

Vocabulary Strategies for the Mathematics Classroom



Dr. David Chard

Language and Vocabulary Consultant for
Houghton Mifflin Math and Professor of
Reading, University of Oregon

Vocabulary knowledge is as essential to learning mathematics as it is to learning how to read. In language arts, mathematical words conjure up graphic representations of the objects they label. But when it comes to abstract mathematical concepts, words describe activities or relationships that often lack a visual counterpart. Yet studies show that children grasp the idea of quantity, as well as other relational concepts, from a very early age (Dehaene, 1997). As children develop their capacity for understanding, language, and its vocabulary, becomes a vital cognitive link between a child's natural sense of number and order and conceptual learning.

Children learn mathematics best by using it, and understanding the language of math gives students the skills they need to think about, talk about, and assimilate new math concepts as they are introduced. For example, as students develop conditional knowledge, knowing how to label and define objects—such as the difference between triangles, rectangles, and polygons—is essential to manipulating those objects.

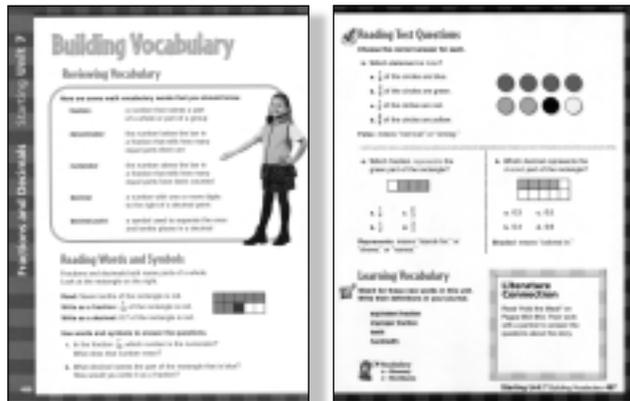
The language of math, in this case, is critical to helping children develop the means to acquire new concepts.

LET'S TALK NUMBERS: THE IMPORTANCE OF TEACHING STUDENTS THE LANGUAGE OF MATHEMATICS

While young students learn how to “do” math, they must also learn how to articulate what they are learning. Children must learn to recognize and answer why questions in order to develop problem-solving skills. And for teachers to accurately assess student progress, children first need to acquire the means of explaining how they solve problems as well as what concepts might not be clear to them. Recent national legislation, such as the *No Child Left Behind* Act, increases pressure on school districts to ensure Adequate Yearly Progress for every elementary student, regardless of their background. This puts a premium on high-stakes standardized tests administered at the end of each school year. But only through frequent classroom-based assessments can teachers get timely feedback about



student progress. A well-designed mathematics program should enable teachers to accurately assess how well students are learning new content at the end of each lesson, and target interventions when



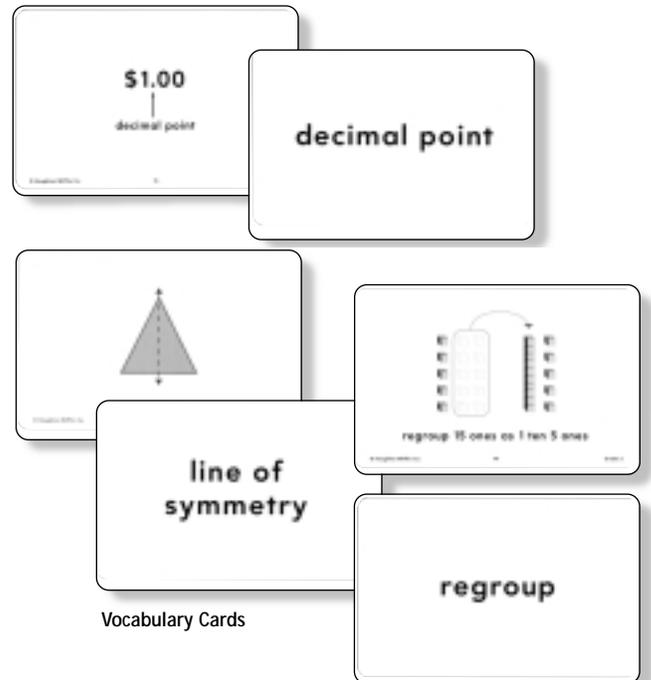
Student Book, grade 4, page 486 and 487

needed. Vocabulary knowledge—and ensuring that students’ learn, review, and use it—makes problem solving on high-stakes assessments accessible.

MAKE VOCABULARY KNOWLEDGE A PART OF EVERY LESSON

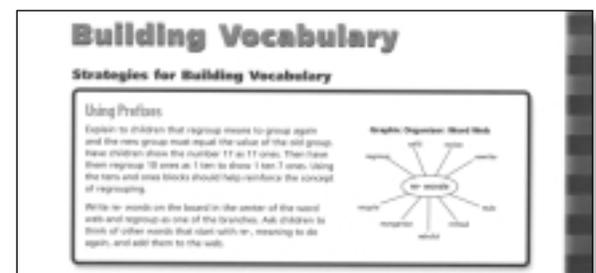
Vocabulary strategies for the math classroom are similar to those used in language-arts instruction. Teachers must know where in the curriculum to introduce vocabulary words, and when and how to help students make key connections that build on prior knowledge. Additional support may be needed to help non-English-speaking students. An effective mathematics program should therefore build vocabulary development into lesson content, assessments, and intervention modules that target a wide range of student needs. To ensure that students are assimilating and using vocabulary knowledge essential to learning mathematics, an effective mathematics curriculum should include these simple strategies in every lesson:

- Preteach mathematics vocabulary
- Model vocabulary when teaching new concepts
- Use appropriate labels clearly and consistently
- Integrate vocabulary knowledge in assessments.



PRETEACH MATHEMATICS VOCABULARY

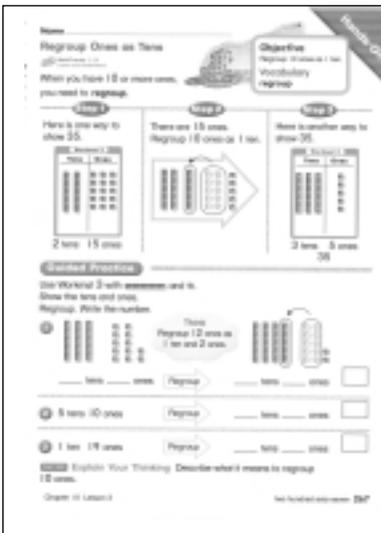
When and how should explicit vocabulary instruction be integrated into the mathematics curriculum? Preteaching vocabulary in the mathematics classroom removes cognitive barriers that prevent children from grasping new content. When taught only at point-of-use, vocabulary words are often lost or misunderstood as elementary mathematics students focus on learning new procedures. By preparing students with background information—such as vocabulary—at the start of a new lesson, they are better equipped to put that information to use. The lesson then serves to reinforce new words that stand for concepts as they are learned. Preteaching math vocabulary also ensures that students learn and review essential words and expressions long before they turn up on formative and summative assessments.



Student Book, grade 2, page 260

MODEL VOCABULARY WHEN TEACHING NEW CONCEPTS

As new concepts are being introduced, teachers should model vocabulary words using appropriate problems as examples. Children need many exemplars as they learn to apply unfamiliar words to very abstract concepts. When modeling vocabulary, it is important to use examples that children can see and manipulate as well as discuss and write about. A good mathematics program should also use culturally relevant examples to illustrate math vocabulary in action.



Student Book, grade 2, page 267

Graphic organizers can help children grasp an understanding of mathematical terms and their relation to one another. Multi-syllabic strategies can help students distill word roots that provide contextual clues to their meaning. Instructors should

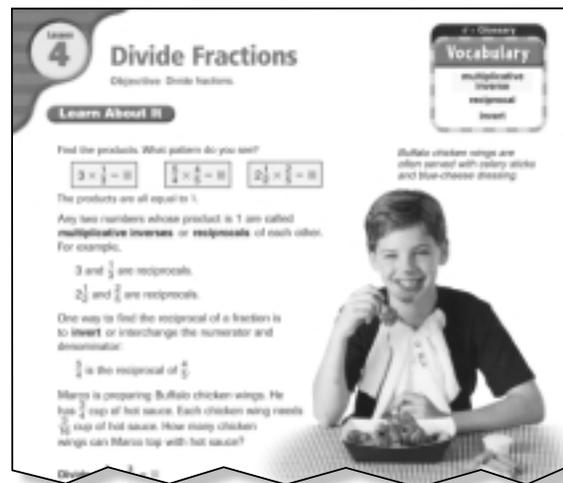
model vocabulary with illustrative, precise examples and attempt to engage students in conversation using appropriate language.

USE APPROPRIATE LABELS CLEARLY AND CONSISTENTLY

In the past, unconventional methodologies have abandoned the teaching of standard mathematics terminology in favor of inventive words or phrases created as scaffolding to help children grasp concepts.

While this might seem to activate children to “do” mathematics, it often deprives them of the words they need to communicate what they are learning in relevant ways. Mathematical language is used and understood around the world, and conventional mathematics vocabulary gives young learners the means of communicating those concepts universally.

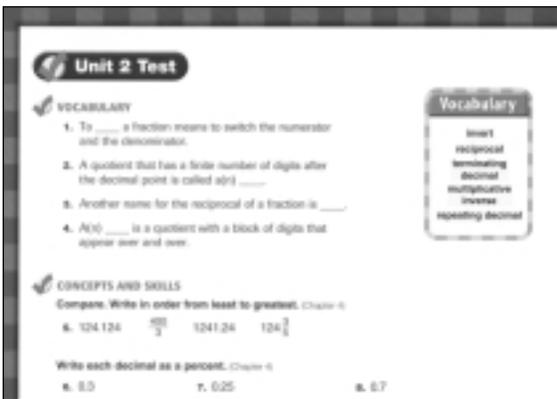
The teacher’s role in planning a hands-on mathematical task is to make sure their students are processing the right information. To ensure this, children need to be given appropriate vocabulary words to describe and reinforce the mathematical concepts and functions they are learning. An effective mathematics curriculum should use these labels consistently. For example, when teaching reciprocals, it is important that children learn the word “reciprocals” to describe the concept. If the concept is discussed as “flipping fractions upside-down” without using the mathematical label, students miss the opportunity to connect the right vocabulary word with the concept as they are learning it.



Student Book, grade 6, page 132

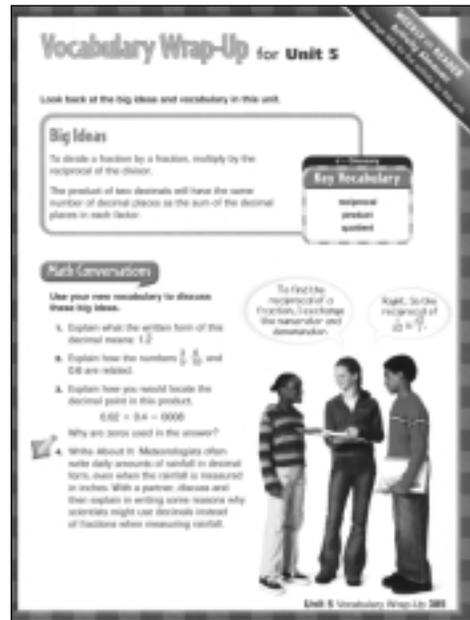
INTEGRATE VOCABULARY KNOWLEDGE IN ASSESSMENTS

Vocabulary should be placed strategically in questions to reinforce vocabulary knowledge along with conceptual knowledge. A goal of quality assessment must be to “remedy whatever learning errors occur at the time” (Guskey, 2003), and assessing vocabulary knowledge is intrinsic to this process. Teachers should be careful to review vocabulary when it is used in a different context, so kids don’t miss the connections as they are being made.



Student Book, grade 6, page 174

One obvious goal of reinforcing universal usage and building fluency with mathematical concepts is to prepare students to do well on standardized tests. Students who score poorly on tests often do so because they have difficulty reading and understanding the problems presented. To promote conceptual understanding and problem solving, lessons should include a focus on the mathematical vocabulary and comprehension skills students need to acquire in order to read and interpret problems successfully. By consistently using the labels for models and manipulatives that are commonly found on tests in their own lessons, teachers can ensure that students are well prepared for test taking. When effective vocabulary instruction is built into a mathematics curriculum, student achievement is likely to improve on mathematics assessments.



More importantly, as children develop mathematics language, they learn to communicate and share universal mathematical concepts and operations with their peers and others (Cobb, 1998). Vocabulary knowledge provides young learners with a mathematics foundation they can apply—and build on—in and out of the classroom.

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