Ever wonder why you had to spend all those hours in the lab, tired eyes squinting at equipment while you scribbled down your notes?

The experience of working with laboratory equipment is vital in helping students master technical concepts in science and engineering. Besides reinforcing what has been taught in the classroom, lab time also gives students valuable career skills.

But what happens when student demand for laboratory stations outpaces the supply—or when the labs are not accessible after hours?

Enter the Automated Laboratory Test Environment (ALTE), the brainchild of Tom Eppes, assistant professor and chair of the Department of Electronic and Computer Engineering Technology in the College of Engineering, Technology, and Architecture (CETA), and CETA Assistant Dean Peter Schuyler. With programming support from then-undergraduate student Darin Gilchrist ’04, the two faculty members developed ALTE as an innovation in the burgeoning field of “distance education,” or learning via the Internet.

**Why a Virtual Lab?**

"We were responding to a noticeable absence of online laboratory experiences for students," Eppes says. "In the past six years, several universities have developed systems for distance experimentation, but most of them relate to a single course. We wanted a system that could be used for multiple experiments across many programs and disciplines."

Guided by Eppes and Schuyler, Gilchrist developed software and built a Web site for ALTE in an undergraduate research project before receiving his degree in electronic engineering technology in January.

Simply stated, ALTE allows students to run experiments remotely via the Internet. But it actually will do much more. The system allows faculty to manage a library of online experiments, and it will act as a server to store and run experiments.

"Laboratory experimentation is central to the curriculum and mission of our college," Eppes says. "Hands-on experience with industry-standard testing protocols in the laboratory is a benchmark of our programs. As our enrollment has grown, however, students have found it more difficult to schedule lab time—especially during evening hours when working students prefer to take classes."

ALTE will allow students to conduct experiments over the Internet 24 hours a day, seven days a week, from their dormitory rooms, homes, or offices. Part-time students working in local business and industry will have access to course experiments without traveling to campus.

To date, ALTE has received approximately $16,500 in funding from a variety of sources. Agilent Technologies and National Instruments, leaders in the instrumentation field, have provided equipment, software, and other support. University-sponsored Coffin grants in 2003 and 2004 have also financed some of the hardware. These one-year grants, named after the university’s first chancellor, Vincent B. Coffin, support full-time faculty scholarly activities.

Plans call for pilot testing ALTE this fall in two courses taught by Eppes and Schuyler. "We plan to offer at least two experiments in each of the courses," Schuyler says. "We will conduct these labs in the distance lab format. The only difference from normal labs will be that the students will ‘touch’ the equipment via the Internet."

Initially, students performing the experiments will come from CETA’s electronic, computer, mechanical, and audio engineering technology programs as well as The Hartt School’s music production technology program.

**How Does It All Work?**

In a typical on-site laboratory experiment set up to study the behavior of electronic circuits and their components—such as resistors, capacitors, and inductors—a student would apply an electronic signal to a circuit and measure the signal at various points along it. The student would then compare the measured values with theoretical values obtained through mathematical analysis. The final step would be interpreting the results to explain the differences. Using the ALTE system, students will perform the same tasks, access the same equipment, and obtain...
the same results. They’ll just do it without setting foot in the lab.

Although students will use ALTE initially to study mechanical and electronic engineering principles, eventually the platform could be extended to other academic disciplines.

Says Schuyler, “ALTE will allow a higher level of synergy and more sharing of the resources that historically have been segregated into individual programs. We foresee the creation of courses spanning several disciplines in CETA, with ALTE facilitating the development of more interdisciplinary programs and curricula.

“New courses could access a particular laboratory such as the wind tunnel or environmental lab for an experiment or two,” he says. "In the past, this would be difficult to schedule. But by accessing the labs through ALTE during evenings or weekends, we would open up whole new avenues.”

ALTE is one of several programs that will support the objectives of the Integrated Science, Engineering, and Technology (ISET) complex now under construction. ISET and ALTE will help move the university into a position of regional prominence and national recognition in the areas of science, engineering, and technology.

“ISET will allow the university to organize and allocate its resources in terms of disciplines, rather than by college,” Schuyler says. “When the complex is completed in 2006, it will provide a rich environment in which our science, engineering, and technology programs can grow and complement one another. It is our hope that ALTE will support and encourage this synergy.”

Why Stop There?

Eppes also expects ALTE to spawn new opportunities for community outreach. “We could create a library of experiments for use by K-12 educators,” he says. “Students interested in science and engineering could access the library of experiments through the Internet. In theory, we will open our doors to them.”

ALTE also could expand opportunities for cooperation with local industry. Eppes and Schuyler foresee providing greater service to local companies by offering similar laboratory experiences remotely. Local industries could gain access to the system in cooperation with CETA’s Engineering Applications Center.

In the pilot tests starting in September, Eppes and Schuyler will survey students to gather feedback on the distance laboratories and use the results to plan future courses. Over time, CETA is expected to offer more distance labs through additional courses and programs via the ALTE program.

“We’re optimistic about the future of this project,” Schuyler says. “We’re grateful for the university’s support in providing seed money via the Coffin grants. We’re seeking additional funding from a variety of government and private sources, and we’re looking forward to forging new relationships with individuals, the community, and industry as we expand the program.”

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