The purpose of this presentation is to discuss the results of a quasi-experiment to determine the effect of a web-based software application on student learning, performance, and satisfaction in a Freshmen Calculus course, Math 160 (N=144). Though this is a core course for students in a University, it is equivalent to a high-level calculus course in high school. In Math 160, students should demonstrate the ability to solve problems in differential and introductory integral calculus of one variable. Traditionally, the instructor uses minimal technology, and the educational process is very teacher-centered. The use of a web-based application is an attempt to make the process more student-centered. This presentation discusses the difference between students who used the web-based application versus those who did not.

The study contributes to the scholarship of teaching and learning in mathematics by looking at how technology may affect student learning, including their perception of learning, and their course satisfaction; the type of learners that prefer using technology to learn Mathematics; and the impact of technology on mathematics teaching in a calculus course. The National Council of Teachers of Mathematics (2000) proposes that teaching and learning of mathematics can be affected by the use of technology. Technology can provide resources for student learning beyond the boundaries of the classroom, thus redefining the education process in the traditional setting, where the teacher is the center of instruction.

With Calculus on the Web (COW), students are able to work through calculus problems individually guided by the web tutorial. Unlike working with a textbook, they are led through the problem-solving process. They also receive immediate and personalized feedback. Additionally, COW incorporates interactive graphical presentations which help students visualize calculus concepts.

The research questions for this study are:

1. What are the effects of different learning environments on student learning?
2. How does the use of the Math software affect student performance?
3. What are the effects of different learning environments on teaching?

The participants are approximately 140 students from four sections of Math 160, during Fall 2004. The treatment group (two of the four sections) work extensively with COW both during and outside of class time. The instructor use COW to go through calculus examples, and then have students work on problems individually. As the students work through the exercises, the instructor monitors their progress, and helps them with problems and questions. After class, the students work with COW in the computer labs or at home. The control group (70 students from Math 160) do not use COW, but learn calculus through traditional teaching methods. Assessments are based on student performance by comparing scores on a common final exam and also by means of a survey to discover any changes in student attitudes toward learning.
Preliminary results suggest that even though students perform significantly better with the use of technology in that course, they may not have derived as much satisfaction as those who do not work with technology. The difference seems to be that those who used technology have less direct time with the instructor, which is more positively correlated with satisfaction. However, the significant increase in performance cannot be ignored and this presentation suggests some ways of balancing these two aspects of teaching.