



The Answer Is 20 Cookies. What Is the Question?

The answer is 20 cookies. What is the question?

Before reading further, decide how you would respond to this question. This is exactly what hundreds of elementary students did during the 2004–2005 school year. The answer was not always 20 cookies. Sometimes it was 28 pigs. At other times it was 15 snowmen or 90 cents. Regardless of the answer, the students were being asked to create their own word problems. But was this time well spent?

According to the Teaching Principle set forth in *Principles and Standards for School Mathematics* (NCTM 2000), effective teaching includes providing students with mathematical tasks that are both engaging and challenging. Such tasks provide students with opportunities to make connections and deepen understandings (Stein and Smith 1998). In examining mathematical tasks, Stein and Smith described characteristics of varying levels of tasks

with respect to their cognitive demand. On the basis of these criteria, tasks at the highest level call on students to use relevant knowledge and considerable cognitive effort.

Reflect on how you felt when responding to the opening question. Did you experience a moment of anxiety? Did you immediately know how to complete the task? Or did you begin to analyze the situation and think about how to proceed? Did you stop to think about a real-life context that could be used to illuminate this task? How do you think elementary students would react to this problem? Such responses and actions are what make this a worthwhile task. For elementary students, the process of writing a word problem is a useful task that serves to develop a deeper understanding of mathematics. Additional benefits of problem writing for students include growth in problem solving and improvement in mathematical attitudes (Whiten 2004).

Recognizing the importance of providing engaging tasks in mathematics classrooms, we worked in a staff development setting to enable teachers in three Title I schools to incorporate worthwhile mathematics tasks into their elementary classrooms. One task the teachers used involved having students write word problems. The purpose of this article is to describe this task so that other teachers may implement it in their classrooms. In addition, we share sample student responses along with the lessons learned through this experience.

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Figure 1

A third-grade student's response to the task "The answer is 20 cookies. What is the question?"

Word problome
 Me and my brother shared some cookies. There was 30 cookies I got five and he did. how many cookie are left over.

Figure 2

Sample fourth graders' responses to the task "The answer is 45 red cars. What is the question?"

The Answer is:
 45 red cars

There are 90 clowns. Each pair needs one red car. How many red cars do you need.

There are 245 red cars are in a parking lot. 200 blow up how didnt blow up?

The Task

One task we suggested that teachers use was what we called "The Answer Is ..." task. This task, as described by Jenner (2002), calls on students to create word problems that have a specific answer. Jenner's strategy involved a target answer, such as 16. To prevent students from simply replying with number facts, we modified this approach to include units, such as 16 cookies.

As we planned the staff development sessions, we saw this as an excellent task for teachers to begin with for two reasons. First, the task was fairly easy to use in any classroom. Many teachers used it as part of their students' morning work or as part of their daily calendar routine, others as a journal writing assignment. Second, the task provided teachers with immediate feedback on what problem-writing skills their students already possessed, if any. Did the students already recognize what constitutes a word problem? Were they ready to write word problems? Did they need practice in creating number sentences before venturing out to write

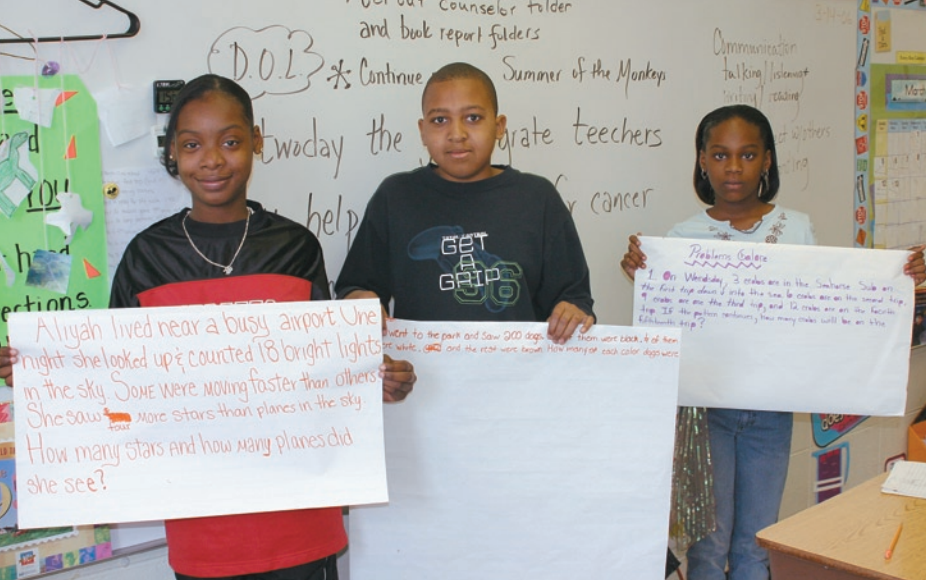
story problems? These questions could quickly be answered with this strategy.

Lessons Learned

After learning about the task, these elementary teachers returned to their classrooms to try it out. At follow-up meetings, they shared anonymous samples of student work as well as what problems were encountered. From this process, we were able to compile a list of lessons learned.

Give clear directions

Several teachers gave their students the following problem—"The answer is 20 cookies. What is the question?"—and asked them to write the question. Because the students were unfamiliar with this type of activity, most of them did not understand these directions. Initially, many returned a blank stare. One second grader wrote, "How many cookies is it." The teachers found that the students were more successful with the task when they used more detailed directions such as these: "Write a story problem (or



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Figure 3

Sample problem statements demonstrating student difficulties

I had 10 crayons.
 John gave me 5 crayons.
 I saw 5 more then I
 20 my mom gave me
 4 crayons. That how I got
 24.

Jimmy's mom made 8 tomato's
 She made 3 more now there's 11
 tomatoes. If there's 8 tomato's
 and Jimmy's mom made 3 more how
 many are there now. 11

word problem) that has an answer of 20 cookies.” **Figure 1** shows a third grader’s response to these directions. To successfully complete this task, this student created a multistep problem that requires the reader to understand that two people took five cookies each.

Provide specific units

Providing units for this problem, such as cookies or snowmen, is important for two reasons. First, students tend to respond with number facts when no units are given. In our work with summer school students, we posed this problem: “The answer is 20. What is the question?” Students responded with “What is $10 + 10$?” and other number facts that resulted in 20. Later, when we provided units, these same students instead tried to create word problems. Second, providing units can often draw on students’ creativity in writing their problems. **Figure 2** provides two fourth graders’ responses to the following problem: “The answer is 45 red cars.” Writing a realistic problem about cookies is a little easier than writing such a problem about cars. After all, how realistic is it to say that a person has 44 red cars and then is given 1 more by a friend? By including red cars as the units, we were asking the students to be more creative in developing a real-world context.

Anticipate difficulties

When the students, particularly in the younger grade levels, first began writing problems, the teachers anticipated several difficulties. One difficulty was that some students, in their formulation of the problem, either did not ask a question or included the answer as well as the problem question (see **fig. 3**). These students were struggling with the idea of having the answer, or solution, before they had formulated their problem. For older students, class discussions of problems such as these were beneficial in aiding them to write better problems. These discussions centered on questions such as “If we took this problem to another class, would a student in that class be able to solve it?” or “What difficulties might someone have if you gave them this problem?”

For younger children, however, the teachers found that providing more structure was more beneficial. These teachers developed a template for the problems that involved the student telling a story, asking a question, providing a number sentence that represented the problem, and then drawing a picture of the problem (see **fig. 4**). This structure

Figure 4

Sample problem-writing format

_____’s Word Problem

My story:

My question:

My number sentence:

My illustration:

enabled the students to be more successful in writing problems and gain understandings that would later help them complete the task without the format. In addition to providing more structure, the teachers also engaged students in writing number sentences that had a target answer, representing number sentences with pictures, and then telling stories about the pictures. All these activities helped develop the prerequisite skills for completing the task of writing word problems.

In addition to the instructional challenges that emerged with the strategy of giving the students prior knowledge of the answer and then having them construct a related problem situation, many teachers also faced the developmental challenge of students who did not naturally move beyond creating simple addition problems. The teachers developed two ways to deal with this. First, rather than just providing the answer, they asked for a problem that could be represented by a particular number sentence, such as 3×4 . Second, some teachers challenged the students with additional requirements for the problems, such as designating the operation to be used in the problem or stating that the problem must be a multistep problem.

Prepare to be amazed

Perhaps the most important lesson we learned was that students will amaze you! Initially, many of the teachers were skeptical about their students' ability to write their own word problems. This skepticism quickly faded as the students became involved in the task and began to surprise their teachers with their creativity. **Table 1** contains sample student-generated problems that made us smile and say, "Wow!"

Conclusions

At the end of the school year, the teachers were asked to write about the impact of this problem-writing task on their classrooms. Their responses reflected their enthusiasm for having their students write problems. One second-grade teacher wrote, "I am so thrilled that they are so smart and great thinkers and really enjoy problem [writing]. If we skip a day, they complain." A third-grade teacher responded, "They have surprised me by their creativity and ability to solve/create what I considered a 'hard' problem."

In addition to the benefit of engaging students, the teachers also reported that their students seemed to be braver when it came to solving math-

Table 1

Samples of Amazing Student Problems

Student's Grade	Target Answer	Student-generated Problem
1	8 bugs	"I have 10 bugs. I squwash 2. How many are left?"
2	28 pigs	"There are 30 pigs on the farm. They killed 2 pigs for Pork Chops how many pigs are left?"
2	90 cents	"Tristan has 1 nickel. He gets 1 more from Williams. Tristans mother gave him 4 dimes. His other frind gives him 4 more dimes. How mech money do I have in all."

ematics problems. Once students had written word problems that had multiple steps and contained extraneous information, they were more willing to tackle such problems, whether in their homework or class work or on standardized tests.

"The Answer Is ..." task proved to be an excellent method of engaging students with a mathematical task that requires a higher level of cognitive demand. Students in any elementary classroom can be involved in writing problems. Through this task, students can demonstrate not only their creativity but also their understanding of mathematics. Clearly, this is a worthwhile mathematical task for all students.

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