RI INTENSIVE MATH INTERVENTION PROJECT

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Helping Students With Word Problems

Schema-Based Instruction: Multiplicative 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 multiplicative.

How is it different from other common instructional practices? Typical word problem instruction asks students to find keywords or identify word problems by an operation. Both approaches can mislead students because 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 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 a multiplication 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 multiplicative schemas. Multiplicative schemas involve multiplication or division procedures. One multiplicative schema is the **equal groups** problem.

Equal groups problems are when a group or unit is multiplied by a specific number for a product. Students are asked to solve for the unknown product (total) or unknown group.

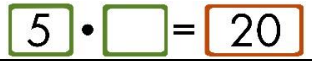
Student knowledge: Students need to know if they are solving for the number of missing groups, the number in each group, or the product (total).

<u>Product (total) unknown:</u>

- Tara has 6 bags of oranges. There are 4 oranges in each bag. How many oranges does Tara have?

<u>Groups/number unknown:</u>

- Matthew has 20 comic books. His bookshelf has 5 shelves. He wants to put an equal number of comic books on each shelf. How many comic books will he put on each shelf?



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

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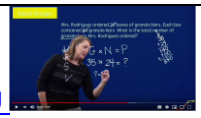
How do I teach this?

What should I do?	***What does this look like?***
Choose a schema to introduce to students.	"This is a type of problem called an equal groups problem. Let me show you why."
Start with stories that contain all the information.	"Yan has 48 soccer cards. The cards were sold in packets with 8 cards each. She bought 6 packets of cards. It's an equal groups problem because Yan has bought 6 packets and they all have an equal number of cards inside: 8. 6 equal groups of 8 means that she has 48 cards."
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, not to rely on key words.	Groups • Number in each group = Product 6 • 8 = 48
Teach the students how to solve a word problem with an unknown quantity.	Jenna has 3 boxes of colored pencils. She has 24 colored pencils in all. Each box is full. How many colored pencils are in each box?
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? *Equal groups problem*. How do you know? *Each box should have an equal number of colored pencils. We know how many she has in all, and how many groups (boxes). We need to know the number in each group.* Groups • Number in each group = Product 3 • unknown number in each group = 24 3 • 8 = 24

Watch Dr. Sarah Powell introduce this multiplicative schema. https://youtu.be/BPa6nNyy-MU



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