

## BIOLOGY

# Computer simulations supplement wet labs

## *Allegheny College*

For most students enrolled in their first year of biology, mastering scientific concepts often takes a backseat to understanding the array of alien-looking equipment in the biology laboratory. Until recently, students at Allegheny College were no exception.

“Students were spending the majority of their lab time trying to comprehend the equipment. As a result, they were not as engaged in the experiments they were performing or in the process of science as they should have been,” says Ann Kleinschmidt, assistant professor of biology at the college.

Working with Charles Fleming of Allegheny's Educational Computing Services, Kleinschmidt developed a novel approach to help students quickly grasp the basics and move onto the core concepts of the class. “We were at the point in the Biology Department where there was definitely a need for something beyond a textbook to help students get familiar with the course materials and procedures,” Kleinschmidt explains. The solution: creating a series of 12 NeXT-based pre-lab applications, called the Gator Pre-labs, to supplement students' weekly wet labs.

Each week for three months last fall, Kleinschmidt prepared pre-lab lessons for the students and then gave them to Fleming, who created NeXTSTEP applications. Via a microscope or color television camera, Fleming captured scientific images and incorporated them into applications using a NeXTdimension board. He used *Mathematica* for data analysis and Diagram! to produce active diagrams of equipment and lab procedures. Fleming says that Interface Builder was particularly helpful in creating the lab applications.

“Interface Builder made it possible for us to design a substantial program each week,” he says. “Think about it. We started with nothing. And every week of the 12-week course, we beat our deadline and built a functional, bug-free program. That says a lot about NeXT's capabilities.”

Each of the pre-labs comprises several parts, including a short quiz based on a reading assignment and simulations of experiments and procedures students will conduct in wet labs that week. As part of the pre-lab, students are asked to form a hypothesis regarding each experiment. After completing the experiment, they comment on whether the results supported the hypothesis and suggest additional experiments to

further test the hypothesis.

<sup>a</sup>An advantage of using NeXT for biology,<sup>o</sup> says Kleinschmidt, <sup>a</sup>is that a much wider range of possible conditions can be tried in testing hypotheses. The students are limited by the wet labs because there isn't time to do multiple experiments. Students are spending more time than ever before evaluating data, and they are more engaged in the work than the pre-NeXT students were.<sup>o</sup>

The Gator Pre-Labs application series is available via anonymous FTP from [pellns.alleg.edu](ftp://pellns.alleg.edu) in `/pub/next/Biology`.

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