GRAPHING CALCULATORS AND VISUALIZATION IN THE COLLEGE ALGEBRA CLASSROOM

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Each year there has been a growing recognition among educators of the important role technology can play to enhance many aspects of the teaching and learning of mathematics. Through numerous conferences, publications and workshops, the news is spreading on how graphing calculators can aid in the mathematics curriculum especially in conceptual understanding. This technology puts the necessary tools in the hands of the students to discover basic concepts, rules and patterns for themselves, to explore open-ended problems, and to make real world applications accessible in the classroom. The applications and implications of hand-held graphing calculators are reshaping methods for teaching mathematics. Graphing calculators now provide students with the opportunity to interact visually with mathematics in ways never experienced before in their education.

The purpose of the study was to investigate how the graphing calculator can provide a visual pictorial form to algebraic concepts, thereby enabling students to "see" the significance of abstract patterns and mathematical problem solving that previously could be interpreted only by traditional means. The objective is to present algebra and graphing concepts using the TI-82 graphing calculator to enable students to employ spatial visualization skills to better grasp the mathematical concepts. Using the TI-82 should improve the students' understanding of the concept by providing an alternative to the algebraic method of viewing the problem.

Approach to the study

College algebra is typically taught the traditional way with a fairly narrow algebraic approach. Using the TI-82 graphing calculator, the typical approach is supplemented in a way to make the classroom more exciting. With the instructor using the overhead panel projection system in the classroom, what was once a passive atmosphere is now a more active one. Using the TI-82, mathematics is made more exciting to the students by getting them

personally involved in experimentation and discovery. The instructor was able to guide students as problems were worked and students visually discovered important concepts by doing the necessary work. With the power of the graphing calculator, it allowed the students to actually see what they could never before even imagine. The graphing calculator helped to create an interactive learning environment in which students are more likely to construct their own mathematical understanding.

This research was a continuation of a study done in 1993 at Georgia State University. It was based on the effective use of the TI-81 graphing calculator in the college algebra classroom. This on-going study was carried out in two sections of college algebra also at Georgia State University during the winter and spring quarters of 1994. The participants consisted of students enrolled in the undergraduate program in which the students were required to furnish their own TI-82 graphing calculator to use in and out of the classroom. The course was designed to implement the use of the graphing calculator as a visualization tool in the college algebra classroom in order to meet the needs and purposes of today's students.

The use of the TI-82 graphing calculator in the classroom was designed so that the use of this type of technology supplements mathematics instruction. The TI-82 allowed the instructor to guide students as problems were worked and visually demonstrate important concepts in the algebra curriculum. Also, the teacher was able to facilitate student thinking in mathematical models and problem solving.

With the help of the TI-82, students were to focus on achieving an understanding of the concept of functions, to develop competency in problem solving, to acquire a more confident understanding of graphs and other quantitative materials that they will encounter in their daily lives. Using the graphing calculator as a tool for mathematics exploration, students were able to strengthen their understanding of the relationship between graphs and symbolic forms. The visualization aspects of the graphing calculator enabled students to fit graphs of functions to pictures and real-world situations. Hence, they enhanced their concept images with regard to functions and modeling.

Results

The results indicated that students' response to the use of graphing calculators in the classroom was very positive. Most students believed that concrete visualization through the use of the TI-82 graphing calculator was beneficial to their

understanding of algebraic concepts. The visualization aspects of the graphing calculator exposed the students to more functions and problems. Students saw the relationships between graphs, transformations, and equations of functions. With the use of the TI-82, students were able to generate a larger number of examples than they would have with pencil and paper. Also, the students were able to view and solve more modeling problems because they could visualize problems better and hence were able to develop their ideas and understanding of mathematics. The instructional strategies used in this research show that the use of graphing calculators gave the students the opportunity to explore more topics and develop their problem solving skills through the use of concrete visualization.

Conclusion

This study was initiated to encourage the effective use of graphing calculators in existing mathematical content of the college algebra course. The results of this study can be viewed as another step toward a more mature body of knowledge about the application of graphing calculators in the process of teaching and learning. Hence, with the use of the graphing calculators in the college algebra classroom, students have enhanced their concept images through the use of this visualization device.