Integrating the TI-73 Graphing Calculator in 8th Grade Mathematics

A PROPOSAL for a PROJECT in MATHEMATICS

by

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ABSTRACT

Eighth grade mathematics is the final course where students are not allowed to use calculators on the Texas Achievement Knowledge Skills (TAKS) standardized exam. However, the state is requiring immediate implementation of the use of graphing calculators in 8th grade mathematics classes, even though students will not be allowed to use them on the state exam. The National Council of Teachers of Mathematics (NCTM, 1989) calls for student access to appropriate calculator technology throughout their mathematics studies.

Research indicates that simple, non-graphing calculators are used on a regular basis in middle schools, often due to cost. However, graphing calculators are ideal for teaching complex mathematical concepts because of their large screen, graphic capabilities, multi-line display, and ability to explore functions by graphing. Technology is becoming increasingly available in middle schools, and it is vital that middle school teachers' possess the capabilities to use technology, especially the TI-73 graphing calculators, effectively and efficiently in the classroom. This project will create activities and problems to support the use of graphing calculators in the 8th grade curriculum. They will be carefully selected to provide the most effective impact on comprehension and ability of students using the TI-73 calculators in 8th grade mathematics.
INTRODUCTION

Eighth grade mathematics is the final course where students are not allowed to use calculators on the Texas Achievement Knowledge Skills (TAKS) standardized exam. Beginning in ninth grade, the use of graphing calculators in mathematics courses is mandated by the state for the TAKS test given in April. During professional development training (Education Service Center 2 by Gaye Glenn) on recent modifications to the state standards, the Texas Essential Knowledge and Skills (TEKS), educators were notified that the state is requiring immediate implementation of the use of graphing calculators in 8th grade mathematics. Therefore teachers will be expected to teach the use of calculators, even though students will not be allowed to use them on the TAKS exam.

Immediate concerns include funding to purchase the calculators, proper training for teachers, and if teachers will actually implement or ignore the state mandate. To implement the state mandate, new curricula incorporating the graphing calculators is needed. The objectives of this project are:

- identify existing curricula (if any)
- design 8th grade mathematics lessons targeting the use of TI-73 graphing calculators

RELATED WORK AND JUSTIFICATION

Various mathematical organizations encourage the inclusion of graphing calculators in mathematics. The National Council of Teachers of Mathematics (NCTM, 1989) calls for student access to appropriate calculator technology
throughout their mathematics studies. The American Mathematical Association of Two-Year Colleges (AMATYC, 1995) promotes extensive use of graphing calculators and emphasizes the inclusion of technology as part of an exploratory learning environment.

Pullano (2000) found that graphing calculators are relatively low cost technology compared to computers. Ellington (2006) notes that when the graphing calculator is used in instruction, but not in the testing process, it does not help to develop the necessary skills to apply mathematical procedures and formulas. She further states that when the graphing calculator is included in the instruction and allowed in the testing process, that the calculator aids the students in their development of procedural, conceptual, and overall mathematical achievement skills.

Technology is becoming increasingly available in middle schools, and it is vital that middle school teachers' possess the capabilities to use technology, especially the TI-73 graphing calculators, effectively and efficiently in the classroom. Harshbarger and Yocco (1999) conducted an inservice workshop for middle grades mathematics teachers in California on how to use the graphing calculator. They helped teachers explore projects using the special features of the TI-73 graphing calculator, to make mathematics fun and interesting while learning. The goal of this workshop was to offer activities that would assist teachers in learning on how to use the TI-73 and properly align with pedagogy when introducing technology to their classroom. The workshop was received with enthusiasm. Teachers entered the workshop with different levels of experience.
and because of this factor were asked to team up with teachers who had no experience. A 26-page booklet prepared for the workshop gave the keystrokes used with an emphasis on the features unique to the calculator. The workshop and the booklet provided the teachers with interesting middle school grade projects that were easy to implement into the curriculum. It was this inservice and booklet that inspired the author to create similar lessons and activities for 8th grade mathematics, aligned with the Texas curriculum and TEKS.

Current research indicates simple, non-graphing calculators are used on a regular basis in middle schools due to cost. However, graphing calculators are ideal for teaching complex mathematical concepts in middle schools due to their large screen, graphic capabilities, multiline display, and ability to explore functions by graphing (Margaritis, 2003). Graphing calculators are capable of displaying all three major representations of a single function, in algebraic, graphical and data table representation simultaneously (Pullano, 2000).

A common perception is that if students use calculators they will lose their paper and pencil algorithm skills due to dependence on the calculator. Actually, graphing calculators give students and teachers the opportunity and ability to explore, compare, and investigate concepts in a more comprehensive way than if a simple calculator or no calculator was used (Margaritis, 2003).

In reviewing literature and thesis papers, the author found that many educators feel the need to include graphing calculators in the middle school curriculum. Furthermore, each individual has their own opinion and views as to which manner is most effective for their teachers and students. These articles
and thesis papers have provided a basis for which a calculator-based curriculum shall be written for the author’s own district and neighboring districts. It is the author’s intention for this curriculum to be adopted in the scope and sequence in the future.

This project is important, especially in the author’s district, because the students in this district are below the state and national averages on completing Algebra 1 in middle school. It is worthy of a master’s degree, because it will be presented to the district for adoption to be incorporated with the scope and sequence calendar implemented at the district to assist the teachers and students to familiarize themselves with the calculator and how to use it when completing lessons. Furthermore, in the near future, the district is requiring that middle school students meet the state standard of completing Algebra 1 in middle school and will be requiring teachers to implement the change and be effective.

PLANNED ACTIONS

This project will begin with researching the curriculum, scope and sequence of 8th grade mathematics in Texas. Further research will determine what curricula are currently available to teachers on integrating the graphing calculator in the 8th grade classroom. The author will then design activities and problems to be included in the curriculum to support the use of graphing calculators. They will be carefully selected to provide the most effective impact on comprehension and ability of students using the TI-73 calculators in 8th grade.
mathematics. The completed project will be presented to the author’s district for possible implementation in the upcoming school year. It is the author’s intention to incorporate the project curriculum as part of the current scope and sequence calendar for students entering 8th grade mathematics in the 2008-2009 school year. The calculator-based curriculum materials will be available in different formats such as printed pages, a notebook, online, and/or CD.

Lessons from this project will be presented to fellow colleagues in the school district and neighboring districts to evaluate the effectiveness of the activities and problem scenario(s) based on their teaching experience. Colleagues will be asked to provide feedback in two areas: first, whether the activities and problems are easy to teach, follow, and implement within the current scope and sequence, and secondly, if the activities and problems provide a deeper understanding of mathematics in an interesting manner. Any and all feedback will be used to make modifications to the curriculum.

TIMELINE

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<tr>
<th>Event</th>
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<tr>
<td>Prepare Proposal</td>
<td>May 29 – July 17, 2007</td>
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<td>Distribute Proposal</td>
<td>July 17, 2007</td>
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<td>Project Proposal Defense</td>
<td>July 24, 2007</td>
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<td>Research/Write</td>
<td>June – November 2007</td>
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<td>Colleague Feedback</td>
<td>October 2007</td>
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<td>Project Defense</td>
<td>November 2007</td>
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<td>Graduate</td>
<td>December 2007</td>
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END RESULTS INTENDED

This project will produce two or three for each six week period. These lessons will assist 8th grade teachers to incorporate the graphing calculator into different topics within the TEKS guidelines. The lessons will further enhance the skills students obtain for the TAKS examination. It is anticipated that students will be more successful in their high school mathematics courses following their experience with graphing calculators in 8th grade. Increased self-esteem, greater confidence, and more engagement in mathematics will be reflected by improved student grades and higher state exams scores.
REFERENCES


