Implementing Mathematical Mindsets in a High School Mathematics Classroom

Abstract

Mathematical mindset theory (Boaler, 2015) indicates student achievement in mathematics has the potential to improve, through the use of, student engagement, collaborative groups, and open-ended problem sets that allow students to discover their own understanding of mathematics. This presentation explores how and when I used methods of mathematical mindsets in my classroom, when it appeared that these types of lessons were not appropriate, and student reactions to lessons using mathematical mindsets versus lessons that did not incorporate this theoretical framework. Lessons learned are also explored.

Timeline

- Mindset PD August 2018
- Fall and Spring 2018-2019 Consortium Meetings and Classroom Implementation
- Julia Robinson Math Festival Training March 2019

Math Classes at SHS Included

- 9-12 grade
- Algebra
- Geometry
- Calculus

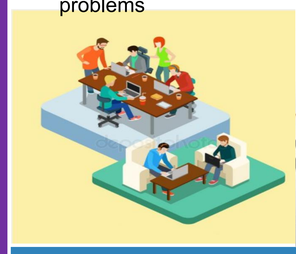
Example Lessons and Their Delivery

Lessons

- Rigid Transformation, Right Triangles and Trigonometry
- Rate of Change, Linear and Quadratic Functions
- Derivatives, Integrals, and Their Applications

Delivery

- Hands on and group work activities
- Group projects for end of term assessment
- Traditional instruction, followed by group practice, followed by independent partner practice
- Traditional instruction, followed by collaborative inquiry-based activities
- Analyze and investigate strategies for problem solving application-based problems

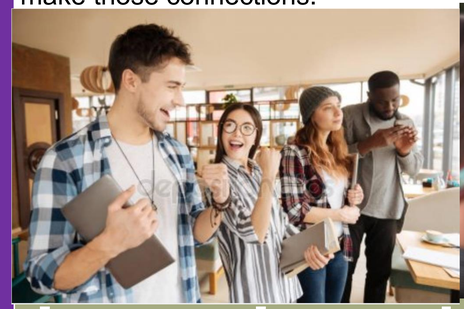


The Connection Between a Growth Mindset and Mathematical Achievement

When students deeply understand content, a process called compression occurs (Thurston, 1990) in which mathematics that is well known takes up less space in the brain allowing for more space for newer mathematics that is linked to the previous information. According to Boaler (2013) "growth mindset intervention led to a clear gain in achievement, particularly for African American students. After the intervention, achievement differences between White and African American students disappeared. In addition, the African American students in the growth mindset group showed a significant increase in their valuing and their enjoyment of courses."

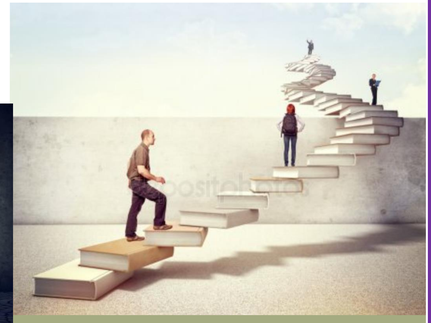
Initial Student Reactions to Mathematical Mindsets

Student reaction at first was negative because they never had to think critically and apply their learning to real world problems. Overtime, some students enjoyed it. They liked seeing the real-world connection and using critical thinking to make those connections.



Lessons Learned and Remaining Challenges

This method of learning mathematics challenges students' previously held ideas that they should be told the procedures involved in problem solving instead of discovering their own methods of solving themselves. This can result in negative behaviors and classroom management challenges.



References

Boaler, J. (2013). Ability and Mathematics: the mindset revolution that is reshaping education. *Forum,* 55(1) 1-10.

Daly, I., Bourgaize, J., & Vernitski, A. (2019). Mathematical mindsets increase student motivation: Evidence from the EEG. Trends in Neuroscience and Education.

Thurston, W. (1990). Mathematical education. *Notices of the American Mathematical Society. 37(7*) 844–850.