



Henry S. Kepner, Jr.

*Our challenge is to give all students the necessary preparation and opportunities to make learning algebra a successful experience.*

## ALGEBRA—CONNECT IT TO STUDENTS' PRIORITIES!

When you hear the word algebra, what comes to mind? A one- or two-year course focusing on manipulating symbols? Well, algebra is much more than that! One of the biggest challenges facing us as mathematics teachers is to show all students—and their parents—that algebra is a tool for understanding and describing relationships in widely varied settings. Making connections from descriptions in words, graphs, or tables to symbolic representations brings insight to students. Seeing these links strengthens students' ability to move back and forth between the concrete and the abstract and boosts their confidence in using symbols that they understand to be firmly based on mathematical properties and connected to the world.

Algebra and algebraic reasoning have recently received considerable attention. NCTM's *Principles and Standards for School Mathematics* (2000) and *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics* (2006) provide guidance and a broad vision of algebra in mathematics curricula. A new NCTM position statement on algebra—"Algebra: What, When, and for Whom?" (2008, see p. 2)—gives a concise statement of this vision. All these documents call for building conceptual understanding, procedural skills, and problem-solving simultaneously.

Successful problem solving, in both purely mathematical and real-world contexts, is critical to students' motivation throughout their school years. Problem statements and solution strategies take different forms at different levels. Consider, for example, the following story problem: "Tanya has 5 marbles. Her brother gives her some more. Then she has 12. How many marbles does Tanya receive from

her brother?" Students in grade 1 might use objects, tallies, and counting strategies such as "counting on" from 5 to 12. Then children learn to make the statement, "5 + what = 12?" Later, every Algebra 1 textbook includes a corresponding exercise: "5 + x = 12."

All students need ongoing experiences that assist them in making connections by requiring them to produce multiple representations. As students advance in school, they must have many opportunities to model real-world problems and contexts with appropriate mathematical representations, including algebraic expressions, functions, and equations or inequalities. Not only does this work help students progress to skillful use of symbols but also gives a motivating reason for doing so. The tasks that we pose are critical in motivating students! In working with spreadsheets, for example, students discover that algebraic expressions define the values in many cells, demonstrating that algebra carries beyond the mathematics classroom to other areas of their lives.

Students do not acquire an understanding of algebraic concepts or the skill to use them in a single mathematics course or year. Developing algebraic reasoning should be a focus of mathematics instruction, extending from work with describing patterns in preschool and continuing through justifying procedures and solving problems by using whole numbers, fractions, decimals, and integers and performing advanced work with functions in high school and beyond.

As adults, we recognize algebra and its applications as important gateways to expanded opportunities. Our challenge is to give all students the necessary preparation and opportunities to make learning algebra a successful experience.

Originally published in the *NCTM News Bulletin* (December 2008). Copyright 2008, The National Council of Teachers of Mathematics. All rights reserved.