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Multi-tiered Systems of Support: Developing Interventions that Engage

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Topics for Today

• Brief overview of RtI Model, one version of a multi-tiered system of support (MTSS)
• What helps students with disabilities build cognitive structures and connections in mathematics? What doesn’t help???
• Research based interventions to try (not buy)
• Diagnostic interviews - a way to gather feedback on students’ mathematical thinking
• Strategies for teaching math that DON’T EXPIRE!!

Differentiation versus Intervention

• Differentiation
  – Occurs during Tier 1 instruction
  – Allows for different abilities in the same instructional session with grade level content – IN the current curriculum
  – Hides the fact that students are working on different tasks
• Intervention
  – Occurs during Tier 2 and 3 instruction
  – Develops specific skills and concepts for a targeted group of students to address areas of identified weakness by building on students’ strengths
  – Provides intentional foundational support that may not be grade level – may NOT be in the current mathematics curriculum

What are the Differences?

What if one student had a good understanding of a mathematical concept and the other student had only memorized the idea (or was challenged to effectively memorize the concept or skill – like a student with disabilities)?

Intervention Recommendations from Research

– Concrete–Semi-Concrete–Abstract (CSA) visual approach
– Explicit instruction
– Underlying mathematical structures

Based on:


So, What did You Learn in Elementary School?

• With the person sitting next to or around you, discuss these rules – were you taught them in elementary school?
• Addition makes numbers bigger.
• Multiplication makes numbers bigger.
• Decide if the rules shown at the right are always true.
• When you multiply a number by 10, just put a 0 on the end of the number.
• If the rule is not always true, find a counterexample.
Goal – Try to AVOID DEAD ENDS

“13 Rules that Expire” (Karp, Bush & Dougherty, August 2014 in Teaching Children Mathematics)

“12 Math Rules that Expire in the Middle Grades” – Mathematics Teaching in the Middle School.

“Circumventing High School Rules that Expire” – Mathematics Teacher November 2017

Another Option - from Magdalene Lampert

• You – Start the problem (on your own)
• Y’All – Share ideas with peers
• We – Share ideas and strategies with the whole class – including misunderstandings (let’s not wait for the test to find out what students don’t know)

Can an Intervention Provide time to Discuss Options?

How could students talk about which of the following three options would be the correct answer?

• The shepherd is 30 years old
• The shepherd is 125 years old; and
• It is not possible to tell the shepherd’s age from the information given in the problem.

Can an Intervention Provide time to Discuss Options?

Why Avoid a Key Word Strategy?

• The use of a Key Word Strategy does not—
  – Develop of sense making or support making meaning
  – Build structures for more advanced learning
  – Appear in many problems
• Students consistently use Key Words inappropriately
• Multi-step problems are impossible to solve with a Key Word Strategy (and two step problems start in 2nd grade).

What is the Whole School Agreement?

How does it help MTSS?

• Decide on the language and models everyone will use – focusing on precision and consistency
• Prepare all students, from the beginning, to walk out of the building with the mathematical knowledge and processes they need
• Engage each and every student in “doing mathematics” to build long lasting understanding

Cai, J. (2010). Helping elementary school students become successful mathematical problem solvers. In D. Lambdin (Ed.), Teaching and learning mathematics: Translating research to the classroom (pp. 9–14). Reston, VA: NCTM.

Karp, Bush & Dougherty (2016) Establishing a Mathematics Whole School Agreement. NCTM.

Stein, Smith, Henningsen & Silver, 2000 - Mathematical Tasks Framework

Caldwell, Kobett & Karp (2014) Essential understanding of addition and subtraction in practice. grade 2-5/78