



Transforming East Alabama Mathematics

The East Alabama Partnership for the Improvement of Mathematics Education

Fifth Annual TEAM-Math Partnership Conference
Kellogg Conference Center
Tuskegee University
September 5 - 6, 2008

Mini-Presentations

Session I: September 5, 2008, 4:25PM – 4:50PM

- **Title:** *Examining Teacher Change in a Middle Grades Mathematics Department*
Presenter: Gayle Herrington, Columbus State University, Columbus, GA
Location: Ballroom A

Abstract: Abstract Teacher change is a multidimensional process. This study examines the intersection of context and relationships within a middle grades mathematics department participating in systemic reform.

- **Title:** *Geometry in Narnia: the cylinder, the cone, and the sphere*
Presenter: Kenn Pendleton, American Council on Education, Washington, DC
Location: Meeting Rooms D-E

Abstract: A sphere is intersected by a plane not containing the center of the sphere. What name(s) describe the part of the sphere above or below the plane? How can its volume be found? If the volume is known, to what depth is the sphere filled, or what is the distance from the top of the contents to the top of the sphere? How can first-year geometry students find the answers to these questions?

The volumes of most solids studied in a typical first-year geometry class can be found using formulas that are easy to understand, derive, or develop. This holds true for cubes, rectangular solids, right prisms, cylinders, oblique prisms, pyramids, cones, and frustums as is shown through the use of a number of models. The one solid studied in a first-year geometry course whose volume formula is not so easily understood, derived, or developed is the sphere.

Perhaps a reasonable conjecture on the part of students would be to expand the formula for the area of a circle, $A = pr^2$, to arrive at $V = pr^3$. This thought is tested by measuring the diameters of spheres and finding their volumes by displacement. Photos of the process were taken and the results displayed in a scatterplot to provide evidence that the conjecture is incorrect.

Calculus provides a simple means of deriving the formula, but first-year geometry students haven't studied calculus. Another means of developing the formula is through the use of **Cavalieri's principle**, named after the Italian mathematician Bonaventura Cavalieri (1598-1647) who analyzed the fact that the volume of a solid can be determined by cross sections perpendicular to a given reference line. Through yet other models, I describe this principle and show how the formula for the volume of a sphere can be found. These same models lead directly to the solutions to the questions related to volume and height posed in the first paragraph.

- **Title:** *Can Students Construct Multiplication Algorithms?*
Presenter: Betty Senger, Dept. of Curriculum & Teaching, Auburn University, Auburn, AL
Location: Meeting Rooms F-G

Abstract: Without access to the traditional multiplication algorithm, these third grade students were challenged to create their own strategies and algorithms using intuition, reasoning, and number sense. The participating teacher had designed the lesson around contextual, and challenging problems. We will look at the algorithms the students created and discuss them. What may have contributed to the children inventing their own algorithms?

Session II: September 5, 2008, 5:00PM – 5:25PM

- **Title:** *Using Music and Literature to Reach All Learners*
Presenter: Denise Dark, Grade 1 Teacher, Jeter Primary School, Opelika, AL
Location: Ballroom A

Abstract: Participants will revisit familiar children's songs and stories to discover patterns embedded by composers and authors. Participants will represent the patterns using various manipulatives and/or art media. (Grades K-2)

NCTM Content Standard - Algebra
 NCTM Process Standard - Representation

- **Title:** *Saving Billions: Six Sigma for Educators & Students*
Presenter: Jack Frederick, Principal Systems Engineer, Raytheon Company, Waltham, MA
Location: Meeting Rooms D-E

Abstract: Motorola developed Six Sigma and reported \$17 billion savings from 1986 - 2006. Six Sigma business strategy is a Wall St buzzword with roots in Quality processes. Raytheon to American Express invest big bucks training Six Sigma Black Belts (Experts) to build process performance ranging from Missile Defense Radars to Administrative details like food arrangements for business meetings. I'll teach you enough Six Sigma so you discuss it at the water cooler, and whet your appetite to teach students and apply Six Sigma to education, make improvements and save big dollars!

- **Title:** How Graphing Calculators and Visual Imagery Contribute to College Algebra Students' Understanding
Presenter: Rebekah Lane, Dept. of Mathematics, Florida A & M University, Tallahassee, FL.
Location: Meeting Rooms F-G

Abstract: The purpose of this study was to answer the following research questions:

- What is the role of graphing calculators in understanding functions?
- How does visual imagery contribute to visual and non-visual College Algebra students' understanding of functions?

Interviews and document reviews were the data sets used in this study. The data were analyzed by using two theoretical frameworks: O'Callaghan's (1998) translating component for understanding functions and Ruthven's (1990) role of graphing calculator approaches. The investigation utilized the qualitative case study method.

The two participants in this study were presented with mathematical tasks to complete over the course of a semester. Each task was given to the students individually. In order to thoroughly understand the students' responses, task-based interviews were conducted and videotaped. In addition, each participant was interviewed based on his or her response to the mathematical tasks. The tasks captured different types of mathematical functions. These included linear, quadratic, cubic, absolute value, and exponential functions. Furthermore, prior to receiving the tasks, the students' preference for processing mathematical information visually or non-visually were determined using Presmeg's (1985) Mathematical Processing Instrument and Questionnaire.