

**Final Team Project**

**LT 785 Research Methods in Educational Technology**

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## **I - Statement of the Research Question**

How has or will technology improve integration and learning in math and science in the K-12 schools?

## **II - Summary of the Literature (25 points)**

Science and mathematics can be considered as two separate subjects. In reality, they go hand-in-hand. Science uses mathematics to solve problems, gather data and to create quantitative models. In the past, methods of gathering data included using analog equipment, graph paper and mechanical tools to synthesize the information. With today's technology explosion, the methods of using mathematics in science have changed. Graphing programs, graphing calculators and probeware make data collection easier, faster and more real-world (Lukens, J. and Feinstein, S. 2000) .

In a study by Lukens, J. and Feinstein, S. (2000), students that enrolled in an integrated Advanced Placement Biology/Calculus block course scored 43.5% higher on the Advanced Placement Biology Exam compared to students enrolled in a traditional Advanced Placement Biology course. Of the students in the integrated course, 85% passed the AP Biology exam, scoring a 3 or higher (scale of 1-5) in comparison to the students of the traditional AP Biology course with 38% passing.

With the use of these modern tools, the integration of mathematics and science has never been easier and more productive. In a report by Rye, Priselac & Bardwell (1999), graphing calculators can be used to generate descriptive statistics of data, which in turn, can be analyzed to develop understandings of variables, correlation and linear regression. Students will have immediate feedback when collecting data, be able to simulate situations based on collected variables, and make the real-world connection between mathematics and science.

Computers and computer software can be a valuable tool in integrating math and science. Cummings (1998) states that spreadsheets are an invaluable tool for students to for charting data. Once the data has been entered, students can create visual displays in the form of graphs to visually analyze the data. Spreadsheets can also be used for keeping student records, such as grades and financial information.

## **III - Summary and Conclusions (5 points)**

## **IV - Application of the Research in a Typical School/Classroom,**

*or*

**Effect that the Educational Technology Topic *Could Have* in  
a Typical School/Classroom (10 points)**

## **V - List of References (8 points)**

## Appendix A - Analysis of Research

### Article 1 Darren Swenson

#### Bibliographic Citation (APA Style)

Type of Research:    \_\_\_ Descriptive                            \_\_\_ Correlation  
                             \_\_\_ Experimental                        \_\_\_ Causal-Comparative  
                             \_\_\_ Historical                                        \_\_\_xx\_ Quasi-Experimental  
                             \_\_\_ Meta-Analysis                                \_\_\_ Survey

#### Evidence from article you used to determine Type of Research

The study was done over a period of two school years (1997-1999). The researcher took test results from the Advanced Placement Biology Exam taken by students from two different classes: one entitled AP Biology taught traditionally; the other entitled AP Biology/Calculus taught in a two-period block. Also, grade point averages (GPA's) of the students in the two classes were compared. The researcher appears to be an instructor of one or both classes, making this more of a quasi-experimental study than a causal-comparative study.

#### Purpose of the Research

The purpose of the research was to determine if the use of graphing calculators would improve student achievement in upper level biology courses.

#### Instruments Used

The instrument used in this study is the Advanced Placement Biology Exam. Also, descriptive statistics of the students' grade point averages were used.

#### Validity and reliability of Instruments Used

The AP Biology Exam is a valid instrument to be used for purpose of this research. The AP Biology Exam provides content-related evidence of student achievement. The AP Biology Exam is also a reliable instrument based on the comparison of grade point averages between the classes.

#### Subjects

The subjects in this study are students in the same high school enrolled in AP Biology/Calculus block course (39 students) or traditional AP Biology (105) over a two year time period.

#### Results and Conclusions

The results of this study indicate that students that took AP Biology/Calculus block course, integrating the use of graphing calculators, achieved 43.5% higher on the AP Biology exam than students that took the traditional AP Biology course when the means of the two classes' AP Biology exam test scores are compared. Of those that took the AP Biology/Calculus block course, 85% passed the exam with a score of 3 or higher (on a scale of 1-5). Of those that took the AP Biology traditional course, 38% passed the exam. When the grade point averages were compared, there was a 7.4% higher GPA average for the AP Biology/Calculus block course.

#### Possible Influence of Extraneous Variables

There are multiple possible extraneous variables that need to be considered in this quasi-experiment. First and foremost is the time students spend in the classroom each day. The students in the AP Biology/Calculus block course were in class twice as much as those in the AP Biology traditional course. The second obvious extraneous variable is that the block course was taught by two instructors while the traditional course was taught by one.

Other extraneous variables may include course materials, time of day, class size, teaching methods, teacher personalities, and academic proficiency of the students.

#### Possible Threats to Internal and External Validity

Some possible threats to internal validity include subject characteristics (students were not randomly selected), loss of subjects (number of students that dropped out of the courses are unknown), data collector characteristics (how the instructors implemented the study), data collector bias (the researcher was the instructor), extraneous events (many of which happen in public schools), attitude of subjects (it is unknown if the students knew they were in a study), and implementation (which could be instructor related or personal bias of the students' choice of course).

This study was done in one school with two courses in a two-year period. The results do suggest that the integration of the graphing calculator into a biology course increases student achievement. However, the generalizability of the results to a larger population is in question, as stated by the author.

#### Generalizability of Results to Local Issues

Based on the lack of demographic information of the high school in which the study was conducted, it is difficult to generalize the results to certain areas of the country. However, AP requirements have been established nation-wide. Therefore, the results may be applicable to AP Biology courses nationwide.