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- 3 The "Object Participant" Paradigm: Towards an Appropriate Use of Graphing Calculators in the Teaching and Learning of School Mathematics
Michael Todd Edwards & Jamie Borchik, Miami University

Numerous studies have highlighted the potential of graphing calculators to transform the nature of teaching and learning in school mathematics classrooms. A growing body of research indicates that thoughtful use of graphing calculators enhances student mathematical understanding and performance. For instance, calculator use has been linked to higher achievement among low performing students, improved student knowledge of functions, and significant gains in concept attainment, problem solving, and operational skills.

Despite the apparent benefits of calculator use, instructors remain slow to incorporate the tools into their classroom teaching repertoires. Often, misconceptions regarding calculator capabilities inhibit full inclusion of the tools into mathematics classrooms. For instance, many believe that heavy calculator use will erode students' computational or mental math skills. Others argue that calculators inhibit student mastery of basic concepts. These beliefs - common among both teachers *and* students - are cultivated by "inappropriate" calculator use, particularly by inexperienced users. Throughout the article, the authors dispel these "myths", while highlighting teaching strategies that utilize calculators as "conversation pieces" rather than "answer generation devices." In particular, they explore the notion of calculator as "participant" as a useful framework for considering appropriate uses of graphing calculators.

- 12 Conducting an Online Inquiry-Based Mathematics Workshop: A First Experience
Rich Einsporn, Antonio R. Quesada, Lynne M Pachnowski, Linda Marie Saliga, The University of Akron

The purpose of this project was to determine if inquiry-based mathematics learning could be accomplished online. To this effort, a team of math professors developed curricula that satisfied the criteria of inquiry-based mathematics instruction and implemented these in an online format. The team developed an online graduate course with components from the areas of History of Math, Geometry, Abstract Algebra, and Statistics. The modules were tested through a summer workshop offered for in-service teachers. From the data collected, the team concluded that online mathematics instruction using inquiry-based modules designed to be completed in a collaborative student environment was possible, but challenging. The difficulties of coordinating real-time work sessions and of writing mathematical notation using only the keyboard were the most notable negative aspects. The instructors' ability to view the work of all the participants and assist all groups was an advantage that the online environment provided over face-to-face instruction.

- 20 Digital Imaging in the Mathematics Classroom
Janet M. Walker, Indiana University of Pennsylvania

The use of digital photography is becoming permeated into our society. Students use their cell phones to take pictures on a daily basis. Why not use this in the mathematics classroom? This

article describes an activity that will provide students an opportunity to learn about mathematics through the use of digital imaging. Students will take a picture, download it, and then superimpose some type of mathematical function on top of that picture. Furthermore, they will investigate the mathematics involved with the function and even create their own problems based on the photo.

24 Spherical Tiling, Spherical Perspectives, and Eversions: Examples of Science and Art Connections

Reza Sarhangi, Towson University

This article investigates the sphere as a source of inspiration for both scientific and artistic communities through an excursion from ancient to modern time. After the introduction of the Platonic Solids, the article presents the work of a medieval Persian mathematician, who applied the idea of a regular tessellation of a Euclidean plane to a sphere. The article then introduces George Hart and his *Millennium Bookball* sculpture. After that, the article introduces Magnus Wenninger, a mathematics teacher, and his book, *Spherical Models*. We then read about Dick Terms, an artist who brings the surrounding world around a sphere to its surface, using a six-point perspective. The article continues with a short story about the collaboration between the artist, Brent Collins, and the scientist Carlo Séquin. We then read about a mathematics discovery that it is possible to turn a sphere outside-in by means of a continuous deformation. The two videos “Outside In” and “The Optiverse” present this discovery with colorful images and interesting background music. These videos not only make better sense of a challenging mathematics problem, but also bring a sense of appreciation to the public and curiosity to the younger generations. The article concludes with a note about spherical geometry classroom activities.

33 Discovering the Area of a Circle: Egyptian Style

Gail Kaplan, Towson University

This article describes a hands-on exploration of the area of a circle from an historical vantage point, using a process described in the ancient Egyptian Rhind Papyrus. Students enjoy a discovery experience culminating in unearthing the Egyptian estimation for π .

37 Assembling and Applying the Algebraic Thinking Puzzle: Patterns, Conjectures, Proofs, and Extensions

Armando Martinez-Cruz, Mark Ellis, Gerald Gannon, CSU Fullerton

In this paper, the authors describe the use of a triangular array of odd numbers to engage mathematics students in recognizing, explaining, generalizing, and justifying numerical patterns. This is offered as a context through which to provide mathematics students, particularly those who are pre-service and practicing teachers, experiences to apply algebraic skills. The analogy of assembling a puzzle is used to convey how simpler mathematical results can serve to extend and prove more complicated mathematical ideas using basic algebra.

47 Applying Bayes' Theorem

David R. Duncan & Bonnie H. Litwiller, University of Northern Iowa

No abstract available.

- 50 What Do Pythagorean Triples Have To Do With It? (Column: Mathematics Contest Corner)
Debora Kuchey & T. Michael Flick, Xavier University
- 54 Discovering the Area of a Circle: Egyptian Style (Activity)
Gail Kaplan, Towson University
- 57 Average Rate of Change (Activity)
Ed Laughbaum, The Ohio State University