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### Tarheel of the Week

## Duke professor perfects science of giving

By JONATHAN GOLDSTEIN; STAFF WRITER

Gary Ybarra had no idea where he would find \$9,600 to buy the 64 computers about to become part of a fire sale in Cary, but he knew he had to get his hands on those machines.

He couldn't bear the thought of some other business snapping up the IBMs that a closing high-tech firm was planning to unload, especially with so many Triangle schools desperate to improve their technology. So Ybarra, a Duke University professor and administrator, persuaded the company to give him dibs on the \$150 computers and decided he would figure out how to pay for them later.

"It was just too good to pass up," recalls Ybarra, who donated the computers to six elementary schools this past winter and eventually won a grant to cover the cost. "I was planning to take out a home equity loan if I had to."

Ybarra's friends and colleagues say that story perfectly illustrates his efforts over the past decade to share his love of science and engineering with children as well as college students. It also reveals how far Ybarra (pronounced Why-bear-uh) is willing to go for teachers and kids.

"He just has this passion for what he does," says Kristina Johnson, dean of Duke's Pratt School of Engineering, where Ybarra is director of undergraduate studies for the department of electrical and computer engineering. "To me, he's like the Coach Krzyzewski of engineering."

For years, Ybarra worked informally with Triangle teachers to help introduce children to the scientific concepts that underlie engineering and much of modern society. He fired low-power laser beams across classrooms to explain the properties of light, showed students how to build simple switches so they would understand electricity, and described how gravity keeps our feet on the ground and our planet in orbit.

Now, Ybarra can't help but smile as he describes his time in Triangle classrooms. After a few minutes of talking, he is on his feet, pulling a small laser from his desk and re-creating a lesson he once taught.

Hands moving in sweeping motions, he explains how various lenses can scatter or focus a beam of light.

When teaching, whether in front of a class or a single person, Ybarra is clearly in his element. He has learned, to his great satisfaction, that his enthusiasm is more contagious than the flu.

"Generating this passion for learning is the focus of all my programs," he says.

About three years ago, Ybarra learned of a National Science Foundation program that would help him expand his audience to thousands of children per year. He grabbed the opportunity.

In 1999, with a \$340,000 NSF grant and help from others at Duke and N.C. State University, Ybarra created an "engineering teaching fellows" program that sends college students into elementary and middle schools in and around the Triangle to augment science lessons. This year, the program involves more than two dozen graduate and undergraduate engineering students from Duke and N.C. State who work with about 4,000 children in nine schools.

Kids in the program build bridges out of gumdrops and toothpicks, design and operate marshmallow-firing catapults, and attach tiny harnesses to beetles to see how much weight the insects can pull. All of it helps them understand the forces that make things work.

Children in some of those classes say they have never learned so much about science - or enjoyed it so much.

"I've always loved science, but this has helped me to love it a whole bunch more," says Jack Wheless, a fifth-grader at Raleigh's Washington Elementary School. "Pretty soon, we're going to be making terrariums and aquariums out of Coke bottles."

Encouraged by success in the program's first two years, Ybarra plans to ask NSF for a \$1 million renewal of the grant next year.

He also recently won a \$167,500 grant from the Burroughs Wellcome Fund to start an after-school science and engineering program at Durham's Rogers-Herr Middle School. That too will involve Duke engineering students helping children explore science.

Despite his grounding in the serious work of engineering, where millimeters matter, Ybarra admits he is not so different from many of the children he teaches.

His office is full of ceramic bunnies, plastic fighter planes and tiny toy dinosaurs. He builds and launches model rockets at the 10-acre spread in Efland he shares with his wife, Nancy. And his personal World Wide Web page is full of goofy, close-up photos of his beloved dogs - he has three - as well as seals, a rhino and some of the other animals he photographed at the state zoo in Asheboro.

"I'm still a kid," he says, smiling. "I'll always be a kid."

As a kid - admittedly a 40-year-old kid with a slightly receding hairline - Ybarra knows how lame science can be with a dull teacher. He also learned early on how fun it can be with a great teacher.

One of the most influential teachers in Ybarra's past was Alton Bethea, a fun-loving, elderly physics teacher at Pinecrest High School in Southern Pines. Through hands-on experiments that kept his students moving, Bethea proved to a 16-year-old Ybarra in 1977 that physics and other sciences can be fascinating and thoroughly understandable.

Ybarra remembers students shooting plastic darts at a falling ball in Bethea's class as the teacher demonstrated how gravity makes objects fall at the same rate. Years later, Ybarra came to understand the value of those lessons, which were reinforced by Donald Rhodes, one of his professors at N.C. State.

"I realized that most kids haven't been introduced to science in a way that makes it fun to learn," Ybarra says. "I want to be a part of future generations who find a love of learning and especially of science and engineering."

And every time he sees a kid grasp a scientific concept, Ybarra knows he has passed on the same gift of understanding that an old physics teacher gave him 24 years ago.

"There's a certain feeling of satisfaction when you have a moment of discovery," he says. "That's precisely the feeling that I want kids to have."

#### PROFILE: GARY ALAN YBARRA

Born: May 13, 1960, in Hampton, Va.

Raised: Sacramento, Calif.

Family: Wife, Nancy Catherine Shaw.

Education: Bachelor's in electrical engineering, N.C. State University, 1982; master's in electrical engineering, NCSU, 1986; Ph.D. in electrical engineering, NCSU, 1992.

Employment: Director of undergraduate studies and associate professor of the practice of electrical and computer engineering, department of electrical and computer engineering, Duke University, 2000 to present; assistant research professor in electrical and computer engineering, Duke University, 1993 to 1999; instructor and research assistant in the department of electrical and computer engineering, NCSU, 1983 to 1992.

Honors: Named NCSU electrical and computer engineering department outstanding teacher, 1987; won DuPont teaching fellowship in engineering, 1991.

Pets: Samantha and Max, both black lab mixes, and Sherlock, a red hound.

Quote: "The way we interest people in science is to make them realize that it's in everything we do."