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Building Bridges to the Future

By Scott J. Cech

George S. Alarid, Alexander M. Martinez, and two other students, all 15-year-old rising sophomores at Colorado high schools, are building a bridge. That is, they're trying to.

"This is like a train wreck," said Mr. Alarid, looking forlornly at the collapsed pile of glue-smearred popsicle sticks with which he and the rest of the Blue Team are trying to assemble a model bridge. All around him on this day in late June, teams of other teenagers who share the boys' Hispanic heritage are trying to do the same thing: build a bridge sturdy enough to support a steady increase in pressure.

Mr. Alarid has wood glue all over his hands, and he's looking at the clock: Only minutes are left in the exercise, and the stumpy wood supports his team had so carefully assembled have fallen apart. But he and his teammates hurriedly pick up the pieces, putting them together as fast as they can.

The seven teams of four students each are all a part of SciTech Summer Camp--a joint project being led by the Society of Hispanic Professional Engineers, or SHPE, and the Hispanic Engineer National Achievement Awards Corp., or HENAAC, both based in Los Angeles. For the second year in a row, area high schoolers have gathered here at the University of Colorado and three other Western universities to be part of one of the largest efforts specifically aimed at getting more Hispanic students into the so-called STEM fields of science, technology, engineering, and mathematics.

It's not just a bridge of sticks that the students are building here, of course. Whether or not their

ramshackle constructions do hold together, and whether or not they fully realize it, the students are also attempting to build a bridge to studying STEM fields in higher education and, after college graduation, to working in those fields.

That's significant for the future of the students, most of whom would be the first in their families to attend college, and could help correct the nation's disproportionately low percentage of Hispanics in STEM fields.

But the significance is also nationwide. Amid widespread warnings that rising numbers of STEM professionals in such nations as India and China are putting the United States' traditional engineering predominance at risk, leaders in academia, industry, and the Latino community itself increasingly see Hispanics--the nation's fastest-growing population segment--as a natural source for quickly ramping up the number of homegrown engineers and other technical professionals.

In Demand

For employers who depend on a technically advanced workforce, such an increase can't come too soon.

Linda Lung, the education program coordinator at the Golden, Colo.-based National Renewable Energy Laboratory, or NREL, was direct in her appeal to the Boulder SciTech campers on their second day.

"We need you," she told the students.

Like other high-tech workplaces, NREL and the other national labs within the U.S. Department of

Energy are confronting glum demographics--the average age of Energy Department employees is 49, Ms. Lung told them. And the labs fear they won't be able to find enough fresh talent to replace baby-boomer engineers and scientists when they retire.

But they also face additional challenges that make programs like SciTech that much more necessary.

Unlike private companies, which can import foreign workers, "we can't take foreign nationals in some cases because of security issues," Ms. Lung said. "We need homegrown science and math professionals, and that's you."

Raul Cosio, the vice president of IBM's systems and technology group in Selmers, N.Y., sees SciTech as an important lever in the movement to channel more Hispanics into the STEM workforce.

"For IBM as a company, and for other similar high-tech industries, it's imperative that we continue to have a pipeline of talent available to us," he said in an interview. "[W]hat we want to do is open the doors."

The full dimensions of the problem were exemplified in painful detail in the latest "Profiles of Engineering & Engineering Technology Colleges," an annual look at the number of students and professors studying engineering, released in June.

According to the survey, which covered the 2006-07 academic year, and was released by the American Society for Engineering Education, or ASEE, despite the growing national clamor for more engineers, the number of engineering graduates is actually falling.

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Although the decline in engineering graduates from 2005-06 was small--1.2 percent, to 73,315--the Washington-based organization projected that it might continue for at least the following two years, because overall college enrollment dropped in both 2004 and 2005.

Contrast that with the projected need: The U.S. Bureau of Labor Statistics expects a need for 160,000 more engineering positions between 2006 and 2016--an 11 percent increase over the previous decade that does not include the replacement of many retiring engineers.

As of 2005-06, Hispanics didn't look particularly poised to substantially fill the nation's tech gap.

As reported in the ASEE survey, the percentage of engineering bachelor's degrees earned by Hispanics in the United States has fluctuated slightly over the past few years, but at around 6 percent, it is basically the same as it was in 1999-2000.

'Uphill Stream'

Nick Quiñonez, HENAAC's manager of education programs and one of the camp leaders here in Boulder, readily acknowledges the challenge of getting more students interested in STEM fields.

"The work is not seen as glamorous--you don't see many engineers on TV," he said. Added to that image problem is the frequent difficulty of persuading teenagers to take college-prep coursework in high school, including advanced math and science classes, Mr. Quiñonez said. The upshot: "We've got some work to do--it's an uphill stream."

SciTech was created expressly to swim that uphill stream, said Gary Cruz, SHPE's assistant director of programs, who also helped direct the camp here.

While "a lot of feel-good activities that are just one time or a weekend" aim to boost Hispanic students' participation in the sciences, Mr. Cruz said, there had been nothing that really immersed students in college life and exposed them to a full spectrum of STEM fields before last year's inaugural SciTech camp.

Despite all the awards and events dedicated to injecting more students into the STEM pipeline, Mr. Quiñonez, said, tech-industry "professionals kept coming up to us saying, 'It's not making a dent--we've got a kind of crisis here.' "

Pooling their expertise and reaching out to employers with a big stake in achieving a steady supply of future STEM workers, HENAAC and SHPE's educational foundation launched the camp last year to start making that dent.

SciTech campers spend four days on a given university's campus, sleeping in dorm rooms and eating in the dining hall like regular college students. At this year's Boulder camp, the teenagers put in 15-hour days, each of which had a theme, such as science, engineering, or technology.

In between projects such as the bridge-building exercise and tours to NREL and a planetarium, students visited various university labs. Undergraduates and professors talked to them about building satellites for space research and showed them carbon-fiber race cars that University of Colorado students had built to study energy efficiency.

"Students in this era respond to [the] 'wow' factor," Mr. Quiñonez said. He noted that every camp day also features an interactive, team-based project that taps into students' competitive drive. Opportunity for College

But camp organizers also recognize the need for talk about college at a nuts-and-bolts level.

According to "Reality Check 2006," a **Public Agenda** report for which the New York City-based nonprofit organization surveyed parents of various backgrounds, 86 percent of Hispanic parents said they believed virtually all students were better off going to college, compared with 54 percent of parents from other backgrounds.

On the other hand, according to Public Agenda's 2007 report "Squeeze Play," 69 percent of Hispanic parents--even those making \$50,000 or more a year--believed that many people who are qualified for college don't have the opportunity.

Jean Johnson, the executive vice president in charge of Public Agenda's Education Insights division, said the research showed that "Hispanic families really value education" but also doubt that college is a viable possibility.

"There's often a kind of a choice," she said, "between going to college or going to work and helping the family."

The latter obligation often wins out: Only 6 percent of the nation's 53 million college graduates in 2006 were Hispanic, though Hispanics by then represented 15 percent of the nation's population, according to a report released in January by the Washington-based Pew Hispanic Center.

With those concerns and statistics in mind, SciTech camp conducts intensive, hours-long sessions on how to write an outstanding essay in support of a scholarship application. Students also get pointers directly from university financial-aid officials, and on the camp's final day, campers' parents attend workshops

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on admissions, college choice, and financial aid.

True to the camp's mission and most of its students' economic circumstances, the SciTech camps are designed to be as accessible as possible. Any incoming high school sophomore of Hispanic descent within 50 miles of the camp campus who has a 2.5 grade point average or more is eligible, and thanks to corporate sponsorship, the students are charged just \$10 for the experience.

It's too early to gauge how effective the camp will be in turning young Hispanics toward STEM careers. But the SciTech camp idea has already been enthusiastically embraced by several companies and agencies that depend on a technically advanced workforce.

IBM got the project off the ground with a \$150,000 grant, and other employers such as the Department of Energy, ExxonMobil, and the National Science Foundation have stepped up to defray much of the roughly \$40,000 that each camp costs.

"The demand is out there," Mr. Cruz said, adding that universities in Indiana, New York state, and Texas have expressed interest in hosting SciTech camps. Expanding SciTech

"We've piloted the program; now we're looking to replicate it," he said. "What we'd like to eventually have is 40 to 50 campers per camp, and have 20 of those camps across the country."

Anthea Johnson Rooen, the acting director of the University of Colorado's multicultural engineering program, said the appeal of hosting SciTech is self-evident. "We're starting to think about the future of Latino students in Colorado--how many of those will be math- and science-ready in [the future]?" she said.

William E. Kelly, a spokesman for the American Society for Engineering Education, applauded SciTech's outreach to Hispanic students who have had little exposure to college.

"I think it's a challenge to get out to these communities, so my sense is ... anything that can be done is going to help," he said. He also praised the camps' decision to target students at an age when their visions of higher education and careers are likeliest to still be open to suggestion.

That's what happened to Abril L. Silva, now 16 and a rising junior at Denver's South High School, when she took part in the inaugural SciTech camp here last year.

"It just caught me by surprise," said Ms. Silva, who had been thinking of becoming a psychologist but emerged from the camp with a new career in mind: electrical engineering. "It was amazing. I learned so much."

It's far from certain how many of this year's campers will end up studying engineering, let alone entering the profession. But if a taste of success improves the odds of that happening, then a STEM-oriented future just might be in the cards for George Alarid, Alexander Martinez, and the rest of their engineering team, who just barely managed to put their rickety-looking popsicle bridge back together in time.

Against all odds, and much to Blue Team's surprise, when the glue dried, the bridge ended up proving the strongest of the lot when the students tested it. It held as much weight as Mr. Quiñonez could pile on.

"All that pressure, and it didn't break," Mr. Alario marveled.

Mr. Alexander had an idea why: "We just poured so much glue on it, it all held together."