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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 <u>try</u> (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

- **C**oncrete--**S**emi-Concrete--**A**bstract (CSA) visual approach
- Explicit instruction
- Underlying mathematical structures

Based on:
Newman-Gonchar, R., Clarke, B., & Gersten, R. (2009). A summary of nine key studies: Multi-tier intervention and response to interventions for students struggling in mathematics. Portsmouth, NH: RMC Research Corporation, Center on Instruction.
Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* New York: Routledge.

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?
- Decide if the rules shown at the right are always true.
- If the rule is not always true, find a counterexample.

- Addition makes numbers bigger.
- Multiplication makes numbers bigger.
- When you multiply a number by 10, just put a 0 on the end of the number.

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.

Caldwell, Kobett & Karp (2014) *Essential understanding of addition and subtraction in practice, grades K-2*. NCTM.

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)

Clement & Bernhard, 2005 A problem solving alternative to using key words.
Van de Walle, J., Karp, K., & Bay Williams, J. (2016). *Elementary and Middle School Mathematics: Teaching developmentally*. New York: Pearson.

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