others represented various habitat features that influence the deer population. As the instructors described environmental changes, such as increased traffic or the encroachment of predators, students physically acted out the scenarios. They discovered that a given amount of land has a certain carrying capacity for a species, and natural and manmade limiting factors—such as housing, traffic and predators—affect the rise and decline of that species' population. The activity, led by TRC professional development coordinator Marsha Willis and graduate assistant Linda Brown, demonstrated to students that everything in an ecosystem is interrelated and elements of the environment continuously affect populations.



Regarding technology,  
the bar is being raised  
by the students themselves.  
They're digital natives and  
when it comes to technology  
and science, they're feeling  
more and more at home.



— Dr. Keith Mitchell  
TRC coordinator for technology initiatives

Glass," led by TRC science education student assistant Deanna Buckley. First- through third-graders tapped into higher level thinking skills to examine a scientific mystery, generate questions about the nature of light, examine variables that could affect experiment outcomes, make predictions and test their theories. Working in teams, students used water-filled glass test tubes, Jell-O, a laser level, newspaper, water and clear plastic wrap to answer scientific queries about light refraction phenomena.

"These students are very young,"



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— Rachel Glassford  
Fifth-grader at San Angelo ISD

"I've kind of always liked science because it's all about solving mysteries," said Rachel Glassford, a fifth-grader who participated in the habitat activity, "and, in a lot of cases, it's about analyzing people and the human brain. I plan to be a crypto-zoologist when I grow up and whatever career you go into, it really helps to have learned plenty math and science."

Dr. Debra Junk, TRC coordinator for mathematics initiatives, and Dr. Carol Fletcher, TRC assistant director/research and development coordinator, led fourth-graders through a lively, hands-on geometry exercise called "Crazy Shapes." Students moved through four workstations solving challenging three-dimensional polyhedron and polygon puzzles and, as a takeaway, received packets of toothpick puzzles and a Rubik's Cube Jr. to continue honing their problem-solving skills at home.

The youngest symposium attendees successfully tackled a complex lesson titled "Through the Looking



Seventh- through 10th-graders in the podcast authoring class were given an iPod Shuffle loaded with more than 100 science and math podcasts.

said Buckley, "yet they have the ability to reason logically when they're given an opportunity to observe physical characteristics and systematically eliminate non-contributing variables. Each query in our lesson sequence built on what the students learned in a previous part of the series, and they were able to execute complex tasks in the end that might at first have seemed beyond their capabilities.

"Making students active participants, having them discover the answers to questions they generate, demonstrating the real-world relevance of the material and giving them exciting challenges make all the difference. If we can get children interested in science and math at this early stage and successfully introduce concepts like light refraction, just think what they will be able to do in high school and beyond. And they actually will have fun doing it!"

In addition to receiving lesson-related items to take home, all students who participated in the symposium also were given Longhorn embossed T-shirts and caps to commemorate the event.

"One reason that San Angelo was a very good choice for this initial symposium offering," said Dr. James P. Barufaldi, Ruben E. Hinojosa Regents Professor in Education and center director, "is because Dr. Bonds, the San Angelo ISD superintendent, is such a visionary. She's realized the critical importance of getting students interested in science and math, facilitating their academic success in these areas and keeping them focused on ways they can use this knowledge for the rest of their lives—preferably in careers like engineering and high tech.

"In inviting these students to the UT campus, we hope to get them excited about science, math and technology and also, perhaps, recruit future Longhorns. Thanks to education leaders like Dr. Bonds who

ambitiously push the boundaries, these students see the world as their 'learning village.'"

The Center for Science and Mathematics Education is a research, service and teaching unit in the College of Education's Department of Curriculum and Instruction. The center's primary goal is to design and implement activities that enhance preschool through college teaching and learning of science and mathematics. The center's activities are data-driven and informed by state, national and international research, including research done at the center itself.

The award-winning Texas Regional Collaboratives program, which is the cornerstone of the center, has received about \$45 million in funding from state, federal and corporate sources. Generous supporters include the Texas Education Agency (TEA), Shell Oil Company, AT&T Foundation, El Paso Corporation, Toyota USA Foundation, the Cynthia and George Mitchell Foundation and the National Science Foundation.

"TEA's significant investment in the TRC coupled with the substantial contributions of corporate and foundation partners," said Jbeily, "have generated a powerful synergy of people and organizations working together to improve science, technology, engineering, and mathematics (STEM) education in Texas and beyond."

Praise for the TRC is abundant, and commendations from the U.S. Department of Education, policy makers, state legislators and business partners only reinforce the message that the TRC's strategies are working. In 2000, the TRC was inducted into the Texas Science Hall of Fame and in 2001 was recognized by the Texas governor, Senate and House of Representatives for distinguished achievements and contributions in the support of education reform.

In 2006, a landmark \$1 million gift from Shell Oil Company allowed the TRC to expand its efficient, dynamic collaborative concept to Louisiana. Partnerships based on the Texas model formed there and now offer enhanced professional development training for Louisiana science teachers.

"The center and the TRC offer cutting-edge, research-driven training to science and math teachers and work very hard to build support for this enterprise," said Barufaldi, "but all of that is behind the scenes from the student's perspective. What the student sees and learns is that science is everywhere, that you're living science when you're running and kicking a ball, eating, riding a bicycle or turning on a light.

"If someone doesn't believe there are children who think that science and math are stimulating, they should attend next year's SYSTEMS symposium and discover what learning looks like these days. These are not your parents' science classes!"



Sixth-graders learned CSI-style forensics techniques like advanced fingerprint analysis and chromatography.



"If we can get students interested in science and math at this early stage ... just think what they will be able to do in high school and beyond. And they actually will have fun doing it!" —Deanna Buckley, TRC science education student assistant