Supplemental Handouts

Response to Instruction and Intervention for Math: Assessment~Collaboration~Instruction

Making a Difference:
Educational Practice that Work!

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Handout 1

National Math Panel

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To compete in the 21st century global economy, knowledge of and proficiency in mathematics is critical. Today's high school graduates need to have solid mathematics skills—whether they are headed for college or the workforce. To help ensure our nation's future competitiveness and economic viability, President George W. Bush created the National Mathematics Advisory Panel (National Math Panel) in April 2006.

The panel was charged with providing recommendations to the President and U.S. Secretary of Education Margaret Spellings on the best use of scientifically based research to advance the teaching and learning of mathematics. Expert panelists, including a number of leading mathematicians, cognitive psychologists, and educators, reviewed numerous research studies before preparing a final report containing guidance on how to improve mathematics achievement for all students in the United States.

The National Math Panel's final report, issued on March 13, 2008, contains 45 findings and recommendations on numerous topics including instructional practices, materials, professional development, and assessments. Highlights from the report are briefly summarized below. Please visit www.ed.gov/MathPanel for the executive summary and full report.

Core Principles of Math Instruction

- The areas to be studied in mathematics from pre-kindergarten through eighth grade should be streamlined and a well-defined set of the most important topics should be emphasized in the early grades. Any approach that revisits topics year after year without bringing them to closure should be avoided.
- Proficiency with whole numbers, fractions, and certain aspects of geometry and measurement are the foundations for algebra. Of these, knowledge of fractions is the most important foundational skill not developed among American students.
- Conceptual understanding, computational and procedural fluency, and problem solving skills are equally important and mutually reinforce each other. Debates regarding the relative importance of each of these components of mathematics are misguided.
- Students should develop immediate recall of arithmetic facts to free the "working memory" for solving more complex problems.
- The benchmarks set forth by the Panel should help to guide classroom curricula, mathematics instruction, textbook development, and state assessments.
- More students should be prepared for and offered an authentic algebra course at Grade 8.
- Algebra should be consistently understood in terms of the "Major Topics of School Algebra," as defined by the National Math Panel.
- The Major Topics of School Algebra include Symbols and Expressions; linear equations; quadratic equations; functions; algebra of polynomials; and combinatorics and finite probability.

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Student Effort Is Important

Much of the public's "resignation" about mathematics education is based on the erroneous idea that success comes from inherent talent or ability in mathematics, not effort. A focus on the importance of effort in mathematics learning will improve outcomes. If children believe that their efforts to learn make them "smarter," they show greater persistence in mathematics learning.

Importance of Knowledgeable Teachers

- Teachers' mathematical knowledge is important for students' achievement. The preparation of elementary and middle school teachers in mathematics should be strengthened. Teachers cannot be expected to teach what they do not know.
- The use of teachers who have specialized in elementary mathematics teaching could be an alternative to increasing all elementary teachers' mathematics content knowledge by focusing the need for expertise on fewer teachers.

Effective Instruction Matters

- Teachers' regular use of formative assessments can improve student learning in mathematics.
- Instructional practice should be informed by high-quality research, when available, and by the best professional judgment and experience of accomplished classroom teachers.
- The belief that children of particular ages cannot learn certain content because they are "too young" or "not ready" has consistently been shown to be false.
- Explicit instruction for students who struggle with math is effective in increasing student learning. Teachers should understand how to provide clear models for solving a problem type using an array of examples, offer opportunities for extensive practice, encourage students to "think aloud," and give specific feedback.
- Mathematically gifted students should be allowed to accelerate their learning.
- Publishers should produce shorter, more focused and mathematically accurate mathematics textbooks. The excessive length of some U.S. mathematics textbooks is not necessary for high achievement.

Effective Assessment

The National assessment of Educational Progress (NAEP) and state assessments in mathematics should be improved in quality and should emphasize the most critical knowledge and skills leading to Algebra.

Importance of Research

The nation must continue to build the capacity for more rigorous research in mathematics education to inform policy and practice more effectively.

For more information, please visit www.ed.gov/mathpanel.

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Handout #2
IES RtI Mathematics Practice Guide
8 Recommendations and Level of Evidence

Tier 1	
1. Screen all students to identify those at risk for potential mathematics difficulties and provide interventions to students identified as at risk.	**Moderate**
Tiers 2 and 3	
2. 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.	**Low**
3. Instruction during the intervention should be explicit and systematic. This includes providing models of proficient problem solving, verbalization of thought processes, guided practice, corrective feedback, and frequent cumulative review.	**Strong**
4. Interventions should include instruction on solving word problems that is based on common underlying structures.	**Strong**
5. Intervention materials should include opportunities for students to work with visual representations of mathematical ideas and interventionists should be proficient in the use of visual representations of mathematical ideas.	**Moderate**
6. Interventions at all grade levels should devote about 10 minutes in each session to building fluent retrieval of basic arithmetic facts.	**Moderate**
7. Monitor the progress of students receiving supplemental instruction and other students who are at risk.	**Low**
8. Include motivational strategies in tier 2 and tier 3 interventions.	**Low**

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Breakout Activity
(Handout #3)
Scaffolding Problem Solving:
Focus on the Process rather than Arithmetic

An oak seedling grew 10 inches in the first year. Every year after, it grew 1 inch. After 9 years the oak tree was 18 inches tall.

An oak seedling grew 25 feet in the first year. Every year after it, grew 5 feet. After 4 years the oak tree was 40 feet tall.

An oak seedling grew 4 meters in the first year. Every year after, it grew 2 meters. After 7 years, how tall was the oak tree?

Robert planted an oak seedling. It grew 10 inches the first year. Every year after, it grew 1 ¼ inches. How tall was the oak tree after 9 years?

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Breakout Activity
Handout #4a

Radius	Circumference $C=2\pi r$	Area $A=\pi r^2$
r=		
r=		
r=		
What is the relationship:		

Handout #4b

Radius	Circumference $C=2\pi r$	Area $A=\pi r^2$
r=2in		
r=4in		
r=8in		
What is the relationship:		

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Handout #4c

Radius	Circumference $C=2\pi r$	Area $A=\pi r^2$
r=2in	4π inches	4π in^2
r=4in		
r=8in		
What is the relationship:		

Handout #4d

Radius	Circumference $C=2\pi r$	Area $A=\pi r^2$
r=2in	4π inches	4π in^2
r=4in	8π inches	16π in^2
r=8in	16π inches	64π in^2
What is the relationship:		

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*S*paced *I*nstructional *R*eview Planning Sheet
(Handout #5)

Block (Date)	Big Ideas Covered (or specific skills)	Problematic Areas	Problematic Areas Targeted for SIR	Date and Instructional Time Allotted (30-40 minutes)
	1. **2.** **3.** **4.** **5.**	**1.** **2.** **3.** **4.**	**1.** **2.**	
	1. **2.** **3.** **4.** **5.**	**1.** **2.** **3.** **4.**	**1.** **2.**	
	1. **2.** **3.** **4.** **5.**	**1.** **2.** **3.** **4.**	**1.** **2.**	
	1. **2.** **3.** **4.** **5.**	**1.** **2.** **3.** **4.**	**1.** **2.**	

Notes: Use assessment data from Teacher assessments (formal & informal), Progress Monitoring data sources, State Assessments, and other sources of information (teacher's experience). Table abbreviated for space considerations.

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Additional Information and References

Ellis, E. S., Worthington, L., & Larkin, M. J. (1994). *Executive summary of research synthesis on effective teaching principles and the design of quality tools for educators* (Technical Report No. 6, University of Oregon, National Center to Improve the Tools of Educators). Retrieved July 17, 2004, from http://idea.uoregon.edu/~ncite/documents/techrep/other.html

Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R., & Witzel, B. S. (2009). *Assisting students struggling with mathematics: Response to Intervention (RtI) for elementary and middle schools* (NCEE 2009-4060). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/publications/practiceguides/.

Pashler, H., Bain, P., Bottge, B., Graesser, A., Koedinger, K., McDaniel, M., and Metcalfe, J. (2007). *Organizing Instruction and Study to Improve Student Learning* (NCER 2007-2004). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ncer.ed.gov.

Riccomini, P. J. & Witzel, B. S. (2010). *Response to intervention in math.* Thousands Oaks, CA: Corwin Press. www.corwinpress.com

Riccomini, P. J. & Witzel, B. S. (2010). *Computation of integers: Mathematics interventions for middle and high school students*. Upper Saddle River, NJ: Pearson Education Inc. http://www.pearsonhighered.com

Stein, M., Kinder, D., Silbert, J., & Carnine, D. W. (2006). *Designing effective mathematics instruction: A direct instruction approach* (4th ed.). Ohio: Pearson-Merrill Prentice Hall.

U.S. Department of Education. (2008). *Foundations for Success: The Final Report of the National Mathematics Advisory Report.* Washington, DC: Retrieved from http://www.ed.gov/MathPanel.

Witzel, B., & Riccomini, P. J. (2009). *Computation of fractions: Math interventions for elementary and middle grades students*. Upper Saddle River, NJ: Pearson Education Inc. http://www.pearsonhighered.com

Witzel, B., & Riccomini, P. J. (2011). *Solving Equations: An Algebra intervention.* Upper Saddle River, NJ: Pearson Education Inc. http://www.pearsonhighered.com

Parts of this presentation were taken from:

U.S. Department of Education. (2008). *Foundations for Success: The Final Report of the National Mathematics Advisory Report.* Washington, DC: Retrieved from http://www.ed.gov/MathPanel.

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