Educator's Corner : Agilent in Education

Case Study: Drexel

Agilent-Equipped Lab at Drexel University Gives Engineering Students a Competitive Advantage

By Joanne Wetmore-Fish

Let's say you've decided on a career as a trumpet player. You enroll in a leading university with an undergraduate music program. The school's curriculum calls for you to study math and physics your first year so you can understand the intricacies of harmonics. Your second-year classes include materials science courses where you learn about the alloys and finishes used for various trumpet components. In your third year, you learn to read music. And finally, in your fourth year, you try playing the trumpet for the first time.

According to Drexel University Professor Robin Carr, this analogy explains how engineering has been taught in the United States for several decades. Students spend most of their undergraduate years studying theory, with hands-on skills introduced in their senior year. The result is that many engineering school graduates lack the skills they need to succeed in real-world engineering careers.

Joe Grella, engineering design manager at Amtrak, acquired engineering skills the hard way. "When I started my first job fresh out of college, I was very green," he explained. "I saved all my college textbooks, thinking I'd need them. In reality, they were useless. It took me a couple of years of hands-on work to really learn what I needed to know to be an effective engineer."

First-year students use Agilent equipment to learn basic test and measurement practices. Lab exercises incorporate concepts from physics and calculus so students get an understanding of how the disciplines are related.

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"When I'm choosing co-op students, I look for kids with practical experience." Derrick Harris, UNISYS human resources specialist

Problem-solving approach concentrates on lab skills

To rectify the situation, curriculum planners at Drexel University restructured the school's undergraduate engineering curriculum, replacing their traditional theoretical approach with a laboratory-based, problem-solving approach to teaching the fundamentals of engineering. Under the new program, first- and second-year students spend a minimum of three hours each week in the university's new high-tech engineering lab equipped with Agilent test and measurement instruments.

"We took a look at what it takes to be a successful engineer in today's workplace. Then we redesigned our curriculum to give our students the required skills. One element of the program is teaching them, right from the start, to use the equipment--computers, software and test and measurement equipment--they're likely to need on the job," said Drexel Engineering Professor Robert Quinn. "We get students working in the lab right from the beginning of their first semester. Our lab projects get kids working together in teams to solve real problems. Their very first assignment on the first day of class is to design a bridge."

With the emphasis on experimental methods and techniques, Drexel engineering students learn to collect, process and analyze data from Agilent laboratory instruments. "Our freshmen know how to use oscilloscopes, signal generators, amplifiers, power supplies -- they're very technically sophisticated," said Quinn. "Students are required to interpret and present the results of their experimental work as well, so they sharpen their critical thinking, communication and presentation skills in the process. These skills give our students a competitive advantage in their engineering careers."

Lab skills enhance co-op experiences

After completing their first year of studies, Drexel engineering students alternate 6-month periods of co-operative work experience with on-campus learning. The new curriculum is increasing the value of the co-op semesters.

According to Wayne Hill, Drexel's engineering lab supervisor, the students' lab skills make them more useful as co-op employees. "Sometimes in the past, it was hard for a company to offer a truly meaningful co-op job to students. They didn't necessarily have the skills that were needed to work on an engineering team," said Hill. "Now they go into their first co-op job knowing how to use actual electronic equipment. It makes them more valuable to employers."

Derrick Harris, human resources specialist for UNISYS, regularly hires co-op students from Drexel and other universities. "When I'm choosing co-op students, I look for kids with practical experience," he said. "We frequently take Drexel students because they come up to speed quickly."

UNISYS Engineering Department Manager Robert Tickner confirms that Drexel co-op students are valuable contributors. "Co-ops really help us out. The work that (Drexel sophomore) Chris Papademetrious is doing will ultimately become an ASIC that's going to be used on the UNISYS computers. I have a lot of confidence in Chris. He's come back with some design changes that have impressed the engineers. More than that, he's learned to be a team player, to work with other engineers. That's just as

important as his technical abilities."

Tickner believes lab experience contributes to the ability to acquire new skills. "Many co-ops that come out of Drexel have that kind of ability. In fact, we end up employing them," he said.

Drop-out rate shrinks

According to Quinn, another benefit of the new program is a reduction in the drop-out rate for engineering students. "It's not a problem we were specifically trying to solve," said Quinn. "But it's sure a nice bonus. In the past, we'd graduate about 40 percent of the students initially enrolled in an engineering program. The kids would quit before they found out what it's truly like to be an engineer."

This year Drexel expects to graduate approximately 60 of the original 100 students in the first class to go all the way through the new program. "That's a 50 percent improvement in our student retention rate," explained Quinn.

Freshman Paul Weiss believes the new lab plays an important role in keeping students in the program. "(Using the lab equipment) keeps you more interested," he said. "If you're more interested, you're more enthusiastic about learning and it makes you learn more. If something's fun, you'd rather stick with it."

Students and faculty applaud program

Drexel's innovative five-year engineering program began as a pilot program in September 1989, with 100 students. As the program proved successful, enrollment grew to the point where the school's 15-station engineering laboratory was no longer adequate. The university built new state-of-the-art facilities to house two new 15-station laboratories equipped with Agilent test and measurement instruments.

The instruments, chosen from Agilent's basic instrument line, are full-featured test and measurement tools, the same bench-top instruments used routinely by practicing engineers. University officials selected Agilent basic instruments because they wanted high-performance equipment that would fit their tight budget.

According to Professor Quinn, both students and instructors are pleased with the choice. "Our students are excited to be participating in a program that allows them to work with the most modern equipment used anywhere at this level of undergraduate studies," said Quinn.

Freshman Tim Ruiz says the new lab was one of his reasons for choosing Drexel. "I was accepted to other top schools as well. But at other schools I wouldn't be able to use this equipment, to even touch this equipment...until my senior year. At other schools your first three years are theory. Books and theory. At Drexel you get to dive into it right away."

According to Quinn, the faculty is more enthusiastic, too. "We're glad to be conveying the idea that, while learning engineering is difficult, it can also be exciting, rewarding and just plain fun."

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Lab features real-world equipment

Drexel lab managers didn't want stripped-down "educational" test and measurement instruments for their new lab. They wanted high-performance industrial products that students would be likely to find in the labs of real-world companies. the instruments also had to be rugged enough to survive the learning experiences of hundreds of freshmen each year. To meet these criteria, lab managers equipped each lab station with full-featured test and measurement tools from Agilent's low-cost basic instrument line.

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