

# UTEP remakes engineering

By Robert Gray El Paso Inc. staff writer | Posted: Monday, January 4, 2016 12:00 am

You could say that engineering is in Miguel Fraga's blood.

"All of the males in my family are engineers," says Fraga, who remembers fondly how his dad and uncles would bandy about engineering problems at home when he was growing up.

So by the time Fraga was a freshman at Hanks High School, he knew what he wanted to be. But what Fraga is studying now as an engineering student at the University of Texas at El Paso is very different from what his uncles and dad studied.

Fraga has been part of an experiment at UTEP's College of Engineering where engineers have turned their problem solving skills on something new: engineering education.

When the 20-year-old graduates from UTEP, he and his classmates will likely be the first in the country with bachelor's degrees in engineering leadership, a new degree program approved this fall.

Most engineering schools stress technical skills, teaching subjects like calculus and physics, and produce students prepared to go into specific fields, such as mechanical, civil or industrial engineering.

But the creators of UTEP's new engineering leadership degree program, E-Lead for short, are trying to produce a new kind of renaissance engineer – one also skilled in business, entrepreneurship, leadership and teamwork.

UTEP has launched the degree at a time when national educational programs and funding are focused on increasing participation in STEM fields – science, technology, engineering and math – a response in part to concerns that the U.S. is losing ground internationally.

But nationwide, half of those with engineering degrees aren't working in STEM occupations, according to a U.S. Census Bureau report from 2014. Instead, they have veered into other fields such as business, education and sales.



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Students in UTEP's E-Lead program work on a problem. From left, senior Aaron Pacheco, junior Dante Chaparro, junior Yazmin Montoya and senior Isaiah Webb.

“The new world order is having individuals who can cross boundaries, and the traditional engineering model has been, ‘I’m going to make you a technical expert,’” says Roger Gonzalez, Ph.D., director of the E-Lead program. “We will still need those traditional engineers, but we also need engineers that can cross boundaries.”

Gonzalez can describe in intricate detail how the engines in a stealth bomber work, as well as the proper way to load your dishwasher. There really is one.

Before going into academia, Gonzalez worked for General Electric where he helped design components for engines used in stealth bombers and, later, worked in research and development for the company’s appliance division.

Gonzalez, who grew up in El Paso, is also the founder of Limbs International.

The global non-profit headquartered here has developed an ultra-low-cost prosthesis that it distributes to the poor in 30 countries.

Education lab

About 70 students are enrolled in the E-Lead program, and Gonzalez says he imagines the program growing to between 200 to 250 students. Overall, the College of Engineering has an enrollment of about 3,700 and mechanical engineering is its most popular degree program, according to university data.

“To some extent, (the E-Lead) program is the educational laboratory for the College of Engineering,” says Richard Schoephoerster, Ph.D., who pioneered the idea of the degree and, until recently, was the dean of the college. “The whole idea is that what happens here will bleed into the other technical majors in terms of how we teach,” he says.

Leadership programs for engineers are not new. For a long time, companies have operated programs to expose their engineers to the skills they need to succeed in management positions. Some colleges have also launched supplemental classes and seminars in engineering leadership.

But UTEP lays claim to being the first in the nation to offer a full four-year degree in engineering leadership, and administrators call it the first of its kind in the nation.

“We are taking a risk on creating this brand new program, but when they created the first program in industrial engineering, or any other type of engineering, everybody took a risk,” says Carlos Ferregut, interim dean of the College of Engineering.

As technology has entered more facets of life, the role of the engineer has expanded. But engineering programs, instead of taking a more multidisciplinary approach, have demanded more and more technical courses, Schoephoerster says.

They decided to blow up the traditional engineering program and produce something new.

The result is an engineering program that has a teaching environment more in common with a liberal arts college, which focuses on teaching students how to learn rather than training them for a specific job.

“The reality is, none of us know everything a student is going to need in his career and none of us are going to be able to tell a student everything they are going to need to know in their first job,” Gonzalez says.

“If we don’t train our students to do two things – to think for themselves and to be able to learn material on their own – we have failed them,” he adds.

On their first day of school, students are given an ambiguous problem to solve. The freshman class was asked to design something that hops, and students were encouraged to look to nature for inspiration.

They had to work their invention into a functioning game and present it to potential customers – seventh graders – for input.

“They start interfacing with customers, they start looking at technology, they start having to do research and they are having to be creative,” Gonzalez says.

The team Fraga was part of built a toy inspired by ants, which use their powerful jaws to launch themselves into the air, somersaulting to avoid predators.

“It was really tough,” Fraga says. “The (seventh graders) really expected a visually appealing toy, and we didn’t provide that. They did like the mechanism and played with it.”

Support from a grad

Students in the E-Lead program still have to dedicate two years to studying the technical aspects of engineering, but they also have 12 credit hours of electives they can take in any discipline. Most students graduate with a minor, according to Gonzalez.

“Imagine an engineering leadership degree with a minor in music or in art or in criminal justice,” he says.

The program is a candidate for accreditation but cannot receive full accreditation until it has had a graduating class, according to Gonzalez.

The impetus for creating the degree came in part from industry.

Bob Malone, a UTEP graduate who serves on Halliburton’s board of directors, and his wife, Diane, provided the first \$1 million in funding for the E-Lead program, along with a matching grant from the Halliburton Foundation. Malone is a former president of BP America.

“Early on in my career it became obvious that a strong engineering foundation was not enough,” Malone said when the donation was announced in 2011. “Engineering schools need to broaden strong engineering backgrounds with additional critical skills.”

Large companies are looking for engineers who can be elevated into managerial positions, can lead a team and that understand how to talk to customers, Gonzalez says. Small and medium-sized businesses are looking for employees who can wear many hats, maybe an engineer who can also work with customers and understand a balance sheet.

The classrooms designed for the E-Lead program don’t look like traditional ones. Desks are arranged in circles and the walls are feathered with sticky notes, which are used by student teams to brainstorm.

“We love sticky notes here,” one student says.

Like many college students, Fraga is not entirely sure what he wants to do when he graduates, but he dreams of being a researcher for an environmental engineering company. Eventually, he wants to create a non-profit like Limbs International, but focused on environmental engineering rather than biomedical engineering.

He says he was inspired by a study abroad trip he took to Peru in May.

There he stayed with a local Peruvian family and worked with local engineering students to re-engineer a classroom in a poor community.

The challenge was to do so in a way that didn’t require a lot of money and used local resources.

“A lot of people don’t really relate education with engineering directly, ‘How can you engineer education?’ But that was the main focus,” Fraga says.

What they found was a classroom with books piled everywhere and tables that were too small and old. A stack of government-issued laptops gathered dust because no one knew how to use them.

One team of engineering students created a “multifunctional desk,” using the old desks and chairs, which could work as a desk or a bookcase when not in use.

The team included a mechanical engineering student who drew up the designs, an industrial engineering student and Fraga, the E-Lead student.

“We tried to take a multidisciplinary approach,” he says.

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