

# Ohio Journal of School Mathematics

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3 [Subtraction of Positive and Negative Numbers: The Difference and Completion Approaches with Chips](#)

[Alfinio Flores](#), Arizona State University

This article illustrates how the *difference* and *completion* (or missing addend) interpretations of subtraction may be used with chips of two colors to develop understanding of subtraction of negative and positive numbers.

9 [Pasta, A Delectable Way to Graph Trigonometric Functions](#)

[Gail Kaplan](#), Towson University

This article describes a hands on approach to discovering the graphs of both the sine and the cosine function. Students construct one cycle of the graph of each function by using strands of spaghetti to measure the length of appropriate line segments in a unit circle. Students then mentally expand the procedure to create the entire graph. A discovery worksheet leads the students to explore various transformations of the functions. This investigation enables the students to discover the precise relationship between the sine and cosine functions.

The discovery worksheet is designed for students to experience the sine and cosine functions without knowing any formal trigonometry. It might be used in an Algebra I class to illustrate that all functions are not given through traditional formulas or in an Algebra II or Precalculus class as an introduction to the trigonometric functions.

17 [Mathematics Education Reform](#)

[Tim Jacobbe](#), Clemson University

John Dewey's revelations almost seven decades ago are still relevant today. Although mathematics education has gone through a number of reform movements over the years, many of the same debates still exist today. Ohio can serve as an example for other states as they struggle to align local and state standards with the vision of the National Council of Teachers of Mathematics. Debate is a healthy and vital part of educational reform, however there is a point where "math wars" cease to be productive and compromises must be reached.

21 [Using Research to Create and Evaluate a Professional Development Program: The Case of BreakThrough Mathematics](#)

[Karen B. Givvin](#), [Rossella Santagata](#), & [Ronald Gallimore](#), LessonLab Research Institute

How can we improve mathematics achievement? Findings from the Third International Mathematics and Science (TIMSS) 1999 Video Study suggest that our primary focus should be on improving teaching, not on changing the set of individuals who enter the profession. In investigations at the LessonLab Research Institute, we are focusing on three problems that recent research suggests might be hindering the improvement of mathematics teaching—the "mile wide, inch deep" curriculum, the need to improve teacher content knowledge and pedagogical content

knowledge, and the need for teachers to analyze lessons. What might a mathematics professional development program look like if it was designed to address those three problems? How might it be evaluated and what would the evaluation of it show? The purpose of this paper is to present those three problems, to describe a professional development (PD) program that was created to address them, and to describe research being conducted on this kind of PD program.

## 27 [Learning the Epsilon-Delta Concept Through a Competitive Task](#)

**Gary S. Christie**, Baldwin-Wallace College

Research has identified many misconceptions which students construct while studying the epsilon-delta definition. For example, many students believe that a function may not go beyond the point where a limit is being found or that a limit is some unreachable boundary point. Even "successful" students in calculus carry many of the identified misconceptions. Based upon this research and the lack of any reported success in creating a teaching method to reduce these misconceptions, the author designed and implemented a teaching strategy which found success with high school students. This teaching strategy incorporates a competitive game between students in which the rules of the game are derived from the epsilon-delta definition itself. Through use of various linear functions in this game, the author found that students constructed the epsilon-delta concept with none of the misconceptions found in the research. Moreover, students who were interviewed at least six weeks after participation in the game retained a compelling amount of information concerning the limit concept.

## 32 [Why Use a Function Approach when Teaching Algebra?](#)

**Ed Laughbaum**, The Ohio State University

Neuroscientific and cognitive science research results has implications for how we can help our students understand mathematical concepts, and how we can help students remember them correctly and for a longer time. Teaching algebra through a function approach, using "graphing calculator" technology, creates a seamless integration of cognitive science concepts with the teaching and learning of algebra. The article reviews recent neuroscience research in the areas of associations, pattern recognition, attention, visualizations, priming, meaning, distributed learning, and the enriched teaching environment. This is followed by examples where the concepts are integrated into algebra teaching through function.

## 43 [A Twenty Minute Math Contest: Practice for Competition \(Column: Mathematics Contest Corner\)](#)

**T. Michael Flick & Debora Kuchey**, Xavier University

## 48 [Determining Probabilities Using Both Ordered and Unordered Sets \(Activity\)](#)

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

## 50 [Quadratics \(Activity\)](#)

**Miriam Holmes**, Walnut Springs Middle School (Westerville)