Intervention Name:
Schema-Based Instruction / Schema-Broadening Instruction (SBI)
Additive Schemas (addition and subtraction)*

Common Core State Standards Domain Areas: (check all that apply)

Counting and Cardinality (K)	Operations and Algebraic Thinking (K-5)	Numbers and Operations in Base Ten (K-5)	Numbers and Operations – Fractions (3-5)	Measurement and Data (K-5)	Geometry (K-HS)	Ratios and Proportional Relationships (6-7)	The Number System (6-8)	Expressions and Equations (6-8)	Statistics and Probability (6-HS)	Functions (8-HS)	Number and Quantity (HS)	Algebra (HS)	Modeling (HS)
	X	X	X										

Setting: (check all that apply)		
Whole-class	Small-group	Individual
X	X	X

Focus Area: (check all that apply)		
Acquisition	Fluency	Generalization
X	X	X

Function of Intervention:

A *schema* is a way to organize or pattern information within a structured framework of known and unknown information. Within word-problem work, the learner identifies the type of problem (i.e., schema), which lends itself to solving the problem using a given organizational pattern.

The main focus of Schema-Based Instruction or Schema-Broadening Instruction (SBI) is to teach word-problem solving using identification of a problem schema, representation using diagrams or equations to represent the schema, and solving the word problem. Scaffolding of student learning is provided throughout.

Brief Description:

Within each unit:

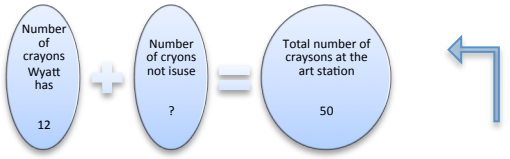
Schema instruction phase- Each type of problem (change, group, compare) is introduced through explicit instruction and requires students use schematic diagrams or equations, which help students understand the structure of the story problem.

Problem solution phase- Follow-up lessons teach students to solve story problems using a four-step checklist: FOPS

___ F - *Find* the problem type
___ O - *Organize* the information in the problem using the schematic diagram
___ P - *Plan* to solve the problem
___ S - *Solve* the problem

With mastery of the strategy, use of schematic diagrams are faded in favor of equations for each type of problem.

Additive Example for Group: There are 50 crayons at the art station, Wyatt is using 12 crayons. How many crayons are not being used?



Small group or parts | Large group or whole (total) | (Whole known)

See below for more examples.

Procedures:

- **Duration:** Students work on lessons utilizing SBI for 50 to 60 minutes each day, although some lessons may be as short as 30 minutes (Jitendra, 2007).
- **Teacher training:** Teachers must be familiar with the instructional scripts for each of the three problem types. It is recommended that teachers assign partners prior to instruction in efforts to maximize time on-task; change partners regularly, and monitor partner discussions and work.
- **Instructional practices:** Teachers should monitor use of checklist and schematic diagram for proper use and

application. Teacher differentiation of lessons is recommended (e.g., more directed instruction, examples, opportunities for response) according to student needs.

- **Monitoring system:** Progress monitoring assessment is recommended every 1 to 2 weeks in addition to ongoing informal assessments and observations. Students should be able to independently verbalize understanding of problem-solving steps and schematic diagrams prior to fading of checklists and diagrams.

Critical Components (i.e., that must be implemented for intervention to be successful):
Teacher scripts are intended to be followed as a framework for language and instruction, allowing teachers the liberty to provide additional scaffolding, explanations, or elaboration when necessary. Assessment should be criterion-based and assess the content that students are expected to learn to ensure mastery (Jitendra, 2007).

Critical Assumptions (i.e., with respect to prerequisite skills): Language contributes to the ability to solve mathematic stories or word problems; consequently students should be able to read and understand the word problem prior to learning to apply the problem-solving strategy. Equally important, students must have ample time to master new skills. Students who have been taught (but not mastered) multiple problem-solving strategies may confuse components. Therefore it may be best to teach a strategy (such as SBI) that allows for multiple opportunities to apply and generalize learned skills (Jitendra, 2007).

Materials:
Teacher script
Schematic diagrams
FOBS checklist (available in Jitendra, 2007)

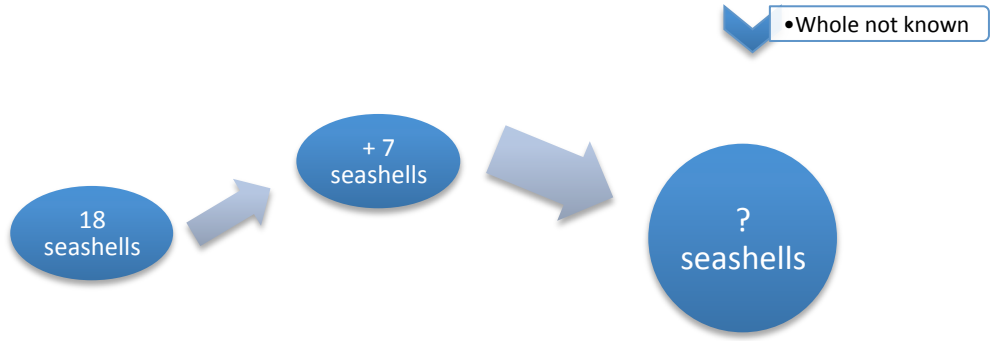
Additive Examples: Each example demonstrates a one-step additive (addition or subtraction) story problem.

Additive *Change*:

In a change problem, one amount increases or decreases (i.e., changes). In change problems, an action occurs and the word-problem situation occurs over time. In a change problem, the unknown can be (a) the starting amount, (b) the increase or decrease amount, or (c) the ending amount.

For example: Leah was collecting seashells on the beach. She has 18 seashells in her bucket and picks up 7 more seashells. How many seashells does she have now?

___ F - *Find* the problem type: In the problem, Leah has seashells and finds more, indicating that there is a change
___ O - *Organize* the information in the problem using the schematic diagram: Since we are changing the value by adding to it, we can set up an change diagram with the known values and unknown values (see below)
___ P - *Plan* to solve the problem: 18 + 7 = ?
___ S - *Solve* the problem: 18 + 7 = 25 seashells

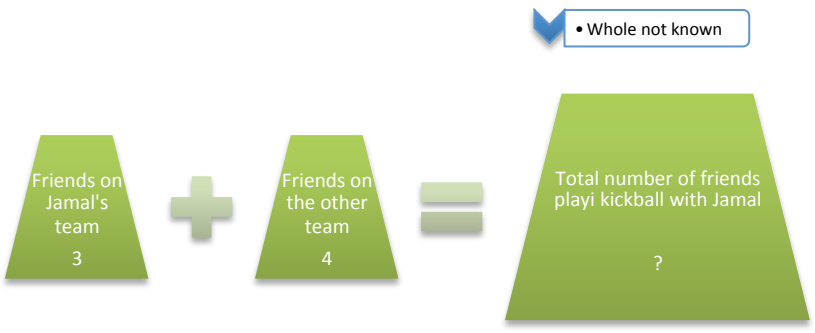


Additive *Group*:

In a group problem, amounts are put together for a total. Group problems are static. In group problems, the unknown can be (a) one of the amounts put together or (b) the total.

For example: Jamal is playing kickball with his friends. If Jamal has 3 friends on his team and 4 friends on the other team, how many friends is Jamal playing kickball with?

___ F - *Find* the problem type: The word problem shares information about two groups, suggesting that this is a group problem.
___ O - *Organize* the information in the problem using the schematic diagram: Since we are combining the values of two groups, we can set up a group diagram with the known values and unknown values (see below)
___ P - *Plan* to solve the problem: 3 + 4 = ?
___ S - *Solve* the problem: 3 + 4 = 7 friends



Smaller groups or parts Large group or whole (total)

Additive Compare:

In a compare problem, two amounts are compared to determine the difference. Compare problems are static. In a compare problem, the unknown can be (a) the greater value, (b) the lesser value, or (c) the difference between the greater and lesser values.

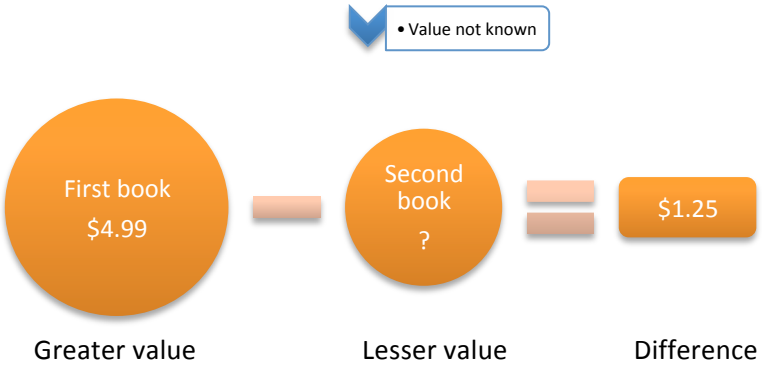
For example, Monica sees a book that she wants to purchase for $4.99. She continues shopping and finds another book that costs $1.25 less than the first book. How much did the other book cost?

___ F - *Find* the problem type: The problem asks that we compare the price of the first book to that of the second book to find the difference between the two

___ O - *Organize* the information in the problem using the schematic diagram: Since we are comparing two values and know the difference, we can set up a compare diagram with the known values and unknown values (see below)

___ P - *Plan* to solve the problem: $4.99 - ? = $1.25

___ S - *Solve* the problem: $4.99 - $3.74 = $1.25



References:

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*Information and Examples for multiplicative SBI (multiplication and division) are available in a separate EBI Network brief