HOW VISUALIZATION CAN IMPROVE THE UNDERSTANDING OF MATHEMATICS

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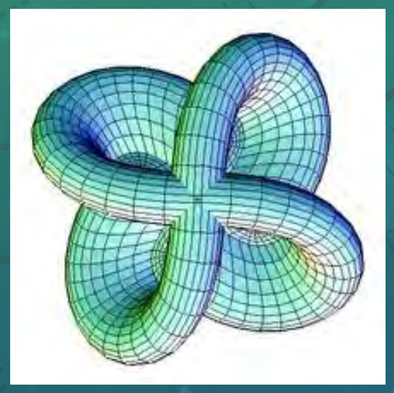
ABSTRACT

High school students have a difficult time taking the new End-Of-Course exams in math. Why are students having this difficulty? This could be because students lack the understanding of visualization in mathematics. Visualization can be helpful to certain students who think this way, while also confusing to those same students, and others as well. However, to what extent do high stakes tests, such as the End-Of-Course exams in Algebra I and II, incorporate mathematical visualization? How can visualization help improve the understanding of mathematics? This review will explain the advantages and disadvantages of incorporating visualization in these exams, how students and teachers can learn to understand visual techniques within math education, and how students approach mathematical situations mentally and physically.



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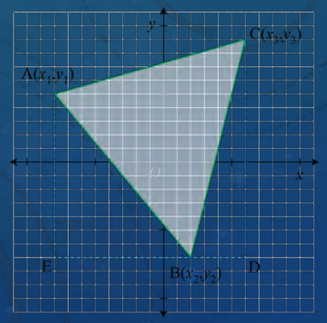
METHODS

- Researched types of thinkers within the classrooms
- Found tests that would require a need to visualize
- Researched more in depth types of learners in comparison to teachers and their students



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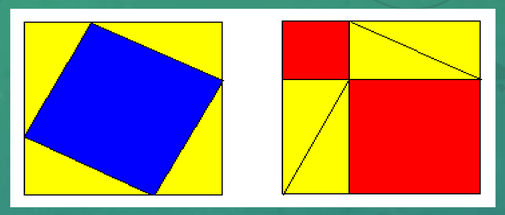

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RESULTS

After my research I have found that there are visualizers (students that prefer visual methods) and non-visualizers (students that do not). These same definitions can also be used for teachers.

Regarding to teaching methods in high school mathematics, it was found that teachers were classified in groups by teaching style just like students were classified in groups by learning style: either mostly visual, somewhat visual, or rarely visual. Teachers who rarely used visual methods taught a more lecturing style in their classrooms. As for teachers who mostly or somewhat used visual methods, they also taught a lecture style but they also incorporated scenarios from the real world and creativity. However, all teachers need to be aware of the visual difficulties of generalization.

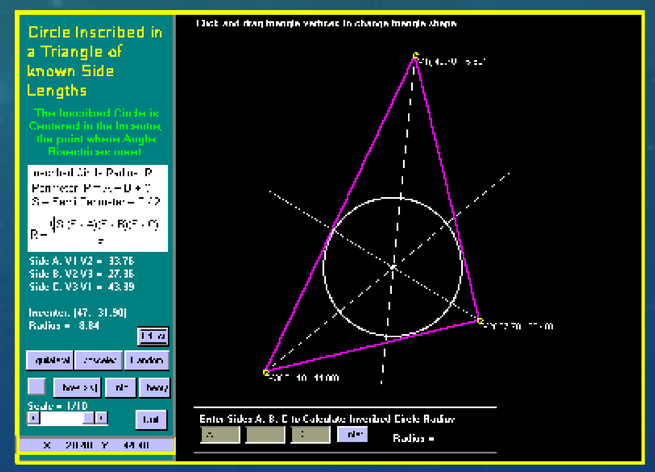
A stereotype that most students believe is that mathematics actually favors non-visualizers. One factor is algebra and geometry appears mainly abstract. A second factor is the time constraints in tests and exams. These do not favor the visual thinkers, since visual methods often require more time. A third factor is most teachers use visual examples but they give more emphasis on using non-visual methods. With an emphasis on a non-visual teaching method, many visual thinking students believe that in order to succeed in math, they would have to memorize formulas, thus discouraging a future in math. However, visualizers did better in classes where the teacher stressed the art of abstraction and generalization with the use of "pattern imagery and the use of curtailed methods" (Presmeg, Visualization and Mathematical Giftedness, 1986). If more teachers become aware of these difficulties and make adjustments accordingly, maybe visual thinking students could be placed in the category of "stars".

What can be seen by students can be missed by experts when using visual concepts. Visualization can encourage verbalization which is why it should be incorporated into the learning practice with algebraic reasoning.

The computer has become a more technological way of visualization without rejecting the algebra. From Souza, the computers emphasize the visualization that "opens new options in the study of mathematics for those who are blocked with respect to algebra" (Villarreal, 2000).

CONCLUSION

Visualization in the classroom can improve the understanding of mathematics for high school students. Though factors contributing to the decline of studying math is not completely known or understood, there are multiple events that happen to students that make them decide to stray away from pursuing a career in the STEM field. From Seymour, "poor teaching by faculty, course pace, course load, inadequate academic advising, financial problems, and language barriers" (Carlson, Oehrtman, & Engelke) can contribute to these events. However, for this decline to fade away, teachers need to incorporate more visual methods within the classroom. This practice of administering visualization more in math education could start in the early on stages of Algebra I and II. As a consequence, students may be encouraged to pursue a future in math.



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