



# Assisting Students Struggling with Mathematics: Response to Intervention (RtI) for Elementary and Middle Schools— An Intro Brief

NCEE 2009-4060 US Department of Education

Recommendation	Potential Roadblocks and Solutions	
Recommendation 1	Roadblock	Solutions/Remarks
<p>Screen all students to identify those at risk for potential mathematics difficulties and provide interventions to students identified at risk.</p> <ul style="list-style-type: none"> <li>Construct a team to evaluate potential screening measures. Include those with a background in mathematics education and expertise in measurement.</li> <li>Pick screening measures that cover instructional objectives and content for each grade.</li> <li>Use screening measures together with state tests in fourth and eighth grade.</li> <li>Use the same screening measures district wide.</li> </ul>	Resistance—Time and Material Allocation	Use Data Collection teams to screen students
	Resistance— Why test all students?	Remind staff that students not considered “at risk” could be so at later points; best to monitor all students.
	Measures May Identify those Not in Need and Not Identify those in Need	Understand the tradeoff between sensitivity and specificity of the measure.
	Resources may not be available for schools where a large proportion of schools is identified.	“Districts will have to determine the resources they have to provide interventions and the number of students they can serve with their resources”
Recommendation 2	Roadblock	Solutions/Remarks
<p>Instructional materials for students receiving interventions should focus intensely on in-depth treatment of whole numbers in kindergarten through grade 5 and on rational numbers in grades 4 through 8. These materials should be selected by committee.</p> <ul style="list-style-type: none"> <li>K-5 tier 2 and 3 interventions should focus on whole numbers and operations.</li> <li>Grades 4 through 8 Tier 2 and 3 interventions should focus on in depth coverage of rational number and advanced arithmetic.</li> <li>Committees should be formed that include experts in mathematics and mathematics education with knowledge of elementary and middle school curriculums.</li> </ul>	Alignment of intervention to core curriculum	Tiers 2 and 3 focus on foundational proficiency. The instruction is supplemental, so the regular curriculum is addressed in core classes.
	Intervention materials may leave topics out	Interventions should focus on whole and rational numbers depending on grade level. Other topics are covered in the core curriculum.

- Four Criteria for Intervention Materials***
1. Integrates computation with problem solving.
  2. Stresses reasoning and sense making for calculations.
  3. Materials should ensure student growth in building algorithmic proficiency.
  4. Frequent review and practice is included.

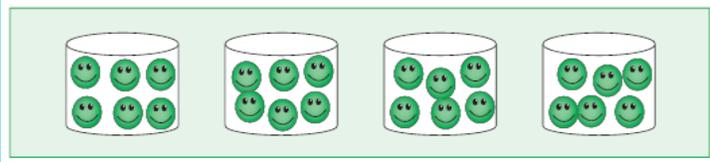


**“Life is a continuous exercise in creative problem solving”**  
 ~Michael J. Gelb

Recommendation	Potential Roadblocks and Solutions	
Recommendation 3	Roadblock	Solution
<p>Instruction during the intervention should be <u>explicit and systematic</u>. This includes providing models of proficient problem solving, verbalization of thought processes, guided practice, corrective feedback, and frequent cumulative review.</p> <ul style="list-style-type: none"> <li>• Instructional materials should be systematic and explicit.</li> <li>• Provide students with problem solving opportunities within a group setting to foster communication of strategies.</li> <li>• Ensure that instructional materials provide an exhaustive review for each session.</li> </ul>	<p>Lack of teacher awareness on how to implement the intervention</p>	<p>Provide professional development sessions where teachers can observe the intervention and role play (practice) being a part of the intervention.</p>
	<p>Those who are intervening may not know the mathematical content.</p>	<p>Knowing the content is vital. Professional development should be given to increase content knowledge.</p>
	<p>Intervention does not have enough models, practice, or think alouds.</p>	<p>Have a mathematics coach or content specialist develop a template that includes the necessary models, think alouds, and practice.</p>
Recommendation 4	Roadblock	Solution
<p>Interventions should include instruction on solving word problems that are based on common underlying structures.</p> <ul style="list-style-type: none"> <li>• Teach students about the structure of various problem types, how to categorize problems based on structure and how to determine appropriate solutions for each problem type.</li> <li>• Teach children to recognize the common underlying structure between familiar and unfamiliar problems and to transfer known solution methods from familiar to unfamiliar problems.</li> </ul>	<p>Curricular material may not classify problems into problem type.</p>	<p>Obtain help from a math specialist to determine problem type and an instructional sequence for teaching them to students.</p>
	<p>As problems get complex, so will the problem type and the task of discriminating among them.</p>	<p>Teach children explicitly to differentiate one problem type from another.</p>
<p><b>Example 2. Compare problems</b></p> <p>There are 21 hamsters and 32 kittens at the pet store. How many more kittens are at the pet store than hamsters?</p> <p>32</p> <p>21 ?</p>		<p>10. <math>P</math>, <math>Q</math>, <math>R</math>, and <math>S</math> represent different towns on the map above, which is drawn to scale. Three of the distances shown are correct. Which distance CANNOT be correct?</p> <p>(A) 8        (B) 12        (C) 13        (D) 26</p>



**Example 7. Manipulatives can help students understand that four multiplied by six means four groups of six, which means 24 total objects**

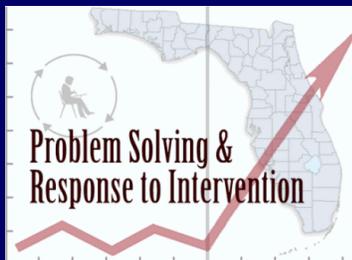


Recommendation	Potential Roadblocks and Solutions	
Recommendation 5	Roadblock	Solution
<p>Intervention materials should include opportunities for students to work with visual representations or mathematical ideas and interventionists should be proficient in the use of visual representations of mathematics ideas.</p> <ul style="list-style-type: none"> <li>• Use visual representations such as number lines, arrays, and strip diagrams.</li> <li>• If visuals are not sufficient for developing accurate abstract thought and answers, use concrete manipulatives first. Use of manipulatives with older students should be expeditious because the goal is to move toward understanding of visual representations, and finally, to the abstract.</li> </ul>	Curricular material may not provide visual representations.	Districts can develop materials, or use the help of a math coach.
	The belief that using concrete materials takes too much time.	Use manipulatives in the initial stages strategically and then scaffold instruction to the abstract level.
	Interventionists do not understand the mathematical ideas behind fractions, integers, proportional reasoning, etc.	Interventionist should obtain professional development or instruction to strengthen their mathematics background.
Recommendation 6	Roadblock	Solution
<p>Interventions at all grade levels should devote about 10 minutes in each session to building fluent retrieval of basic arithmetic facts.</p> <ul style="list-style-type: none"> <li>• Provide about 10 minutes per session of instruction to build quick retrieval of basic arithmetic facts. Use technology, flash cards, and other practice materials.</li> <li>• In grades K-2, explicitly teach strategies for efficient counting to improve the retrieval of mathematics facts.</li> <li>• Teach students in grades 2 through 8 how to use their knowledge of properties, such as commutative, associative, and distributive law, to derive facts in their heads.</li> </ul>	Students may find fact fluency practice tedious and boring.	Use games and other motivational strategies to make learning fun for students.
	Curriculum may not include fact practice or materials for promoting fact practice.	Use supplemental programs and technology to promote this needed practice.

*An In-Depth Look Into Materials*

- Materials should gradually build proficiency.
- Should include step-by-step models of how to perform problem with reason for those steps embedded in instruction.
- Materials should provide districts with sample think alouds and scenarios for explaining concepts.
- The materials should provide teachers with many models on how to solve the problem.

Recommendation	Potential Roadblocks and Solutions	
Recommendation 7	Roadblock	Solution
<p>Monitor the progress of students receiving supplemental instruction and other students who are at risk.</p> <ul style="list-style-type: none"> <li>• Monitor the progress of Tier 2, 3, and borderline tier 1 students at least once a month using grade-appropriate general outcome measures.</li> <li>• Use curriculum embedded assessments in interventions to determine whether students are learning from the interventions. These measures can be used as often as every day or as infrequently as once every other week.</li> <li>• Use progress monitoring to regroup students when necessary.</li> </ul>	<p>Students are at different levels in any given classroom and will make grouping for interventions difficult.</p>	<p>Consider grouping students across classes for intervention purposes. Differentiated instructional groups can also be used.</p>
	<p>There is no time for teachers to properly implement progress monitoring.</p>	<p>Train paraprofessionals or other school staff to implement Progress Monitoring.</p>
Recommendation 8	Roadblock	Solution
<p>Include motivational strategies in Tier 2 and Tier 3 interventions</p> <ul style="list-style-type: none"> <li>• Reinforce or praise students for their effort and for attending to and being engaged in the lesson.</li> <li>• Consider rewarding student accomplishments.</li> <li>• Allow students to chart their progress and to set goals for improvement</li> </ul>	<p>Rewards can reduce genuine interest in mathematics by directing students attention towards gathering rewards rather than learning the mathematics.</p>	<p>Use rewards and praise to encourage effort, engagement, and achievement. Research in other content areas has demonstrated that rewards and praise increase the likelihood of students academic success.</p>
	<p>Difficulty of determining rewards that are appropriate for individual students</p>	<p>Use interest inventories or parent input to determine rewards that will motivate the students.</p>
	<p>It is difficult to fit feedback into instructional time without depleting instructional time.</p>	<p>Verbal praise can be used along with time management techniques to reduce “reward” time. Moreover, praise and specific feedback has been shown to positively influence students achievement.</p>



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