Graphing Calculators in the Secondary Mathematics Classroom

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Abstract

The purpose of this project was to research the effects of graphing calculators in the secondary mathematics classroom and compare my findings with my personal experience of utilizing and analyzing the benefits of graphing calculators.

Procedures

- The personal aspect of this project comes from my time student teaching at Aledo High School which began Jan 3rd, 2017.
- I utilized graphing calculators nearly every day in my instruction of AP Calculus AB, BC, and Algebra II.
- I observed the effects of graphing calculators in my classes and summarized my findings.
- I interviewed students in order to assess their opinions on the benefits of learning with graphing calculators.
- I reviewed three scholarly articles to obtain research findings on how graphing calculators are directly related to improvement in learning and instruction in secondary mathematics.

Literature Review

- Pomerantz (1997) found that graphing calculators expedite student discovery of mathematical concepts by allowing them take an active approach in the classroom.
- Pomerantz also indicated that students develop higher order thinking skills when utilizing graphing calculators.
- Kastberg and Leatham (2005) discussed how graphing calculators permit students to make mathematical connections between multiple representations.
- Mason (2010) focused on how graphing calculators promote computational efficiency and thereby enhance problem solving skills.

How do secondary mathematics teachers utilize graphing calculators to enhance instruction?

How do graphing calculators facilitate learning in the secondary mathematics classroom?

Research Findings

Graphing calculators…

1. Promote self-directed learning
2. Encourage exploration of mathematics through multiple lenses
3. Increase efficiency

Self-Directed Learning: With graphing calculators, students are able to produce their own ideas and solutions. Graphing calculators give students freedom to choose a solving method and therefore make their own discoveries.

Multiple Representations: Differentiating instruction for multiple types of learners is essential in mathematics. Graphing calculators provide numerical, symbolic, and graphical representations.

Efficiency: Graphing calculators eliminate time consuming computations, thus allowing time for students to explore different methods and develop critical thinking and problem solving skills.

Student Teaching Findings

Graphing calculators…

1. Stimulate higher-order thinking
2. Encourage differentiated instruction
3. Increase efficiency

Higher-Order Thinking: "In Algebra II, I'm often overwhelmed with computations. When we learn something new, I can't focus on the concept because I'm dragged down by all of the operations. Graphing calculators perform simple but time consuming operations so that I can focus on the lesson." – Dana C. (Junior, Aledo High School)

Differentiated Instruction: Graphing calculators allow me to teach to different types of learners. If a student is struggling to understand a concept, I can utilize a graphing calculator to show a different representation of the concept.

Efficiency: "I'm able to complete my seatwork much faster, which gives me time to ask questions." – Paige K. (Senior, Aledo High School)

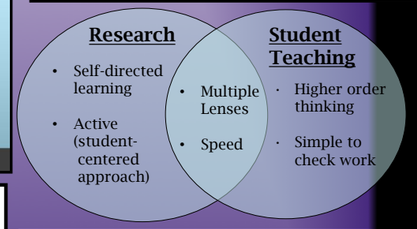
Discussion and Conclusion

How do teachers utilize graphing calculators to enhance instruction?

- Used as an aid to exhibit mathematics through multiple lenses, thereby differentiating instruction for diverse learning styles
- Used to foster a student- centered classroom that focuses on an self-directed approach to learning

How do graphing calculators facilitate learning in the secondary mathematics classroom?

- Increases efficiency, thus allowing time for students to make sense of a concept
- Increases higher order thinking by providing a simple way to check work along the way



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