

Summary

In this study, I implemented Calculus on the Web (COW) in the classroom setting in Math 160 during the Fall 2004 semester. In this course, students should demonstrate the ability to solve problems in differential and introductory integral calculus of one variable. During the study, students spent class time working on problems presented by COW. COW offers instant feedback and guides the students through the solutions. While the students worked on COW, I assisted them individually with issues such as interpreting questions, performing algebraic manipulations or presenting their solution using proper mathematical notations. In measuring the effectiveness of using COW in the classroom, several issues were considered. They involved student enjoyment, student performance and the ability of the instructor to cover the syllabus. The students were given both pre and post surveys to obtain their feedback on the effectiveness on COW as it relates to enjoyment of the course. To determine the effect on student performance a common final exam was used. Exam scores of students who used COW were compared with those of students who did not use COW. A more precise description of the study is given below along with the findings.

Method

Participants

The treatment group consisted of approximately 60 students from Math 160 sections 01 and 02 during Fall 2004. The control group consisted of approximately 180 students in Math 160 sections 01 through 06 during Spring 2005.

Procedure

The treatment group worked with COW during class time in a computer lab twice a week for 20 minutes per session. The instructor used COW to go through calculus examples, and had students work on problems individually. As the students worked through the problems, the instructor circulated the class, monitored their work, and offered individual assistance. The in class COW work carried over into homework which counted for 15% of a student's grade. The control group contained 6 sections of Math 160 taught by 3 different instructors, each with their own methods. My two sections were given biweekly quizzes which counted for 15% of their grade. With the use of two groups, I was able to investigate the proposed research questions through a quasi-experimental design.

Assessment Methods

The mathematics department uses a uniform comprehensive final exam for Math 160 which I used to compare performance of students from the experimental and control groups. I also used a pre-post survey to collect data on how the participants respond to COW in the case of the experimental group and any other technologies used in the control group. The survey results were compared and analyzed to determine the effectiveness and impact of the study.

Results

The participants were controlled for their prior knowledge through the use of a diagnostic test at the beginning of the semester, and there was no significant difference between groups. Participants' final cumulative exam scores were compared and significant difference ($p \leq .05$) was found between those who had COW (N=26), and those who received traditional teaching methods (N=100). Controlling for instructor differences, there is still a significant difference ($p \leq .05$) between those who experienced COW (N=26) and those who received traditional teaching methods (N=48).

The survey results showed there were significant differences in the participants' enjoyment of the learning, course satisfaction, and attitude toward the subject. However, results suggest a trend showing that participants seem to rate courses without cow as more enjoyable, even though they gave lower ratings for the amount of work they put into these courses, and for the amount of material learned. In other words, participants enjoyed learning through the traditional lectures, though they put in less effort and perform significantly lower in these courses, whereas those who did COW seemed to have worked harder, did not enjoy their experience as much, but performed significantly better in the final exam.

Adjustments had to be made in order to meet the syllabus objectives. In order to compensate for the class time spent on COW, there were no in class quizzes and less time was spent at the beginning of each class going over the homework assignments.

Due to the significant increase in student performance, I will continue to use COW in the future and collect more data on its effectiveness.