



Presentation

FULL DETAILS AND TRANSCRIPT

The Content of Math Interventions

December 2009

Topic: Response to Intervention in Elementary-Middle Math
Practice: Foundations of Arithmetic

Highlights

- Determining focus on math interventions based on National Mathematics Advisory Panel recommendations
- For K-5, focus on whole numbers, including place value and addition and subtraction operations with whole numbers
- For 4-8, focus on rational numbers and operations with fractions, decimals, ratios, and percents and complex operations with whole numbers
- Explicitly teaching how to solve word problems using problem types with examples and information about teaching students to identify irrelevant information
- Daily practice on fluency with math facts during interventions and cumulative review
- Strategy approaches to fact teaching, including counting on, deriving facts using properties
- Criteria for selecting a math intervention program

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Welcome to the overview on The Content of Math Interventions.

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When preparing to implement Response to Intervention in mathematics, school leaders will need to determine the content focus for Tier 2 and Tier 3 interventions.

The goal of these interventions is mastery of the fundamental mathematics proficiencies. This focus needs to be kept in mind at all times, and the temptation to oversimplify content avoided.

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Students who are at risk for struggling with mathematics are best served by mastering the essential topics recommended by the National Mathematics Advisory Panel for their grade levels.

At the elementary and middle school levels, this means

- giving an in-depth treatment of a limited number of topics,
- helping students make sense of mathematics operations,
- explicitly demonstrating how to solve word problems, and
- providing continual practice so that students can develop fact fluency.

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Let's take a look at the essential topics for elementary and middle school interventions, along with some strategies for teaching word problems and providing practice with math facts.

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For students in kindergarten through grade 5, Tier 2 and 3 interventions should emphasize working with whole numbers.

Essential skills include strategic counting, number composition, solving problems involving whole numbers, understanding place value and the underlying meaning of addition and subtraction operations.

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In grades 4 through 8, Tier 2 and 3 interventions should focus on rational numbers and operations with fractions, decimals, ratios, and percents. Students will also need help understanding more complex operations with whole numbers, such as long division.

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Evidence is strong that struggling students at all grade levels benefit from interventions that explicitly teach how to solve word problems. Most students who struggle with math have severe difficulties with this kind of exercise and need assistance recognizing the underlying structure of different types of problems. Once they understand the type of problem represented by the exercise, they have a better chance at figuring out what solution to apply.

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Here are some examples of problem types:

Change problems involve adding or subtracting a quantity and often have an element of time involved.

Compare problems involve comparing quantities of items in different sets.

Division problems entail dividing a collection into groups or an item into parts.

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Students should be able to analyze word problems, categorize them by type, and then apply the appropriate type of solution. It may be useful to help students visualize or represent the problem pictorially.

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Struggling students are often distracted by information in word problems that is superficial or irrelevant to the underlying problem. Interventionists can help students learn to identify which details are relevant and how they apply to operations.

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Quick retrieval of math facts is critical for success in all mathematics, including problem solving. A lack of fluency with math facts is a major obstacle for students who are struggling with word problems or learning new math concepts. Students can't understand and work with fractions, for example, without rapid and accurate recall of whole number operations.

Interventions in Tiers 2 and 3 should include at least 10 minutes of practice with arithmetic facts per day. This helps students build automatic retrieval of facts, freeing up their working memory for problem solving.

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Some research shows that *strategic approaches* are more effective for learning and practicing facts than rote memorization.

For younger students, strategies might include explicit modeling of counting on or counting up, which struggling students may not learn on their own, and presenting facts in number families.

For grades 2 through 8, explicit strategies could include teaching students to derive facts by using the associative, commutative, and distributive properties.

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There are many ways for students to practice with arithmetic facts: flash cards, games, contests and competitions, and computer-supported instruction. Regardless of the format, cumulative and frequent review builds the automaticity students need to further their mathematic understanding.

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When selecting or developing intervention programs, focus on those that integrate computation problem solving and include frequent reviews. Ideally, programs will come with assessments that facilitate placement and progress monitoring.

Alignment of Tier 2 and 3 interventions with the core curriculum is not as important as the focus on foundational mathematics proficiencies. It is not essential to cover all math topics in intervention because students will be exposed to them in the core curriculum.

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When selecting intervention programs and math materials, it's important to have individuals who are knowledgeable about mathematics involved in the process. Tier 2 and 3 intervention programs should focus

on proficiency with whole and rational numbers, understanding the reasoning that underlies operations, building fact fluency, and identifying the structure of word problems so that familiar solutions can be accurately applied to them.

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To learn more about The Content of Math Interventions, explore the additional resources on the Doing What Works website.