



Grades 4-8

Stem/Question/Solution Triangles

A guide to looking at word problems in three distinct parts, which enables teachers to scaffold them so that students conceptualize the question themselves.

Using Multiple Representations

An approach where students learn how to make sense of word problems by generating various representations of problems, such as an equation, table, diagram, or graph.

Mathematical Diagrams

A method of using diagrams of a problem situation to determine where the numbers in the problem are coming from.

Helping Students Shift to Sense-making from just "Finding the Answer"

A SERP partnership with middle school mathematics teachers in San Francisco Unified School District set out to explore why students were struggling with math in the middle grades. Data indicated that students did not struggle with particular math topics, but rather with particular problem types: word problems.

As a result, **Tools for Sense-making in Mathematics** was developed, an approach that not only helps teachers guide students through solving word problems, but also attends to shifting the culture of the math classroom away from answer-getting and toward sense-making.

Example of a **Stem/Question/Solution Triangle**:

STEM:

Offers a brief description of some quantitative information.

A dragonfly can fly fast. It can go about 50 feet in two seconds.



QUESTION:

Uses the information in the stem and asks that it be applied to a situation that is different or more detailed.

How many seconds would it take for the dragonfly to go 275 feet?

SOLUTION:

Provides a mathematical representation of the question using the information in the stem, as well as an answer.

$$\frac{2 \text{ sec}}{50 \text{ feet}} = \frac{n \text{ sec}}{275 \text{ feet}}$$
$$n = 11$$

Why give students problems to solve? To learn mathematics. Answers are part of the process, they are not the product. The product is the student's mathematical knowledge and know-how.

Phil Daro, CCSS-M Co-author

Check out the tools online!

serpinstitute.org/sensemaking

Diagnostic Teaching

Tools for Sense-making in Mathematics led to the development of **Poster Problems**, a set of 12 two-day lessons for sixth and seventh grades specifically designed so teachers can see and analyze the thinking of students in real time.

Development of Tools for Sense-making in Mathematics was led by Phil Daro and Alan Schoenfeld through a SERP collaboration with San Francisco Unified School District. SERP has been supported to conduct this work by the S.D. Bechtel, Jr. Foundation.