DOINGWHATWORKS

PRESENTATION
5:17 min

Full Details and Transcript

Preparing Problems for Classroom Instruction

January 2012

Topic IMPROVING MATHEMATICAL PROBLEM SOLVING IN GRADES 4 THROUGH 8

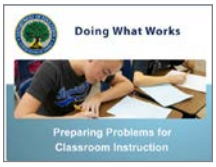
Practice PREPARE PROBLEMS

Highlights

- Problem solving should be an active part of mathematics teachers' classroom instruction.
- Teachers need to look for supplementary sources of problems beyond textbooks.
- Students need to be familiar with the context and language of problems. Teachers can help personalize by rewording problems, placing them into familiar contexts that better align with students' backgrounds, and clarifying unfamiliar words in advance.
- Teachers should review with students the mathematics concepts required to solve problems.
- It is important to explicitly teach academic language (especially for English language learners) and review the meaning of specialized mathematics vocabulary.
- Ideally teachers will choose problems with multiple entry points and use a balance of routine and non-routine problems.

- Routine problems have predictable solutions; non-routine problems require that students grapple with new skills and concepts.
- Teachers can provide additional student time for problem solving by offering worked examples during seatwork and homework.

Full Transcript



Slide 1: Welcome

Welcome to the overview on Preparing Problems for Classroom Instruction.

Slide 2: Classroom instruction

When students are given mathematical challenges in meaningful real-world problems, they are more likely to strengthen their skills and gain a deeper understanding of math concepts.

Problem solving should not be reserved solely for homework and individual practice assignments. It should be an active part of mathematics teachers' classroom instruction.

Slide 3: Selecting problems

In order to effectively incorporate problem solving into daily instruction, teachers need to allocate time to allow for thoughtful selection of problems as they do their advance preparation.

They will likely need to explore a variety of supplementary materials to find relevant and appropriate problems to extend the examples provided in their mathematics textbooks.

Slide 4: Context and language

For students to be able to focus on the mathematics and reasoning required to solve a problem, they need to be familiar with the context and language of that problem. Trying to learn background knowledge and vocabulary at the same time as problem solving can be counterproductive.

When a math problem is couched in terms and concepts that are foreign to students, they become distracted from the goal of the exercise. Instead of focusing on the mathematics and reasoning required to solve the problem, they focus on the unfamiliar situation and vocabulary.

Slide 5: Scaffolding

Teachers can help students by rewording problems, placing them in familiar contexts that better align with students' backgrounds, and clarifying unfamiliar words in advance.

Students tend to engage more actively and perform better when problems are presented in personalized contexts that appeal to their interests.

Slide 6: Sample problem

For example, consider the following problem about grocery shopping:

Mrs. Sears spent 2/5 of the money she had for groceries at the meat store and then spent 1/3 of what was left at the fish market. She had $30 left. How much did she start with?

Changing the context of this question so that it is about using gift cards at an electronics store may more effectively engage students:

On his first visit to Gadgets Galore, Lee used 2/5 of the value of the gift card he got for Christmas. The next day he used 1/3 of what was left. $30 remained on the card. How much was the gift card worth when he received it?

Slide 7: Share knowledge of context

To check on whether the context of a problem is familiar to students, teachers might ask the class to share what they know about that context before working on the problem with them.

These strategies are especially important for English language learners and for students who are currently struggling with mathematics.

Slide 8: Requisite mathematics knowledge

When considering whether or not to use a problem, the teacher should take some time to review with the class the mathematics concepts required to solve it.

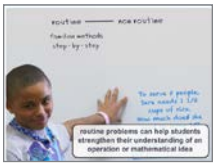
The longer it has been since the underlying concepts have been addressed, the more beneficial such a review will be, especially for struggling students.

Slide 9: Mathematics vocabulary

It is important to explicitly teach academic language and review the meaning of specialized mathematics vocabulary, such as *divisor* or *hypotenuse*. For words that have multiple meanings, such as *area, table, root,* and *volume*, teachers should be careful to note and distinguish how these words are used in a mathematical context. This is particularly essential for English language learners.

Slide 10: Multiple entry points

To facilitate lively class discussion about different approaches, teachers should try to present problems with multiple entry points. To get started on a problem, students might begin a problem by drawing a picture of key problem elements, or preparing a representation such as a strip diagram, listing what they know and need to know, or even acting out a transaction in the problem. As students discover more than one way to solve the problem, it may spur their curiosity, deepen their engagement, and solidify their understanding of mathematical concepts.



Slide 11: Balance routine and non-routine

Finally, teachers should try to strike a balance between routine and non-routine problems.

Routine problems are those that can be solved using familiar methods in step-by-step fashion—even if the problem is cognitively demanding and requires many steps.

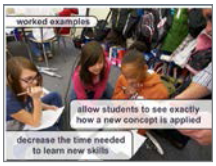
Routine problems can help students strengthen their understanding of an operation or mathematical idea.

Slide 12: Non-routine problems

Non-routine problems, on the other hand, require that students grapple with new skills and mathematical concepts that they may not yet have mastered. Unlike routine problems, these don't have predictable solution paths.

Non-routine problems help students think strategically and apply mathematics in new situations.

Of course, what is non-routine for a less experienced problem solver may be routine for more advanced students.



Slide 13: Worked examples

A teacher can increase students' exposure to problem solving by providing worked examples during seatwork and homework.

Worked examples have benefits for student learning, allowing students to see exactly how a new concept is applied, and can decrease the time needed to learn new skills.

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