Cueing into Word Problems

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Why can't children solve word problems? "They can't read," respond some teachers. "They can't think," reply others. "They can't decide what to do," answer still others.

Although these reasons may be true, they do not adequately describe why so many children fail to solve word problems. To identify specific reasons why students cannot solve word problems, one needs to look at the basic steps used in the process of solving word problems.

1. Reading and comprehending the word problem.
2. Translation from the English into symbolic mathematical expressions and equations.
3. Applying the necessary computational skills to carry out the calculations.
4. Looking back and evaluating the solution process.

Research has shown that the majority of students are able to read most word problems and are able to perform the necessary computations to solve them. But the translation skill is poorly developed in many students.

One approach that is often used to teach the translation skill is to teach students to recognize certain cue words embodied in the problem statement. This approach does not equip students with translation skills that are applicable over a variety of problem situations.

CUES AND DISTRACTORS

Webster defines a *cue* as a "hint or suggestion as to what to do or when to act." In mathematics, terms such as *more than, less than, altogether* and *average,* are considered cue words by many teachers of mathematics because they appear to have a singular mathematical meaning. But all of these terms can possess other meanings different from the assumed in certain contextual circumstances.

A cue word used out of context is called a distractor. That is, the cue word is used, but does not imply the assumed mathematical meaning. Consider the following two examples:

EXAMPLE (A): On Sunday, the milkman brought 4 bottles of milk **more than** on Monday. On Monday he brought 7 bottles. How many did he bring on Sunday?

EXAMPLE (B): The milkman brought 11 bottles of milk on Sunday. That was 4 **more than** he brought on Monday. How many bottles did he bring on Monday?

In Example (A) **more than** is a cue word for addition. In Example (B) **more than** is a distractor, since it implies the operation of addition while the correct procedure is subtraction.

CUEING TECHNIQUE— A CRITICISM

Teaching students to concentrate on cue words without consideration of the syntactic context can only lead to confusion and frustration for the students when they are confronted with the cue word in a different context. Consider, for example, students who are taught to use the cueing technique on word problems containing expressions such as "five **more than** three" (5 + 3). Later when these students deal with inequalities, they will encounter expressions such as "five **is more than** three" (5 > 3). Students whose previous learning has emphasized the cueing technique will have difficulty accommodating this new idea to their existing framework, namely that **more than** "equals" addition.

The best approach to teaching translation skills is to have the student concentrate on the underlying relationships that exist in word problems. Consider, for example, the following three word problems.

1. What number is eight **less than** 20?

2. The length of the Brown's house is 20 metres. That is 8 metres **longer than** the White's house. What is the length of the White's house?

3. Don won $20. That is $8 **more than** Jack won. How much money did Jack win?

All three of these word problems can be described mathematically by the expression: 20 – 8.

An attempted solution based on cue words would produce only one correct answer. If students are to grasp the relationship that exists in these problems, they must disregard the cue words **less than, longer than, more than** and concentrate on the type of relationship that underlies the problem. The student must be able to perceive that these three word problems are structurally the same mathematically.

SUMMARY

When teaching students how to solve word problems, emphasizing cue words without consideration of the contextual situation can give students a crutch of limited value. Students will be successful at solving the word problems containing the cue words in the anticipated form, but they will have undue difficulty with the word problems containing the cue words in a different context. A better approah is to teach students to concentrate on the mathematical relationships that exist in the problem. This can be accomplished by following some basic rules:

1. Present the word problem with a cue word in anticipated form.

2. Present the word problem with the same cue word, but this time, use the cue word as a distractor.

3. Present the word problem with neither cue words nor distractors.

For example:

1. On Tuesday the milkman brought 6 bottles of milk fewer than on Wednesday. On Wednesday he brought 13 bottles. How many did he bring on Tuesday?

2. The milkman brought 13 bottles of milk on Tuesday—6 fewer than he brought on Wednesday. How many bottles did he bring on Wednesday?

3. The milkman delivers milk on Tuesday and Wednesday. In the two days he delivered 13 bottles. He delivered 6 bottles on Tuesday. How many did he deliver on Wednesday?

By discussing the three word problems above, the students should perceive that a complete reliance on cues will prevent them from getting all three problems correct. A better approach would be to consider the context in which the cue word appears. That is a consideration of the basic structure of the problem.

If word-problem assignments contain word problems of each type, they should prevent students from relying totally on cues contained within the problem.

"Face" Values

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Here is a set of activities for students in Grades 6 to 8. Try them out. How good are your students at finding patterns? Answers and hints appear at the end of the activities.

A. Complete the last four

1 ☺ = 1 + 0 = 1

2 ☺ = 2 + 1 = 3

3 ☺ = 3 + 2 + 1 = 6

4 ☺ = 4 + 3 + 2 + 1 = 10

5 ☺ = 5 + 4 + 3 + 2 + 1 = 15

6 ☺ = 6 + 5 + 4 + 3 + 2 + 1 = 21

7 ☺ =

8 ☺ =

9 ☺ =

10 ☺ =