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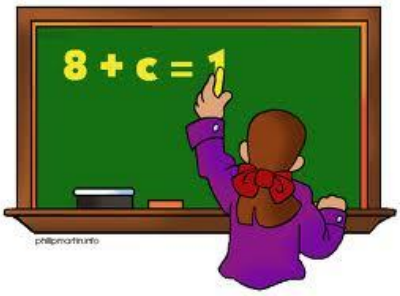
Statement of Purpose



Anyone who has experienced the content standards for 7th grade math can easily see the increase in algebraic thinking skills that takes place. Algebra, as a mathematical concept, is very abstract in nature. According to Piaget's research, students of this age should be entering early formal operations, or abstract thought. However, recent research indicates that by age 14, only 24% of the student population is in early formal operations thought while 50% have yet to complete the concrete stage (Shayer & Adhami, 2007, 268). This presents an interesting and complex problem for teachers. How do we address the content standards which are very abstract in a way that meets the developmental needs of our concrete learners?

According to researchers Ogbuehi and Fraser, "The way in which topics are introduced in algebra, especially in the middle schools, can have a major impact on the way in which the students learn and comprehend" (2007, 102). The researchers go on to explain that it is this issue that leads to most Algebra I students not understanding skills that are considered basic in nature (Ogbuehi & Fraser, 2007, 102). To address this issue, all algebraic topics in this unit of study are

initially approached using a hands-on method, such as Algebra Tiles. Hands-on approaches to algebra concepts are beneficial for several reasons. Firstly, they take abstract ideas and make them concrete by presenting the information in a format that the student can see and touch (Ojose, 2008, 27). Hands-on methods also help students build confidence in their abilities because manipulatives give them the ability to test out their thinking and verify it. Lastly, hands-on approaches help students build the necessary background knowledge for abstract algebra concepts (Ojose, 2008, 28). Research also shows that students who learn through constructivist, hands-on instruction develop more positive views of the content and the learning process (Yager & Akcay, 2008, 9).

A second issue addressed by this curriculum is connecting the math content to a real world context. Too often the math curriculum presents math concepts to students in isolation without them ever seeing how concepts are connected to one another and the real world. These connections will be made through presenting content in real life context and conducting labs for application of linear equations. Helping students make the connections between the real world and the content not only helps them to find meaning in their learning but also helps them grow cognitively as they make the transition from concrete to formal operations thought (Brown & Canniff, 2007, 17). This type of learning activity increases student motivation to learn and teaches them how to be active participants in the construction of their own learning (Brown & Canniff, 2007, 21-22). This balance of hands-on and application strategies help students become the type of critical thinkers crucial to the success of our society.

Each phase of this unit begins with the introduction of a topic using a hands-on approach. After students have gained the necessary background knowledge, instruction moves to the symbolic form and application process. This approach will ensure that the curriculum meets

the needs of the learner by teaching the content at a developmentally appropriate level, the content by ensuring all concepts are attainable, and society by teaching invaluable 21st century learning skills through application of the unit concepts to the real world.

Resources

Brown, C. & Canniff, M. (2007). Designing curricular experiences that promote young adolescents' cognitive growth. *Middle School Journal*, 39(1), 16-23.

Ogbuehi, P.I., & Fraser, B.J. (2007). Learning environments, attitudes and conceptual development associated with innovative strategies in middle school mathematics. *Learning Environmental Research*, 10, 101-114.

Ojose, B. (2008). Applying Piaget's theory of cognitive development to mathematics instruction. *The Mathematics Educator,* 18(1), 26-30.

Shayer, M. & Adhami, M. (2007). Fostering cognitive development through the context of mathematics: Results of the CAME project. *Educational Studies*, 64, 265-291.

Yager, R. & Akcay, H. (2008). Comparison of student learning outcomes in middle school Science classes with an STS approach and a typical textbook dominated approach. *Research in Middle Level Education*, 31(7), 1-16.