

Methods to Engage Students in their Mathematical Learning Experience

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Research Question

What teaching methods can we, as math teachers, use to *engage* students and *facilitate* their learning of mathematical concepts?

Methodology

- ❖ Conducted a self study in Geometry, Pre-Calculus, and Calculus.
- ❖ Implemented engaging lessons and wrote reflections to evaluate effectiveness.
- ❖ Extended our knowledge base to make decisions about future practice.

Literature Review

Behavioral Engagement (Teacher Practices)

Teachers can largely influence a student's behavioral engagement through:

- ❖ modeling appropriate behavior
- ❖ making class interesting
- ❖ using different teaching strategies
- ❖ implementing activities that require higher-order thinking
- ❖ encouraging student participation

Research shows that teachers need more training in these practices.

Emotional Engagement (Learning Environment)

The following can improve the learning environment:

- ❖ creating a classroom community
- ❖ fostering student connections
- ❖ utilizing cooperative learning

Cognitive Engagement (Motivation)

Ways to motivate students in and out of the classroom include:

- ❖ creating mastery goals in addition to performance goals
- ❖ making the material relevant to students
- ❖ alleviating negative peer pressure

Results and Data Analysis

Table 1: Engagement Strategies

Strategy	Topic	Assessment
Use of White Board	Geometry – parallel and perpendicular lines Pre-Calculus – polynomial functions, properties of logarithms	Informal checks, chapter test, post-test, exit slips
Animated examples, individual work	Geometry – rotations (transformation)	Answering and analyzing students' questions, giving students feedback
Class Discussion	Pre-Calculus – transformations of functions	Assessing students' ability to correctly summarize information
Individual work, group work	Geometry – tessellations Pre-Calculus – basic and polynomial functions	Observations of work, feedback questions at end of chapter
Internet, detailed instructions	Calculus – Newton's method	Observation, analyzing questions students ask, informal checks
Koosh Ball review, singing	Calculus – derivative review	Observing student answers, results on chapter exam

White Boards

Advantages:

- Full class participation
- Excitement and child like glee

Disadvantages:

- Easier for student to copy
- Teacher can not see work/mistakes

Animated Examples

Advantages:

- Auditory and visual explanations
- Can see comprehension and ability

Disadvantages:

- Students could copy motions and not create a real understanding
- Students work at different paces

Class Discussion

Advantages:

- Promoted student debate
- Student self-evaluation

Disadvantages:

- Not all students participate
- May not cover all material (slow pace)

Individual and Group Work

Advantages:

- Increased student discussion
- Developed mathematical creativity

Disadvantages:

- Decreased teacher control of classroom
- Unequal student participation

Internet/Step by Step Instructions

Advantages:

- Real world connections
- Teaching tool can be used at home

Disadvantages:

- Some students just went through the motions without real comprehension
- Internet became a toy instead of a tool

Koosh Ball Review/Singing

Advantages:

- Fun and interactive
- Multiple concepts were reviewed

Disadvantages:

- Technology is not always reliable
- Selective student engagement at times

Conclusions

- Characteristics of engaging lessons include being goal oriented and student centered.
- During this self study, we learned that we need to make a more concerted effort to engage students in the classroom.
- A possibility for future study is to look at the effect of engaging lessons on long-term retention of mathematical concepts.