Helping Students Solve Word Problems

by Carolyn Ito

Forrest's box of candy has 20 caramels, 15 cherry-filled, 10 fudge, 8 nut clusters, and 7 jellied candies. What is the probability of Forest getting a caramel candy when he picks his first piece? (Virginia Standards of Learning Assessments, 1998 Sample Test Items, Grade 8 Math, Virginia Department of Education)

The Virginia Standards of Learning Scope and Sequence Guide for Mathematics lists a number of word problem solving skills that all students need to master by eighth grade. These skills include using problem solving, mathematical communication, mathematical reasoning, and solving multistep practical problems involving whole numbers, decimals, and fractions by using estimation strategies.

The number and range of skills necessary for successful word problem solving cause many students difficulty with this area of mathematics. Specifically, students must read independently; understand vocabulary; separate relevant information; visualize, restate a problem, and hypothesize a solution (Landi, 2001); choose the correct operation(s); estimate the answer; write the correct numbers accurately and legibly; solve the problem; and express the answer in the correct unit.

Common Deficits

Underlying processing deficits may compound students' difficulties. Mercer (1997) outlines several deficits relevant to math problem solving.

- **Attention**: maintaining attention to steps in algorithms or problem solving, sustaining attention to critical instruction (e.g., teacher modeling), and paying attention to details

- **Visual spatial**: writing across the paper in a straight line, seeing the numbers or number words against the background of all the words

- **Memory**: retaining math facts or new information, remembering steps in an algorithm, solving multistep word problems

- **Motor**: writing numbers legibly, accurately in a timely manner, in small spaces

- **Language**: verbalizing steps in math problem solving, understanding and using vocabulary

- **Abstract reasoning**: converting linguistic and numerical information into math equations

- **Metacognition**: selecting the appropriate strategy, organizing information, monitoring the problem-solving process, generalizing strategies to other situations

Helpful Approaches

The following approaches may help support students with disabilities in solving math word problems.

1. **Provide daily problem-solving opportunities in the context of students’ lives.** Have students make up their own word problems and solve them. Using students' names, events in their lives, and the math skill being
taught in word problems increases attention and lessens language-based problems.

2. **Practice specific skills such as determining the critical information without having students actually solve problems.** Use examples like the one at the beginning of this article, and ask students to look only for the sentence that contains the question, or only for the quantity words, or only for the clues that indicate the necessary operation. This approach benefits students with memory and metacognition difficulties.

3. **Provide from the concrete, to the representational, to the abstract.** Begin by providing manipulative-models or objects for your students to manipulate-as they solve word problems. Some students may find it helpful to act out the word problem. Then move to the representational level by using drawings to illustrate key pieces of information given in problems. When students are ready, move to the abstract level. Students with abstract reasoning and visual spatial deficits will benefit.

4. **Teach problem-solving strategies.** Strategies have four to seven sequential steps and a mnemonic to help students remember them. Each step of the strategy must be carefully explained, modeled, and practiced. A strategy is introduced after the concept is mastered. Strategies serve as scaffolds, promoting student independence in using a series of steps they already understand. The strategy reminds students of what comes next in a process and would benefit students with attention, memory, and metacognitive deficits.

A number of strategies are described in the Math VIDS materials available in CD and web form. The website is http://etv.jmu.edu/mathvidsr. Enter the user word vateacher and the password mathhelp to access the information. Every school in the Commonwealth has the CD. Examples from the website follow.

- **The SOLVE strategy is a general problem-solving strategy that can be applied to a variety of word problems including whole numbers, fractions, and decimals.**

  S tudy the problem
  O rganize the facts
  L ine up the plan
  V erify your plan with computation
  E xamine your answer

- **The RIDE strategy is another general problem-solving strategy.**

  R ead the problem correctly
  I dentify the relevant information
  D etermine the operation and unit for expressing the answer
  E nter the correct numbers & calculate, then check the answer

Recognizing that math word problem solving is a complex process and requires multiple skills will help us to be more analytical the next time we encounter a student having difficulty solving word problems. By using the approaches and strategies suggested here and in other sources, we can help our students conclude that Forrest’s probability of choosing a caramel candy when he picks his first piece is 1 out of 3.

**References**


Date: November/December 2001