High-Tech Learning

Link computer modeling with classroom instruction, and you've got virtual hands-on experiments

by Vicky Ryder '96

Undergraduates who took Heat and Mass Transfer last spring pioneered a brand-new learning experience, called the "partial studio model." It's a course format that combines lectures on the fundamental theory and practice with work in a high-tech studio classroom, where specially designed computer simulations bring studies to life.

Working in pairs at Pentium-based workstations, students used specialized computer modules to conduct "virtual experiments." With a few keystrokes, they could change the experimental parameters of a heat-flow equation, increase the velocity of a flowing fluid, change the fluid to water or oil or even liquid sodium, or alter the boundary conditions. Color graphics showed their "experimental" results, and user-friendly interfaces allowed them to pull data off the screen for later analysis.

Computers let students conduct multiple experiments in a short period of time and helped them witness the relationships and principles they were learning in lectures. "Normally it takes a long time for an engineer to gain physical insight," says Robert J. Ribando, associate professor of mechanical engineering, who taught the innovative course. "In the studio, students can build insight a whole lot faster."

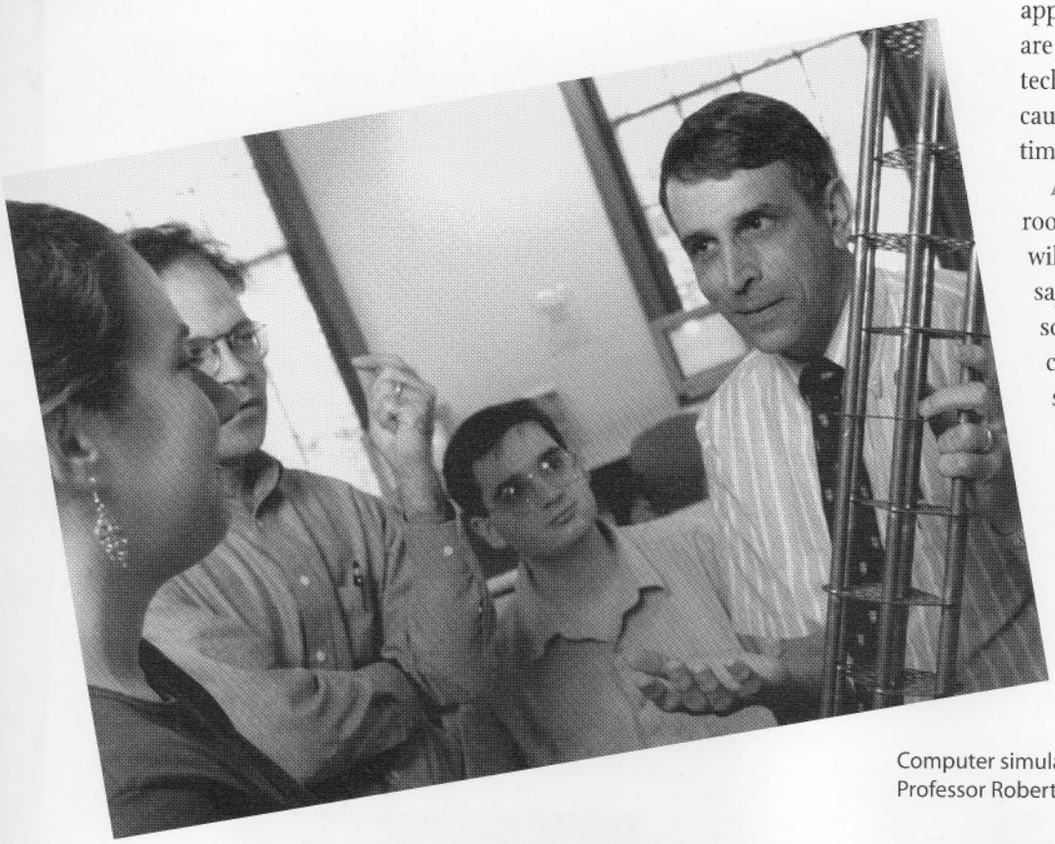
Ribando and graduate student Gerald O'Leary designed the computer modules, combining attractive, student-friendly interfaces generated in Visual Basic with powerful computational methods for interfacing Basic and Fortran coding.

Pioneering students report that the new method worked. "Principles could be virtually applied in the studio session, which led to a much deeper understanding," says Tim Schneller '97, a mechanical engineering student. "I believe this format could be used in a number of different classes with astonishing results."

Karin Giesecke '97 concurs: "Not only do I understand more about heat and mass transfer, I now know how to apply it to problems that will come up later in my engineering studies. I know the reports added a lot to my workload, but I think it was worth it."

Studio sessions allow students to play a more active role in the learning process. This translated into better attendance (close to 100 percent, says Ribando), increased retention, and greater student interest in the material. The studio also introduces students to techniques they will encounter as engineering professionals, which often do not appear in textbooks. "Conventional texts are still full of charts and graph-based techniques developed specifically because there were no computers at the time," says Ribando.

As computers command the classroom, some may worry that technology will depersonalize education. Never fear, says Bob Ribando, our vanguard professor in these high-tech settings. "While circulating around during the studio sessions, acting as coach and mentor, I had far more contact with students than ever before."



Computer simulations work wonders, but sometimes Professor Robert Ribando still likes to show the real stuff.

And the Promise of More

The partial studio model was developed with funds from the University's Teaching and Technology Initiative, supporting computer-based teaching techniques. Eleven Faculty Fellows, including five from SEAS, have received TTI support. TTI is part of the larger Classroom Technology Initiative, which will boost more engineering classrooms soon with computers, network connections, and ceiling-mounted digital/analog projection systems.