Helping English Language Learners Make Sense of Math Word Problems

A Lesson with Second Graders

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Alison Williams's second-grade class has the full range of English language learners (ELLs), from beginning to advanced, including a few native English speakers. Native languages spoken by the students include English, Vietnamese, Spanish, Somali, and Laotian. Alison knows that ELLs typically experience difficulty understanding and therefore solving math word problems for a variety of reasons. She understands that word problems require more careful and slower reading than other prose because they are packed with some or all of the following: symbols such as ×, >, and =, concept words related to math such as greatest amount, least amount, *and* difference between, *and math vocabulary terms that have different meanings in everyday usage such as* even, odd, *and* operation.

A couple of times a week, Alison poses math word problems for her second graders to solve. Sometimes she uses them as a warm-up to math time; other times, she uses them as a main focus. Each time, however, she begins with a class discussion on how to use manipulatives, which she refers to as "math tools." In this excerpt from Supporting English Language Learners in Math Class, Grades K–2 *(Math Solutions, 2009), the authors show how Alison helps ELLs use language to deepen their math learning.*

Focusing on Manipulatives

Once the students were seated in a circle, Alison Williams placed several zip-top bags on the rug in reach of the children. Inside the bags were manipulative materials such as color tiles, base ten blocks, interlocking cubes, and toy dinosaurs. Although manipulatives can build

they can pose a management challenge. For this reason, she always leads a brief conversation at the beginning of math time about how to use them. Students typically remind one another to

Posing Word Problems as Warm-Ups

"Today, we're going to begin math class with a warm-up word problem," Alison told the class. "Who can tell us what we do after I tell the story problem?"

"You tell us a story, and we have to tell it back three times," Ricardo said.

"That's right," the teacher acknowledged. "I tell the story, and then I call on three different people to retell it in their own words. That way, you all get four chances to understand the story problem."

"No," Tommy replied. "We can use different words. But it has to be the same story."

Having the students retell the story problem gives English learners access to the math content

Alison then posed the following word problem orally to the class:

> *Yesterday I went to the park. There were 5 benches. There were 2 people sitting on each bench. How many people were there altogether?*

"Do you know what *benches* are?" Alison purposely asked to make sure that students understood the meaning of this important word in the problem.

"They're like things to sit on, like chairs," Thomas said.

bench

illustration. Whenever possible, she uses visuals to assist English learners. She also knows that

the words.

Alison told the story again and then asked the students to think of another word that means the same as *each*. *Each* is another key word in the story problem, one that students would have to understand in order to solve the problem correctly.

"Every!" students chorused.

"So there were two people sitting on *each* bench," Alison reminded, emphasizing the word *each.* "Or, we could say that there were two people sitting on *every* bench."

Alison then had the students pair up and retell the word problem in their own words, thereby giving everyone an opportunity to think through the problem. Partner talk is an important

teacher provided some help.

Alison paraphrased, modeling correct grammar. "What do I want to know? What's the

"How many people were on the benches?" Yareli asked in an uncertain tone.

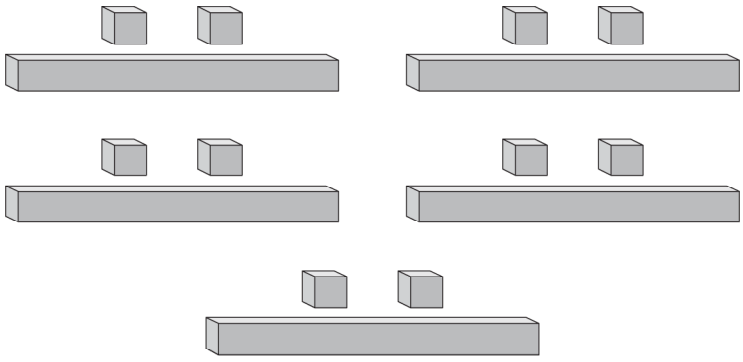
"That's right!" Alison responded.

After listening to two more students retell the story, the teacher directed the class to start working on the problem. As they worked, she made her way around the circle of students, observing and taking mental notes about the strategies that they were using. When the

they solved the word problem.

learning environment, one in which students feel safe to make mistakes, it was no surprise that so many students were eager to participate.

used to model the problem. "Here's the two people. On each bench two people are sitting. There's two people on each bench."



answer, Michelle?"

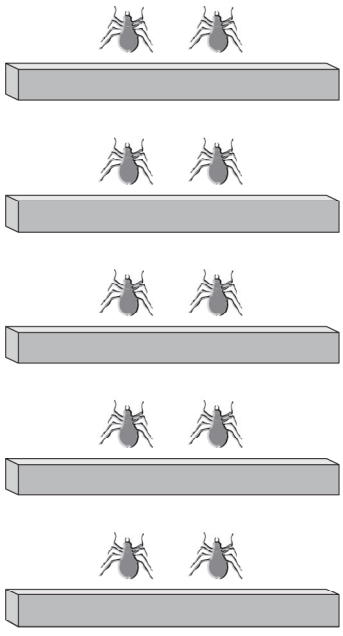
"I counted them all," Michelle responded. Alison waited to see if Michelle would tell the class

Alison directed Michelle to point to her materials as the students counted aloud by twos:

"They were on the benches eating the snack," she began, pointing to the materials on the rug in front of her. "They're eating. And, um, and they were separately. There were two on the bench. I counted the people. They were eating."

Jennifer pointed to the two plastic spiders on each bench.

nodded.



"Count and see how many people there are," Alison directed. Pointing to the spiders, Jennifer counted aloud, one by one, until she arrived at the correct answer of ten.

class was over. The teacher then directed the students to put their materials away, and she proceeded with the math lesson for the day.

Devoting Math Time to Word Problems

On another day, the students were again gathered on the rug, listening to Alison present the following word problem orally.

> *Yareli has 10 treats for her puppies. She has two puppies.*
>
> *How many treats does each puppy get to make it fair?*

"Do you know what dog treats are?" Alison asked the class.

"They're like snacks," Isela said.

"If dogs are good, you give them treats," Chris added.

Alison then held up a little doggie biscuit that she had brought from home to show the students.

To retell the problem, the teacher decided not to have the students use partner talk. Instead, she asked three students to retell the story. She gave each volunteer lots of think time before

Vietnamese, was one of the three students who retold the problem.

"Yareli got ten snacks for her two puppies," she began. "And how many, how many snacks does she need to give her puppies to make it fair?"

"How many treats does she need to give *each* dog?" Alison repeated, emphasizing *each*. As much as possible, Alison either paraphrases or rephrases students' ideas, or she asks

Instead of having the class solve the word problem at the rug, Alison dismissed the students to their seats to work. To transition them from the rug, she distributed to each student a sheet of paper on which was written the word problem and a reminder to show their work using numbers, pictures, or manipulatives. In addition, there were three sets of number choices that students could use when solving the problem:

(10, 2) (12, 3) (15, 2)

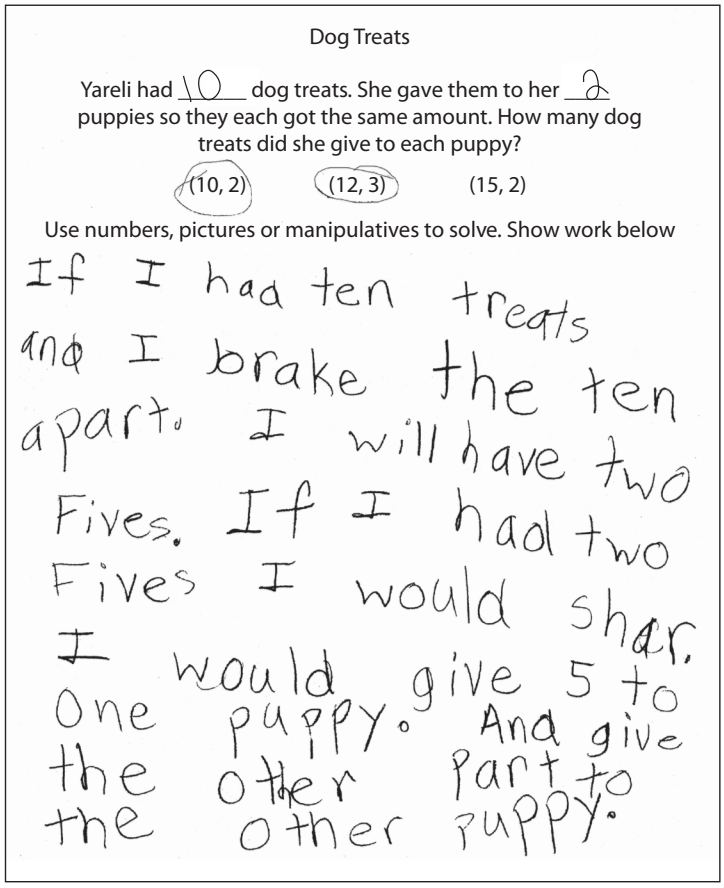
would be able to self-regulate, sometimes with assistance from their teacher, and choose which numbers were appropriate for them. Having three different number pairs also gave early

As the students worked, Alison circulated around the room. When students work on word problems, she sees her role mainly as an observer, keeping track of the strategies students are using. Sometimes she chooses a few children who have solved the problem differently to share in the upcoming whole-class discussion in order to give all students access to a variety of ways to solve word problems.

When everyone seemed ready, Alison transitioned the class back to the rug by having the children leave their manipulatives at their tables and bring only their papers. Once all were

problem: ten dog treats for two dogs. Then, on the count of three, she directed the class to say the answer to the problem aloud.

Figure 1.)



Dog Treats

Yareli had 10 dog treats. She gave them to her 2 puppies so they each got the same amount. How many dog treats did she give to each puppy?

(10, 2) (12, 3) (15, 2)

Use numbers, pictures or manipulatives to solve. Show work below

If I had ten treats and I brake the ten apart. I will have two Fives. If I had two Fives I would shar. I would give 5 to One puppy. And give the other part to the other puppy.

Figure 1. Yareli is an example of an English learner with strong language skills.

with three dogs and twelve dog treats. "I had three puppies," she began. "I mean Yareli had three puppies. Then I got—then I found that twelve is an even number and then I got the cubes."

Alison gave Vanessa a bag of interlocking cubes so that she could show the class what she did.

Continuing, Vanessa said, "I gave one to this puppy, one to this puppy, and one to this." Vanessa was making three groups, or puppies, and divvying the cubes or treats to each puppy, one at a time.

"And then two and two and two," she said, placing more cubes so that there were two cubes in each group. "And then three and three and three and then four and four and four."

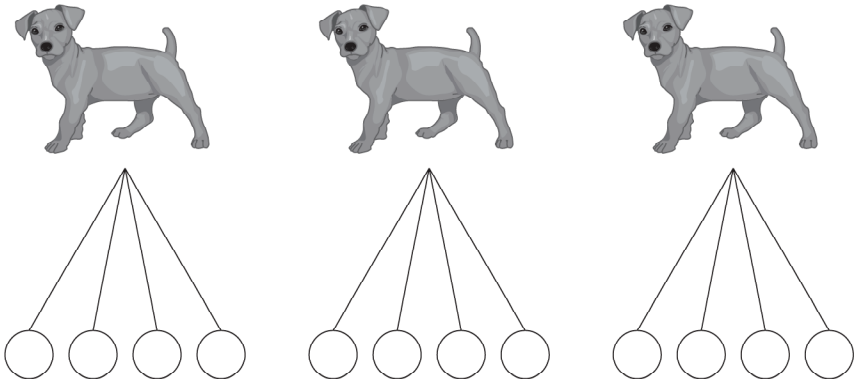
"Can someone tell us what Vanessa just said?" Alison asked the class.

drawing a picture on chart paper.

"And she had twelve treats," he continued. Alison then drew twelve circles below the dogs.

"Yareli gave each dog a treat," Thomas continued, as Alison drew a line from each dog to one treat.

"Then she gave each dog another treat and she kept doing that till each dog got four treats."



"Vanessa's strategy reminds me of the other day when Kerin brought in gummy bears to share with the class," Alison said. "So that everyone got the same amount, Kerin passed one gummy bear to each student and then another to each person so that it was fair, remember?"

help build and cement understanding for all students, particularly English language learners. Figures 2 and 3 show how two other students solved this problem.

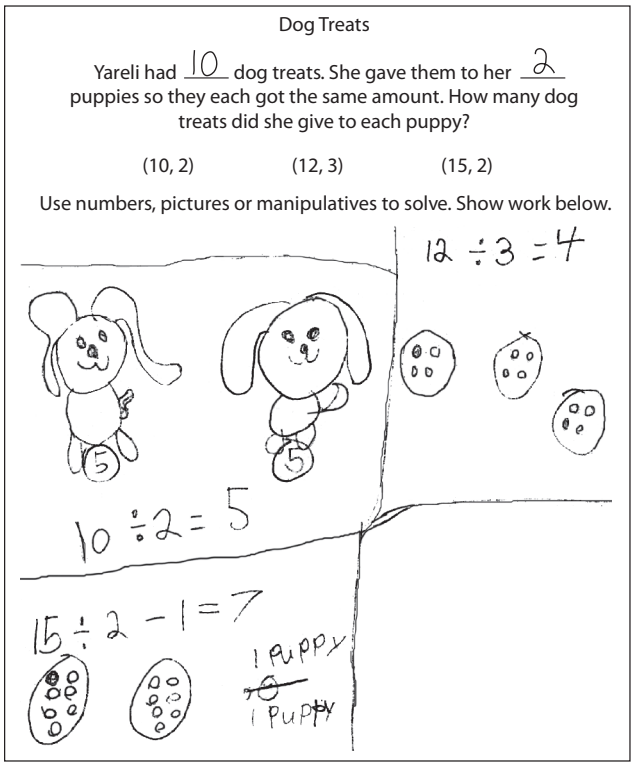


Figure 2. Jessica was able to use division to solve the problems.

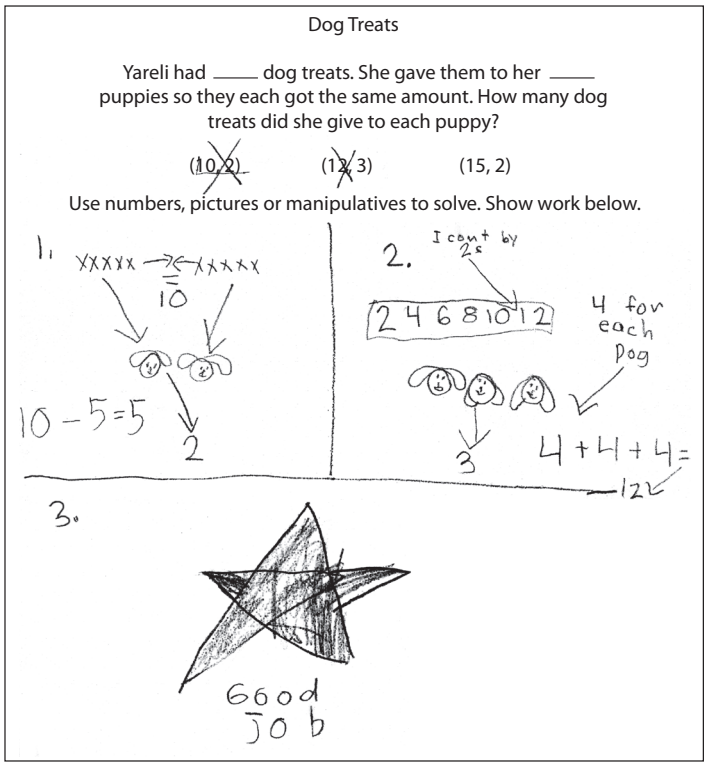


Figure 3. Thomas clearly showed his thinking using words, numbers, and pictures.

Story problems are just math problems with words. But for a student who is learning a second

prevents English language learners from making sense of a math word problem and, thus,

learners can become English language development opportunities in math class. Alison always looks for opportunities to use strategies, such as repeating, rephrasing, and offering prompts, that clarify language and make math content accessible.