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Teaching Math More Effectively and Efficiently

Daniel Holmberg | MTH 412 | Spring 2020 | Western Oregon University

Teaching Math More Effectively and Efficiently

Math education in the U.S. has been struggling. In 2015, the U.S. placed 38th in the world for math. Many students now feel a strong hatred towards math. They feel that it is not relevant to their lives and that it is a rigid topic that is based around rules and formulas. This simply isn't true when it comes to math. Math is actually a very creative subject. It is about making mistakes and exploring the many different ways to solve problems and think critically. Students must have a chance to have math presented in this format and not be taught about math as a set of rigid rules and methods. Luckily, there are new teaching methods to help with this problem.

Some Problems of Traditional Math Teaching

There are four problems that I focused on in my research. Those four are:

- Fear of public embarrassment
- Students not being engaged
- Memorizing methods and formulas instead of understanding material
- Math problems not being relevant

Example of Traditional Problem

Johnny can paint 1 fence board in 1 minute. Jason can paint 1 fence board in 1 minute and 30 seconds. Jason starts painting at 9:00 am and finishes at 1:00 pm. Johnny starts painting at 10:30 am and finishes at 1:00 pm. Who ended up painting more fence boards? How many did each person paint?



Gradual Release

Gradual Release is a teaching method that makes the transition from teacher responsibility to student responsibility more natural. It consists of four different stages. These stages are:

- Focused Instruction (Mainly Teacher Led)
- Guided Instruction (Teacher Facilitated)
- Collaborative Learning (Student Work In Groups)
- Independent Learning (Student Led)

Open Middle Problems

Open Middle problems are similar to problems that are traditionally used except they are presented in a puzzlelike format. They usually involve having an equation or a sentence with blanks for certain numbers in the problem. The student must then fill in the blanks with a digit, usually between -9 and 9, to manipulate the equation/sentence so that it satisfies a desired quality. Students are given several attempts and after each attempt they must write down what they learned and what they will do differently the next time. This causes students to embrace mistakes and understand the whole problem in order to solve it instead of guessing or performing a simple calculation.

Open Middle Example Problem

Using the digits between -9 through 9 (excluding 0) determine two ordered pairs, point A and point B, that when connected by a linear line, creates a line with the equation $(y=mx+b)$ that has a negative y-intercept value (b). You may only use each digit once per attempt. Point A (,) Point B (,).



Discussions With the 5 Practices

Discussion is very important because it helps students learn how to justify their claims and question the claims of others. One method known as "The 5 Practices for Orchestrating Productive Mathematical Discussions" provides teachers with guidelines on how to facilitate an effective student led discussion in math class. These 5 practices are:

- Anticipating (Predict Possible Strategies and Errors)
- Monitoring (Observe Which Strategies/ Errors Are Being Used/Made)
- Selecting (Pick Works Represent the Learning Targets)
- Sequencing (Present Works In Most Effective Order)
- Connect (To Both Learning Targets and Other Strategies)

5 Practice Discussion Example Problem


Look at the following patterns of squares. Which pattern will produce the most squares on the 10th phase?

Pattern 1:

Phase #1  Phase #2 

Phase #3  Phase #4 

Pattern 2:

Phase #1  Phase #2 

Phase #3  Phase #4 

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