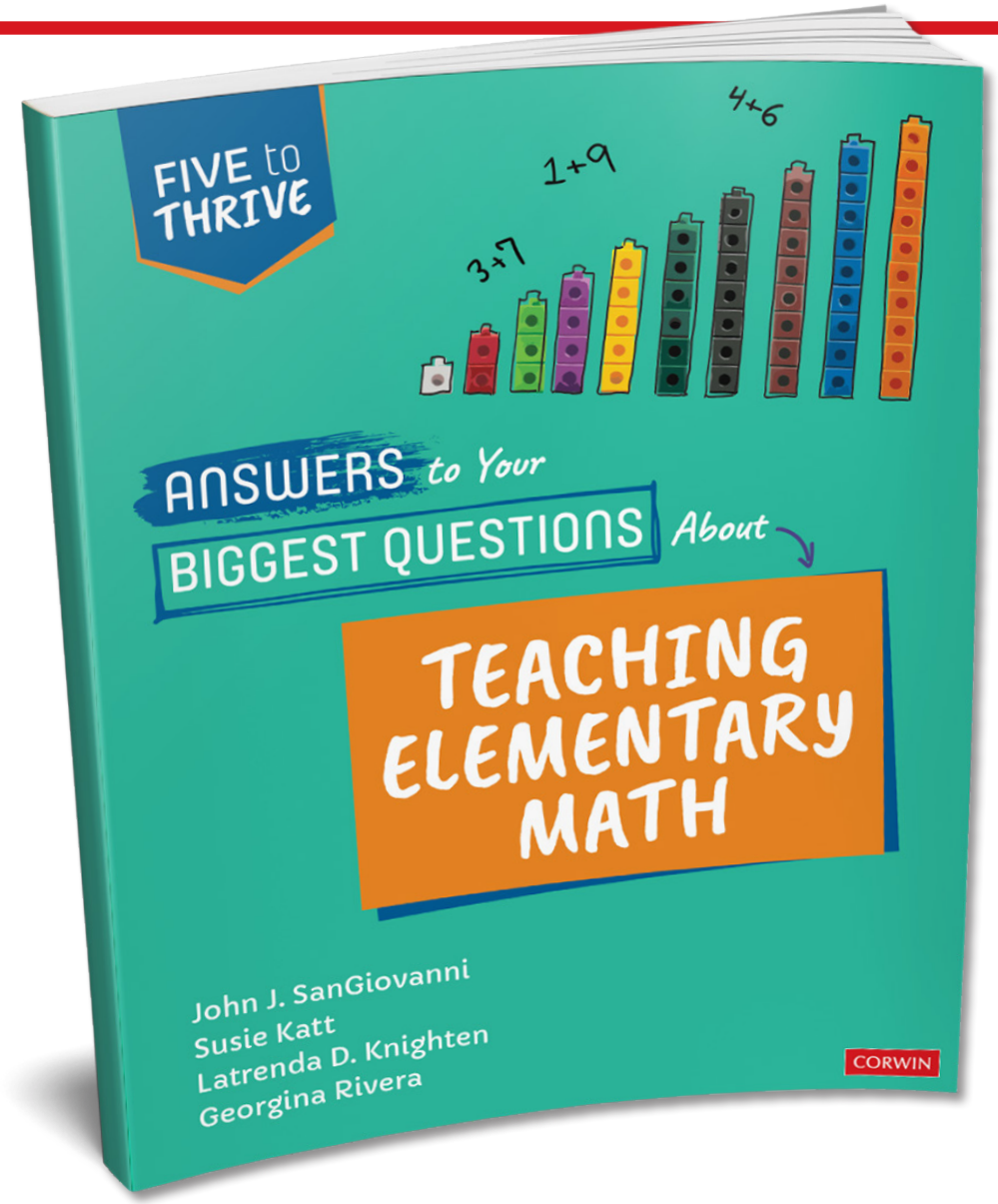

Thank you

FOR YOUR INTEREST IN CORWIN

Please enjoy this complimentary excerpt from Answers to Your Biggest Questions About Teaching Elementary Math, by John J. SanGiovanni, Susie Katt, Latrenda D. Knighten and Georgina Rivera.

LEARN MORE about this title!

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How Do I Teach Problem Solving?

A problem is a question that needs a solution, which may not have one, single, immediately obvious solution pathway or process. "Problem solving is what we do when we don't know what to do" (Liljedahl, 2021, p. 19). Problem solving is not about simply applying a procedure to a problem to find an answer; it is a process that requires students to think, question, and make sense of the mathematics. Teaching problem solving can be hard, and you'll want to avoid teaching "answer-getting" shortcuts that cause students to simply mimic what you do without developing their own conceptual understanding. Shortcuts might offer short-term success, but they rob students of the chance to learn the critical thinking skills needed for the long term. Here is a list of helpful tips for working with problem solving across the year.

Great Resources

There are lots of resources for teaching problem solving. Two resources that have been most valuable to us: Moore, et al. (2019). *Mathematize It!* Corwin; Ray-Riek, M. (2013). *Powerful problem solving.* Heinemann.

TIPS FOR DEVELOPING PROBLEM SOLVERS

Teaching problem solving is hard. You want to avoid shortcuts, such as keywords, as they are not about thinking and don't always work. You also want to avoid proceduralizing problem solving. Real problem solving is not a set of steps that lead to the correct answer. Problem solving is about thinking and reasoning, which is what you want to help your students develop. To do this well, consider these tips:

Tip #1 Include problem solving every day.

Problem solving was once reserved for Fridays or displayed as a word problem at the bottom of a textbook page. But problems come in all shapes and sizes and involve different contexts, different operations, and varying complexity. Because problem solving is at the heart of doing math, and it requires thinking and reasoning, it should also be at the heart of every lesson; the thinking and reasoning strategies shared in the next section will help you realize this.

> I FEATURED "PROBLEM-SOLVING FRIDAY" IN MY CLASSROOM FOR A FEW YEARS. THEN, I REALIZED THAT PROBLEM SOLVING IS SOMETHING WE HAVE TO DO EVERY DAY.
>
> —FIFTH-GRADE TEACHER

Tip #2 Remember that a good problem might not be a word problem.

Good thinking problems can take on many forms. Word problems often represent the bulk of the problems we pose in elementary school. However, problems can take on other forms. Asking second-grade students to represent 437 in four different ways and to explain their thinking is a problem-solving task. Asking fourth graders to create a set of fractions close to 1 and justify their choices is another example.

Tip #3 Avoid keywords and other "tricks."

You may be familiar with an approach to solving word problems that seems to help students get to the correct answer by highlighting numbers and circling the keyword that tells them what to do. But because keywords don't always work in all situations, this approach can be misleading and set students up for errors, misconceptions, and a feeling of incompetence. Notice in the following problems that the keywords *were left* in the first problem has nothing to do with subtraction; the word *times* in the second problem signals multiplication, but division is actually needed; and there isn't a keyword in the third problem. Simply, there isn't any trick for problem solving. It is about making sense and thinking.

In October, 46 jackets were left on the playground. In November, 35 jackets were left on the playground. How many jackets were left on the playground in these two months?	Kristen ran 6 miles last week. That was four times farther than John. How many miles did John run last week?	How many legs do 12 elephants have?

I USED TO HAVE A KEYWORD POSTER IN MY CLASSROOM, BUT I TOOK IT DOWN AND NOW HELP MY STUDENTS FOCUS ON UNDERSTANDING THE PROBLEM BY DRAWING PICTURES AND TALKING ABOUT THE PROBLEM.

—FIRST-GRADE TEACHER

Tip #4 Be patient.

Teaching problem solving is about helping students learn how to think. It isn't easy, and it takes time. Students can be inconsistent when solving problems. One day they might seem able to solve any problem, and other days they may not even know how to get started (see Stuck Students, p. 116). It feels good when students get the right answer, but keep in mind that you want to dig into their thinking.

Tip #5 Use and connect representations.

Physical models and drawings enable students to visualize the problem and make sense of it. Encourage students to represent their thinking in these ways, first, and then have them write equations to go with their thinking. Most important, work to

ensure that students are able to connect the problem, their models and drawings, and their equations to one other. For example, consider the following problem for second-grade students: Jackson scored 68 points in the first game and 73 points in the second game. How many points did Jackson score in the two games?

Physical representation	Visual representation	Symbolic representation
A student uses base-ten blocks to show 68 and 73.	A student draws sticks (tens) and dots (ones) to show 68 and 73.	A student writes 68 + 73 = ?
A student uses two bead strings to show each number.	A student draws a number line that starts with 68 and counts on.	A student records 60 + 70 and 8 + 3 to show partial sums.
A student uses a set of linking cubes with six sticks of 10 to show 60 and seven sticks of 10 to show 70.	A student uses two hundreds charts to show how they added.	A student records 68 + 2 + 71.

The examples in the chart show the different ways students might represent the problem. You want to help them make connections between their specific representation and the problem as well as between the different representations across categories (physical-visual-symbolic) and within a category (base-ten blocks–bead counters–linking cubes).

Tip #6 Talk about it.

Learning to solve problems comes from sharing the ideas and strategies that worked and those that didn't work. Be careful to avoid conversations that simply list the steps one took to solve the problem. Focus the conversation on student thinking. Ask questions like these:

- What did you know about the problem? What were you trying to find out?
- How can you describe the problem in your own words?
- How did you represent the problem?
- How does your representation connect to the problem?
- How does your representation compare with others' representations?
- How do you know your answer makes sense?
- Why did you choose _____ (operation) to solve the problem?
- How is your strategy similar to/different from _____ (another student's)?

Tip #7 Grow reasonableness.

"How do you know your answer makes sense?" is one of the most important questions you can ask your students. Keep in mind that checking for reasonableness is not the same as solving a problem and then using the inverse operation or steps to see if it is correct. To develop reasonableness, incorporate estimation into your math class often (see Estimation, p. 127), and talk with students about their thinking after they find a solution. Every time ask, "How do you know your answer makes sense?" And be sure to talk about how *you* know an answer makes sense—what you ask yourself to check for reasonableness. This helps them develop understanding of what questions they should consider.

Tip #8 Use diverse problem types when using word problems.

Not all word problems are created equal. In fact, there are different types of word problems. Consider this simplified version of problem types, and use a balanced mix of them during instruction.

Addition and subtraction		
Result unknown	**Change unknown**	**Start unknown**
There were 24 cookies on a tray. Ten were eaten. How many were left?	There were 24 cookies. Fourteen were left on a tray. How many cookies were eaten?	Ten cookies were eaten, and 14 were left. How many cookies were there to begin with?

Multiplication and division		
Product unknown	**Group size unknown**	**Number of groups unknown**
There are 6 bags of cookies with 4 cookies in each bag. How many cookies are there?	There are 24 cookies in 6 bags. How many cookies are there in each bag?	There are 24 cookies with 4 cookies in each bag. How many bags are there?

Notes