

Unique Laboratory Experiences for the Commuter University

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The typical three-hour laboratory experience for students in the sciences was designed for small colleges with traditional-aged students who live on campus. Today, many institutions are large and have a significant non-traditional-aged student population. However, science laboratory designs often have stayed the same, leaving students both frustrated and disconnected. At Kennesaw State University, we have been experimenting with our laboratory program as part of our effort to accommodate non-traditional commuter students. Among our innovations have been an open-scheduled laboratory format, "take-home" laboratories, and interest-generating authentic problems. This article will discuss the take-home laboratories.

Kennesaw State University is located about twenty miles north of Atlanta. The student body is very diverse with an average age of twenty-seven. The majority of our 13,000 students work full or part time and many have family responsibilities. As a consequence, most of our students are on campus for a limited amount of time. Therefore, faculty at Kennesaw have developed unique laboratory experiences that help minimize student time on campus while at the same time maximizing learning experiences.

During the semester, students in a wide variety of courses conduct some take-home laboratories. Instead of meeting at a scheduled time in the laboratory each week, students investigate phenomena at home. Information is provided them to enable an investigative, rather than a cookbook approach. With an investigative approach, even an experiment with a simple principle challenges the student. Such take-home laboratories provide opportunities for students to use science processes, critical thinking and a logical approach to design and implement an investigation.

Our take-home laboratories emphasize science process skills such as formulating a hypothesis, identifying variables, and gathering, graphing and analyzing data. As one example, students might be told that a grandfather clock is no longer keeping the correct time and they are to find the factor that affects the timing. They are asked to set-up a simple pendulum at home and investigate the factors that could determine the rate at which their pendulum swings. Another take-home laboratory experience requires K-8 pre-service teachers to visit a zoo, museum, or nature park from a pre-approved list and evaluate the site for presentation of concepts. In another example, students working in groups are given an everyday observation. The group gathers background information and designs a controlled study to explain such phenomena as why some streams meander and others do not. Another activity requires

students to use a population of crickets to study behavior. Students are able to use their computers at home to gather real-time data on topics such as *El Nino* or geological events. They can also use on-line statistical tests for data.

Eventually students should be able to design and complete their own investigation. The kinds of investigations students have chosen to do include food preferences of raccoons, numbers of raisins in different brands of raisin brand cereals, absorbency claims of paper towel ads, and the effect of temperature on breathing rate of fish.

Take-home laboratories have characteristics that are different from traditional laboratories. The materials used must be readily available and familiar to the student, inexpensive, and not inherently dangerous. Because there is no direct faculty supervision, directions given to students must be clear and complete. The directions must include guidelines and objectives that allow students to design their own investigations using materials available at home. Except for e-mail, students are on their own.

There are many benefits to students when take-home laboratories are included in courses. They learn that they do not need expensive or complex laboratory equipment or a white jacket to investigate scientific principles. Since they can observe science in familiar non-laboratory settings, they see that science is working all around them. In addition, they can design the investigation in their own home and schedule their work around other commitments. Students provide course evaluations at the end of each semester and feedback on the take-home laboratories has been very positive. They enjoy the freedom that take-home laboratories give them, sharing their science experiences with their families, and seeing science with real life applications. The major complaint is that they find the laboratories very difficult because they "have to think too much." Evaluations by faculty *share groups* have also provided very positive feedback. Faculty find that students learn principles and science processes better. Take-home laboratories also provide more flexibility for faculty in workload reassignment with decreased time in the laboratory. One faculty concern is that it is difficult to determine if the student has actually done the laboratory work or if, in fact, the data are real. Faculty have also discovered that take-home laboratories are challenging to write and authentic situations are difficult to find.

In light of the many positive aspects of take-home laboratories, we will continue to use them in a wide variety of courses. Take-home laboratory experiences have been beneficial for both students and faculty at Kennesaw State University.