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3 [Impressionism Project: How Mathematics and Social Psychology Can Be Integrated Via Art](#)

Joseph Hutchinson, Dale Price, Toledo Technology Academy

Take a teacher with an interest in M.C Escher and showing students how mathematics relates to ideas across the curriculum; mix in another teacher with a similar interest in Escher and looking to make social studies meaningful to students. Add in a group of students enrolled in both pre-calculus and psychology and you end up with their Impressionism Project using art to integrate mathematics and psychology. The duo gives readers a how-to guide to integrate the seemingly unrelated subjects. Included are student self assessments and examples of their artwork.

12 [The Arithmetic Curiosities of Lewis Carroll](#)

Anthula Natsoulas, University of Toledo

Lewis Carroll, the author of Alice in Wonderland, was a mathematician who often created mathematical teasers, puzzles and nonsense poems. Many of these can be found in his published stories but there are countless more contained in his voluminous unpublished papers. Among edited collections of such mathematical teasers are included tricks for finding the remainders and quotients for division by nine and eleven as well as the game of Numerical Croquet. Lewis Carroll invented the latter as a kind of mental game to sharpen arithmetic skills. Such games and puzzles can be used in the mathematical classroom to help students develop arithmetic skills and to make connections to literature. Carroll's conundrums for division and his arithmetic game are described and suggestions for classroom applications are made.

19 [Using Matrices to Find the Area of Polygons](#)

Danielle Adams, Bridges High School

The formula for determining the area of a triangle on the coordinate plane is derived in this article. The formula, which uses the coordinates of the three vertices of the triangle are arranged in matrix. The matrix is evaluated yielding the area of the triangle. The procedure for deriving the area formula begins by circumscribing the triangle by a rectangle. The result is that several triangles are formed. The area of the original triangle is found by computing the difference between the several triangles and the rectangle. This method is then extended to a five sided polygon and finally to an n-gon. The result is a formula for computing the area of an n-gon on a coordinate plane. There are many formulas such as the area formula for triangles that can be found in the high school mathematics curriculum Deriving formulas develops a knowledge of problem solving and mathematical thinking.

25 [Step One for Developing a Great Mathematics Lesson Plan: Understand the Mathematics](#)

Tracy L. Rusch, Wright State University

There is a clear distinction between being able to get the right answer and knowing why the strategy or algorithm used to get that right answer makes sense. In order for teachers to be able to

construct lesson plans that attend to developing conceptual understanding first, and algorithmic processes second, teachers themselves must have a “deep and connected” understanding of the concept to be taught. This article provides descriptors of *observable* characteristics that teachers and teacher educators can use to identify the depth and connectedness of their students’ mathematical understanding. It also provides some strategies to help pre- and in-service teachers bridge the gap between the “how to get the right answer” mathematics they learned as students and the “why it makes sense” understanding they need to design high quality mathematics lessons for their students. Finally, the article provides a rubric that teachers and teacher educators can use to identify the depth of understanding demonstrated in their students’ written explanations.

36 Using the Digital Camera to make a Difference in Geometry

Tena L. Golding, Southeastern Louisiana University

This article describes a digital camera project that was used in a geometry class for elementary education majors. The project allowed students to connect 1) instruction with assessment, 2) geometric concepts to the real world, and 3) assessment with peer communication. This innovative assessment tool addressed both the mathematical and pedagogical needs of students while demonstrating the power of technology in the classroom

41 Quick-Graphing Parabolas

Steve Phelps, Maderia City Schools

This article presents a method for quickly graphing parabolas by hand that is strikingly similar to the methods used to graph linear equations by hand. The method is based upon the patterns found in the squares of integers, and reinforces the concept of a function family.

50 How Does It Feel? Teachers Count on the Alphabet, Instead of Numbers

Jae Meen Baek, Alfinio Flores, Arizona State University

In-service and pre-service teachers use the alphabet sequence to count and solve simple addition and subtraction problems. This activity allows teachers to see the complexities that young children face when learning early number concepts and operations. By using the alphabet, teachers experience the power of direct modeling and difficulties of counting and derived fact strategies through the eyes and minds of young children.

55 Ohio Graduation Test Quarter Project

Daniel J. Brahier, Breanne Bennett, Bowling Green State University

In this article, the authors present a discussion of how eighth graders in mathematics classes can be served by working the items on a previous Ohio Graduation Test designed for high school students. A project for students is described, whereby eighth graders attempt the problems, categorize them by content area and difficulty level, and use the information gained to assess their own strengths and challenges. Likewise, the teacher can use the performance data to adjust and improve classroom instruction.

64 I'm in the Band: Investigating Quadrilaterals with Paper Cutting and Inquiry-based Teaching Methods

Michael Todd Edwards, Caroline Borrow, John Carroll University

In this paper, we have illustrated rich connections that exist between a middle grades paper cutting activity and discrete mathematics. Through an exploration of the "Cutting Loops" problems, we have encouraged our students to reconsider 3 dimensional shapes in terms of their parts (e.g. regions) rather than as "whole" objects - fostering their progression to higher levels of geometric thought. In the later grades, we use the problem as a vehicle for exploring connections between 2 and 3-dimensional representations of models and as a motivation to write reasoned geometric arguments (i.e. proofs). At all grade levels, we purposely delay actual cutting of the loops in order to foster student discussion and testing of conjectures - key ingredients in any inquiry-based classroom. We've found that the activity strengthens our students' ability to see spatial relationships and encourages them to move more easily between 2 and 3 dimensional representations (a particularly useful skill as they study nets of various 3-dimensional solids).

75 [Algorithms and the Condominium Problem \(Column: Mathematics Contest Corner\)](#)
T. Michael Flick & Debora Kuchey, Xavier University

Student-generated algorithms are algorithms that the students develop through their own problem solving explorations. Once the student generates the steps used to solve the problem, it then becomes necessary for the student to communicate the process to others. Through sharing student-generated algorithms students can determine which algorithm is most beneficial to them and to the problems at hand. In this way, mathematics will become more a product of reasoning and thinking rather than the mere recall or lack of ability to recall traditional algorithms.

80 [Measuring Money by the Pound \(Activity\)](#)

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

81 [Rock and Roads in Ohio: A More Sophisticated Look at Ohio's Major Roads Leading to the Rock Hall \(Activity\)](#)

Sister Mary Theresa Sharp, Kent State University

83 [Crisscross \(Activity\)](#)

Miriam Holmes, Walnut Springs Middle School