RI Intensive Math Intervention Project

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Helping Students With: Word Problems

Schema-Based Instruction: Additive Schemas

What is schema-based instruction? Schema-based instruction teaches students to categorize word problems by the word problem's underlying mathematical structure and then use an appropriate solution strategy. One category of schema is the additive schema.

How is it different from common instructional practice? Typical word problem instruction asks students to find keywords or identify word problems by an operation. Both approaches can mislead students. Key words can represent more than one operation. Identifying word problems by a single math operation is problematic because word problems can usually be solved by more than one operation. Furthermore, multistep word problems usually require multiple operations.

Why should I teach schemas? Schemas support solving single- and multi-step word problems because students begin to recognize separate and distinct mathematical structures.

What will students learn? Students will be able to recognize schemas of additive word problems, translate the information into a visual representation or equation, and correctly solve for the missing information.

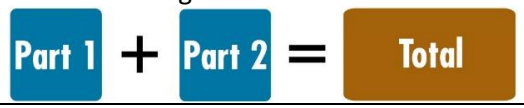
What should I avoid when teaching schemas? Don't tell students to look for key words. Don't tell students "This is an 'addition' word problem."

What students can this help? Schema-based instruction can support typical learners, students with disabilities, and multilingual/English learners.

There are three kinds of additive schemas. Additive schemas involve addition or subtraction procedures. One additive schema is the **combine** problem. Combine problems are sometimes called *total* or *part-part-whole* problems.

Combine problems put together two or more separate parts to make a total. Students are asked to solve for a total or one of the parts.

Student knowledge: Students need to know if they are solving for a total or a missing part.

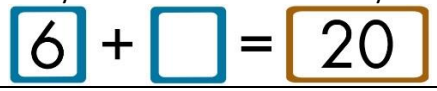


<u>Solving for a total:</u>

- Sam has 2 cookies. Ali has 3 cookies. How many cookies do they have altogether?

<u>Solving for a missing part:</u>

- There are 6 students in the classroom and some more students in the hallway. There are 20 students in all. How many students are in the hallway?



Adapted from Powell & Fuchs (2018) & IRIS Center [https://iris.peabody.vanderbilt.edu/module/math/cresource/q2/p06/]

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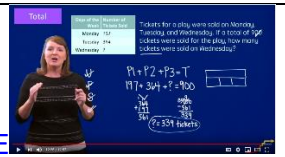
How do I teach this?

What should I do?	***What does this look like?***
Choose a schema to introduce to students.	"This is a type of problem called a combine problem. Let me show you why. "
Start with stories that contain all the information.	"Ayesha has 5 comic books. Riley has 3 comic books. They have 8 comic books altogether. It's a combine problem because two quantities or parts, Ayesha's and Riley's, are being combined for a total. In this problem, we know both parts, but we don't know the total."
Show students how to translate the information for each schema into a visual representation or equation. Teach students to use language in the full context of the schema, and not to rely on key words.	Part 1 + Part 2 = Total (Ayesha's books) + (Riley's books) = (Total books) 5 + 3 = 8
Teach students how to solve a word problem with an unknown quantity.	"Calla has 10 cupcakes. Jaden has 6 cupcakes. How many cupcakes do they have altogether?"
Students need to: 1. Read the word problem. 2. Identify the schema. 3. Translate the information into a visual representation or equation. 4. Solve the problem.	"What kind of problem is this?" *Combine problem.* "How do you know"? *Calla and Jaden both have cupcakes, and it's asking me to combine them for a total.* Part 1 + Part 2 = Total 10 + 6 = 16

Watch Dr. Sarah Powell introduce this additive schema. https://youtu.be/nMn56Su9C0E



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