

Introduction

During the summer of 2004 my colleague, Mark Burtch, and I built and created 7 projects that integrated technology into the Differential Equations (DE) course that students take throughout the MCCCDC district, which was highly void of technology of any kind. These projects were designed to enhance the learning and understanding of the subject at hand through the use of a variety of technology – MAPLE, TI-89/92, and Excel.

The projects were used in four DE courses at SCC and CGCC throughout the 2004 – 2005 academic year. At the end of each semester we gave a student survey regarding how useful the projects were through the eyes of the students.

Student Survey (Attached)

Throughout the 2004 – 2005 academic year 27 students worked through our 7 projects and responded to the survey.

Question 1: Overwhelmingly students saw the necessity of the DE course for their major (82%)

Question 2: All students agreed/strongly agreed that being able to use technology competently was very important to their future.

Question 3: Ninety-three percent of student felt that the projects followed the curriculum and text hence working with the flow of the class and building upon what was being done with the book and with the daily lessons.

Question 4: Eighty-five percent of students agreed or strongly agreed that the concepts they learned in the projects were used in completing homework. Fifteen percent disagreed, obviously, which was the highest percent of disagreement. Here is where teachers need to be sure to have students work on the projects at the appropriate time or adjust the projects to ask more “homework-like” questions to give the feel of the homework the text offers in the projects. Any reason to help a student believe that what they are doing will be helpful to their grade is well worth the effort.

Question 5: Ninety-two percent of students agreed or strongly agreed that the projects gave them a deeper understanding of the DE they were doing during times the projects were not being done.

From a student perspective (the survey did not ask for student names so they were free to respond as they felt without fear of it affecting their grade) it seems that the work we did creating these projects was well worth the effort. The student response to question 5 was a telling point. The projects, in their opinion, helped them do better in the DE course and have a greater understanding of the material.

Student Grades

To determine the worth of the project in student grades was important to us. If the students did not improve their grades overall, then were the projects really enhancing the curriculum? Here are the raw results:

Fall 2000 to Spring 2004: $n = 78$

A's	B's	C's	D's	F's
21 (27%)	30 (38%)	18 (23%)	7 (9%)	2 (3%)

Fall 2004 to Spring 2005: $n = 17$

A's	B's	C's	D's	F's
8 (47%)	3 (17%)	4 (24%)	2 (12%)	0 (0%)

There may be a variety of reasons why the numbers appear as they are. The number of student grades given before the project is a great deal more than those given when the projects were used hence the statistics may not show a true trend. A different text was used in academic year 2004 – 2005 than the previous semesters, which encouraged the understanding of concepts as opposed to using an overly large number of methods. However, from what can be seen, the number of A's given increased by 20 percentage points, the number of B's decreasing but C's, D's and F's stayed about the same. If we assume these changes are due to the projects, then possibly they are targeting the B students and helping them gain understanding of the concepts more clearly to push their grade up to an A. It's an interesting and unexpected group to be targeted with the projects but the results are ones that have encouraged us.

Conclusion

These projects will be updated and adjusted each year so they will become more a part of the course as time passes. For the next few semesters the projects will be used in our DE course (no matter who is teaching) and the survey will be given to students. More grade analysis will be done to make sure the trend that seems to appear above is actually what is happening; the projects are actually enhancing student understanding to the point that their grades are being affected in a positive way. In the future we hope that these projects will be used across the district so that all DE students can have exposure to the technology that will help them in their major and hence in their future.

Note: On the reverse side of the survey, students were asked what their favorite lab was and their least favorite.

Least Favorite: By far the students voted “Mr. Euler Meets Mr. Excel” as their least favorite due to the tedious nature of using Excel to determine Euler approximations to have a particular error.

The second least favorite was the “Matrix Review” simply because these students had not seen much of matrices before.

Most Favorite: The students enjoyed “Maple Lab: Spanish Armada” since it puts math into a context rarely seen. Some commented on how much they enjoyed the history lesson that was required in order to complete the assignment.

The second favorite was “The Trace Determinant Plane”. The students enjoyed the interesting relationships between matrices, trace, determinant, eigenvalues and eigenvectors.