

From Slide Rules to CYBERSPACE



Here or there or anywhere—student engineers roam the campus with their portable laptop computers

BY ROBERT FERRIER

Years ago, University of Oklahoma engineering students went to class with slide rules swinging from their belts. Now they tote wireless laptop computers, portable power to research via the Internet or crunch numbers unimaginable in the past.

In a pilot program begun in the fall of 1996, the OU College of Engineering enrolled 24 entering freshmen in special laptop sections of courses such as introduction to engineering, graphics and calculus. One year later, half the freshmen engineers own wireless laptops, which they use in five engineering classes and in English composition.

“By next fall all the freshmen engineering classes will be laptop sections,” says John Hawley, assistant dean for computing and information technology in the college. “The

scientific and engineering community requires graduates skilled in using personal computers, and we are among those institutions meeting that need. By going wireless, we’ve separated from the crowd.”

Engineering Dean Billy L. Crynes recognized this trend and, along with Hawley and several others, visited schools that already required students to own computers. Hawley remembers one visit that ended any doubts about pursuing the requirement.

“I visited the University of Minnesota at Crookston, where laptops were required,” he recalls. “I saw students sitting under trees or in the cafeteria, using their portable computers. Then I realized I was looking at the future. By placing OU on the leading edge, we expect to have a better

say in how to effectively use this tool. For example, wireless technology extends our local area network. Anyone within 1,000 feet of Felgar Hall can surf the Internet, use e-mail, post to bulletin boards or work on class assignments."

After success of the pilot program, a committee recommended that engineering students be required to use laptop computers. Since many students already had committed to study engineering at OU, it was too late to make the laptop a requirement for academic year 1997-98. Instead, administrators made the program voluntary.

will be the most likely assistance. The College of Engineering is developing programs to assist a limited number of students where the Office of Financial Aid determines unmet need. The OU Computer Store has arranged financing plans with local banks. The college offers merit scholarships (\$500 to \$1,000) for entering freshmen and transfer students, and these funds may be used toward the purchase of a laptop.

John E. Fagan, professor of electrical and computer engineering, says laptops allow students to concentrate on solving a new class of problems that they will encounter in industry. They can analyze

Several OU faculty enjoy teaching with classroom computers because multimedia assignments expand learning, even though these advances require changes in teaching methodology.

"I knew I would no longer be lecturing to a passive audience," says Kanthasamy Muraleetharan, assistant professor of civil engineering and environmental science, who taught two courses in the pilot program. "I had to build interactivity into the course. After 10 minutes of lecture, I shifted to class exercises requiring computational spreadsheets to solve problems. Students learned faster; they were



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■ Students in a computer programming class taught by assistant professor Deborah Trytten, center, became so engrossed in a new technique she was demonstrating that they forgot they were being photographed.

The College of Engineering Advising Center contacted 300 high-ranked students during the summer. Approximately half volunteered to purchase IBM ThinkPad laptops, equipped with either 120 or 133 MHz operating speed, 1 gigabyte hard drives and 40 megabytes of random access memory.

In fall 1998 incoming students taking laptop sections will choose from more powerful computers, ranging in price from \$2,200 to \$2,500. The college has arranged financing through several sources. These freshmen engineers may request a financial aid adjustment from the University's Office of Financial Aid Services. Parent and student loans

performance of large-scale systems under varied operating conditions.

"Introducing the laptop into the classroom of today is akin to introducing the scientific calculator in the late 1960s," Fagan says. "Replacing the slide rule and log tables with this tool raised some controversy. Yet the HP-35 calculator enabled students to solve more difficult problems. Some instructors claimed that students could not understand the physics of the problem if they used the new mathematical tool. Changing to a laptop classroom today raises similar complaints, but soon the laptop will be as commonplace as the calculator."

'doing' rather than listening."

Muraleetharan required homework to be returned through e-mail, thus introducing students to another communication tool.

"Also, we experimented with Internet relay chat (IRC)," he says. "The entire class received an assignment to determine the height of a dam supplying water to a downstream user for the lowest possible cost. The teamwork required that they conduct both in-class and outside group discussions using IRC rather than talking to each other."

Another assignment asked students to write a FORTRAN computer language program, then plug in their computer to a

classroom projector enabling classmates to view and “debug” the program.

“We have exposed engineering students to desktop computing for many years,” Muraleetharan says. “Yet wireless laptops introduce mobility, a major advantage. One student said he felt that he never left the classroom, no matter where he was at the moment.”

Muraleetharan cautions that not all engineering courses, as they are currently structured, lend themselves to laptops. He notes that faculty must spend time thinking of new ways to teach, and they should not fear experimenting with new approaches. “In a laptop class, if an instructor does nothing but lecture, then students will feel shortchanged,” he says.

Baxter Vieux, associate professor of civil engineering and environmental science, benefited from previous teaching experience when he integrated computers into his classroom.

“I had taught computer-aided courses since 1990,” he says. “First I allowed students time to get used to the equipment, the software and the College of Engineering network. Next I restructured my class, limiting lecture to 20 minutes, then going “hands-on” with the computers. Now we either access and download data from the Internet or place a spreadsheet on a Web page for them to analyze. These exercises force them out of a ‘point-and-click’ mode into real work. They must act, think and analyze how changing the parameters affects results. Consequently, they retain the material.”

Vieux says using laptops helps him teach the teaming concept so vital in today’s work environment. He breaks the class into teams called “engineering companies” so they learn group dynamics.

“For example, they access the *Commerce Business Daily* on the Web to view requests for proposals (RFPs), which are solicitations for research projects,” he says. “Individuals choose potential proposal opportunities and then use e-mail and meetings to persuade other team members. Finally, they compose a mock letter requesting the RFP. The laptop’s mobility and Web interactivity enable me to use these types of multi-media assignments.

“Furthermore, I can cover more material,” Vieux insists. “For example, we had a session on regression equa-



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■ Professor John Hawley, at right, pauses in the hallway of Felgar Hall to visit with laptop-equipped freshman engineers. Approximately half of this year’s entering class own wireless computers; by next fall all the freshman engineering classes will be laptop sections.

tions. First we spent an entire class period manually calculating lines of best fit. Then we used computers to do the same job in five minutes so they could appreciate the difference. This increased speed enables me to present more computational problems during the course. As a result, they enter the work environment better prepared. On the downside, changing course material requires time—a sparse commodity for faculty.”

Students like the advantages offered by the laptops, even if they complain occasionally about problems.

“I found the laptop program to be a very educational experience,” says Eugene Chen, Oklahoma City sophomore. “Now I am more familiar and comfortable with Excel, Powerpoint and FORTRAN. With laptops we can work at any time. This sort of familiarity would have been difficult with only two or three hours per week in a computer lab.”

Erin Pitcovich, another Oklahoma

City sophomore, says, “I had an interest in computers but little experience with Netscape, Eudora, Excel and FORTRAN. I learned quite a bit about these programs and how to apply them for class exercises. One of the greatest benefits was the communication between students and instructors. Using the list serve, we solved difficult problems from home, dorms and classrooms.”

Amy Bollman, teaching assistant in the Department of English, instructs a special section of English Composition 1113, which is composed of engineering students using laptop computers.

“Since the students interact more through e-mail, Internet and bulletin boards, they commit themselves more to the course,” Bollman says. “They are proactive rather than passive. Most students fall into two categories: experienced, skilled writers, or those who are bright, yet lack structural skill. Computers benefit the second group especially because the grammar and spell checkers on laptop soft-

ware help eliminate errors. I enjoy seeing students improve as writers. I assign them to evaluate Web sites for quality of research sources, because the better the research, the better the final paper. My students learn things from evaluating Web sites that they cannot learn in textbooks.”

Bollman says students from previous computer-aided courses sometimes refrained from revising papers because the computer and printer produced material “so pretty” that they did

Penn State students. Only our imagination limits the application of computers to learning, because technology brings the world to our classroom.”

Dean Crynes recognizes a growing movement among the 3,300 U. S. institutions of higher education to provide universal access to computers for students.

“This movement is driven by innovative faculty and administrators who are convinced that computers and other forms of information technology can

Oklahoma College of Engineering has added a new dimension to learning.”

OU’s engineers have the support of Senior Vice President and Provost Nancy L. Mergler. “Increasingly, our students use computers as communication devices,” Mergler says. “E-mail, word processors and accessing research sources through the Internet remain the most used applications of personal computers among students in higher education. Wireless laptop computers, connected to the campus network

This movement is driven by innovative faculty and administrators who are convinced that computers and other forms of information technology can positively and significantly change the teaching-learning experience.

■ Freshmen engineers in a special section of English composition taught by graduate teaching assistant Jennifer McClinton find that the laptop course improves their computer skills and the quality of their research and writing at the same time.



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not want to change it. The first draft from a wireless laptop, however, remains “electronic text” as the students e-mail their work to Bollman for evaluation. She inserts comments as footnotes, which the students read and interact with before ultimately printing the work. Now they revise as necessary.

David Mair, associate professor and director of freshman composition, looks forward to linking students and faculty with similar courses taught on other campuses.

“We offer a course taught by three professors—at OU, Ohio State University and Penn State University—all teaching the same text, the same issues, with students sharing a Web page. Thus, students at Ohio State discuss common interests, share insights and communicate with OU or

positively and significantly change the teaching-learning experience,” Crynes says. “In 1992, only four engineering programs required student ownership of computers. However, a recent survey of United States engineering deans indicates in the next three years over 100 engineering programs may require student computer ownership in some form.

“Most faculty and administrators recognize that such ownership is simply the next step in the continuum of calculational power in engineering curricula,” he says. “Everyone agrees that those who hire our graduates expect them to be competent with computation, modeling, simulation, word processing, spread sheeting and other tools. With the application of wireless laptop technology, the University of

and the Internet, are the epitome of ‘anytime, anywhere’ communications tools. OU and other universities have proven that laptops give students access to real- and delayed-time conversations with instructors, collaborative communication with class members, access to course syllabi, readings and lecture notes, and the ability to locate and read research from the library and the Internet.”

Innovative, global education has become the byword for OU’s academic planners at the close of the century. The College of Engineering is aiding that quest by equipping students with wireless laptop computers, unleashing communication and computation at the touch of a button.

Those slide rules will never be missed.