POWERUP WHAT WORKS
powerupwhatworks.org

Lesson in Action

Understanding Problems: Create Your Own

AT A GLANCE

Launch

- Review the lesson goal.
- Introduce the lesson—students create their own multiplication and division word problems.
- Review the problem-solving process by using a multiplication problem.
- Review the problem-solving process again, this time using a division problem.

Learning Task

- Give instructions about the learning task.
- Consider students' strengths, weaknesses, and learning styles when pairing them up to work.
- Circulate around the room while students work, listening to conversations and providing support as necessary.
- When students have finished, bring them back together and have a few students present their problems.
- Have students return to their pairs and create two more problems.

Closure

- Have students write a summary about how to determine whether a word problem requires multiplication or division.

Context

Approaching the end of the school year, almost all of Mr. Garcia's Grade 3 students are proficient at multiplying and dividing within 100. Most are able to apply their skills to solve word problems, but several students are struggling—they have difficulty articulating explanations to their solutions. Throughout the year, his students have been building a class website, sharing resources that other third graders might find useful and showing parents their progress in class. They haven't yet put up any content about solving word problems.

Common Core State Standards

- CCSS.Math.3.OA.3 (http://www.corestandards.org/Math/Content/3/OA/A/3) Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem).
- CCSS.Math.MP1 (http://www.corestandards.org/Math/Practice/MP1) Make sense of problems and persevere in solving them.

Lesson Objective

Students will reinforce their understanding of problem-solving strategies by creating their own word problems and writing solutions. To do this, students will have to understand and explain why multiplication or division is required to solve a particular problem. They will also have the opportunity to create different solution paths and to see those of others.

Technology Tools

- Interactive whiteboard to communicate visually with the class
- Thinking Blocks (http://www.thinkingblocks.com/index.html) applet to demonstrate multiplication and division models
- Presentation creation software (e.g., PowerPoint, Keynote, Prezi)
- Presentation sharing platform (e.g., SlideShare, Prezi) to share presentations on class website
- Digital organizers for students to collect personal notes and reference material
- Polling tool to elicit student feedback

Assessment

- Observe partner discussion during the learning task
- Assess created word problems and solutions
- Read student summaries

Mr. Garcia's Class in Action

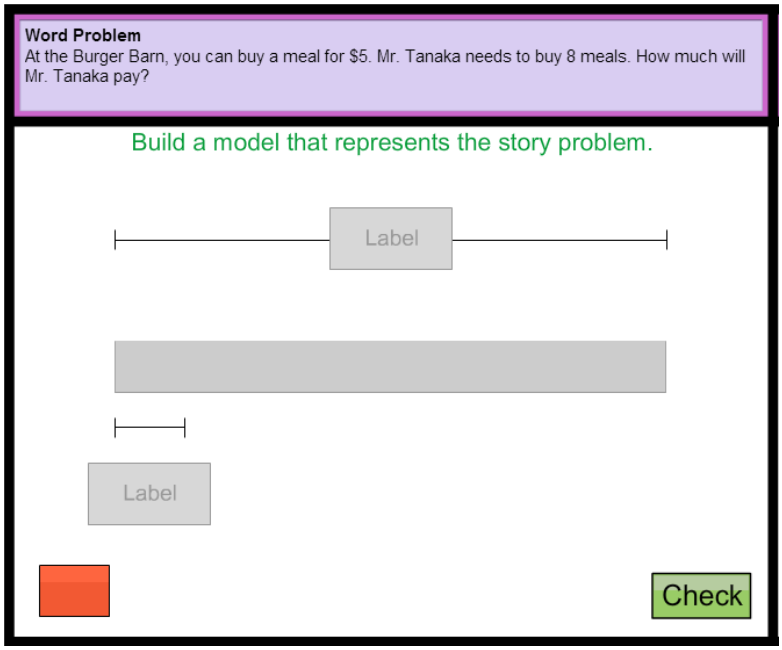
Launch

Mr. Garcia starts the lesson by reviewing the goals displayed on the interactive whiteboard:

- I will understand and be able to explain why multiplication or division is required to solve a particular problem.
- I will be able to find multiple solution paths or representations to solve a problem.

"We've been working the past few days on solving word problems," Mr. Garcia says. "Today, you're not only going to solve problems but you're going to create them yourselves. Before you get started on that, let's do a problem together by using our problem-solving process chart."

On the interactive whiteboard, he puts up a multiplication problem ("find the missing product") from the Thinking Blocks applet.



He asks the class, "What's the first thing we do when solving a problem?"

Sophie raises her hand. "Read the problem. Then, read the problem again and mark the important parts."

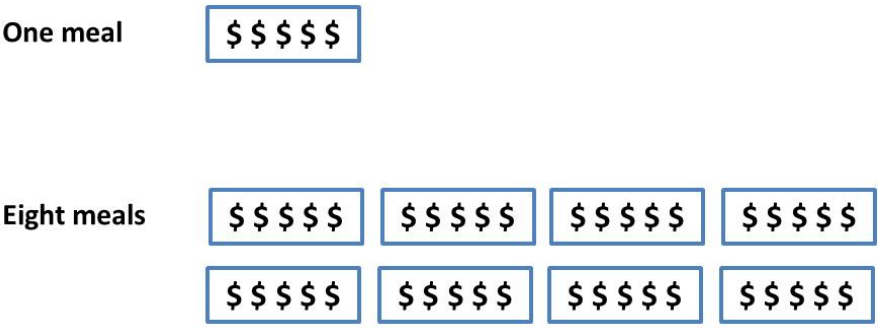
"Right!" Mr. Garcia responds. He copies the problem onto the whiteboard and then asks Alex to read it. With prompting from his peers, Alex underlines the key phrases.

> At the Burger Barn, you can buy a meal for $5. Mr. Tanaka needs to buy 8 meals. How much will Mr. Tanaka pay?

"Is this a multiplication or division problem?" Mr. Garcia asks. "If you know the answer and can give an explanation, raise your hand." He calls on Clara. "Well, it's asking you to find the total cost of something. You know how much one part costs, and you know how many parts. Since the total is the unknown, it must be multiplication." As Clara goes through her explanation, Mr. Garcia points to the relevant parts of the problem.

"Okay," Mr. Garcia says. "The next step in our problem-solving process chart is 'draw a picture of the situation.'" He thinks aloud while drawing, "A meal is $5, and I can show that by drawing five dollar signs, which represents the cost, inside a box, which represents the meal."

Eliciting direction from students, Mr. Garcia completes his drawing,



and writes an equation that corresponds to the drawing.

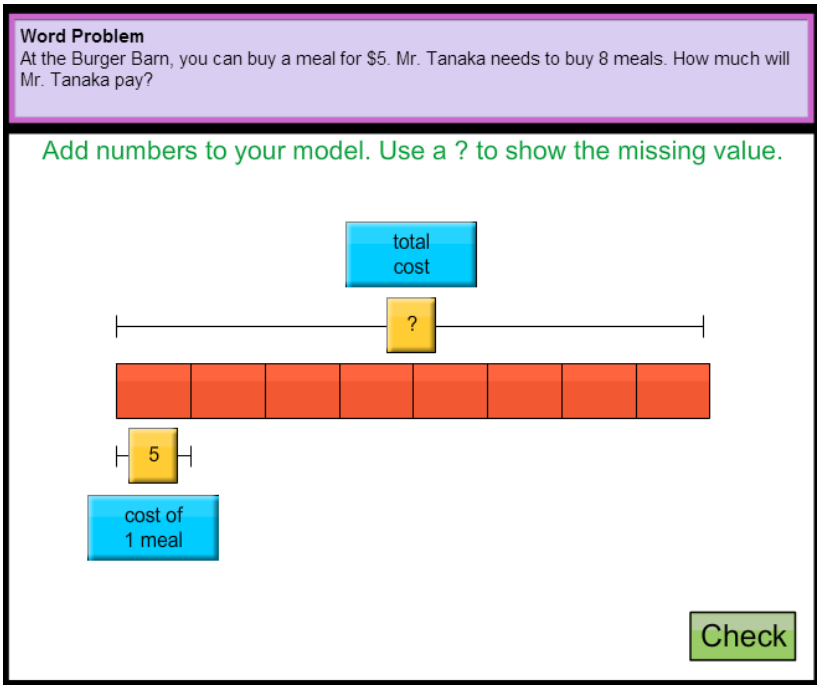
8 x (the cost of one meal) = the cost of eight meals

He then solves the problem.

8 x 5 = 40

Mr. Tanaka will pay $40.

"The picture we drew was one way to represent the problem. Remember that there are many ways to represent it," Mr. Garcia explains. "The Thinking Blocks applet shows us another way." Again, with direction from students, he completes the diagram in the applet.



With students following along, he enters the answer to verify it is correct.

Mr. Garcia pulls up a division problem ("find the missing divisor or quotient") in the Thinking Blocks applet again, and as a class they work through it, referring to the problem-solving process chart as necessary.

Learning Task

Mr. Garcia instructs the class on today's lesson. "You're going to work with a partner on this. I'll give each pair a multiplication equation, and then you need to come up with two word problems that have a solution using that equation. You need to write the problem and a solution method, and the solution needs to include a model."

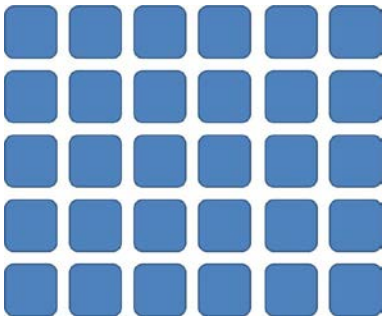
He continues, "These problems will be great to share on the class website, so the last thing you'll do is turn them into presentation slides that can be uploaded. Since other third graders will be looking at these as models, you'll want to create problems that they will find interesting and solutions that have clear explanations."

He calls out the students in pairs and gives each an equation. He has purposefully paired students whose strengths and weaknesses will complement each other.

As students work, he circulates around the room, listening to conversations. He prompts students to think aloud with their partner, and he brainstorms with them if they get stuck on how to create an appropriate model. He directs some students to do a few problems with the Thinking Blocks applet so they can understand better how that type of model is constructed. As the pairs write their solutions, he encourages them to go through the steps in the process chart. He pays special attention to students who struggle with word problems, prompting their thought process with questions and encouraging productive peer interaction.

When all of the pairs have created their problems, he brings the students back together and asks Anna and Marcus to present one.

Each classroom in our school has five computers. If there are six classrooms in our school, how many computers are there in all?



Marcus points at the diagram. “We drew an array to represent the problem. Each column represents a classroom, so there are six columns. The rows represent the number of computers in each class, so there are five rows.”

Anna continues, “To find the total, you could count all the squares in the array, or you could multiply five times six. There are 30 computers in all.”

He asks Anna and Marcus to go through the process chart, underlining key words and numbers in their problem, and then connecting the problem to the model and explanation. He calls up a few more students to present, selecting pairs that used different models and solution methods.

Next, Mr. Garcia gives each pair a division equation and has them create two word problems. He calls the class back together and has a few students present their problems.

After students have written both multiplication and division problems, he instructs them to write up their problems and solutions by using the presentation software.

Closure

To finish up the lesson, students write a summary describing how to determine whether a word problem requires multiplication or division. Mr. Garcia encourages them to use the problems they’ve created as a reference point. Those problems are specific examples of multiplication and division, and the summary should generalize those situations.

Reflection

Later, Mr. Garcia reflects on the day’s lesson. Overall, the presentation slides show appropriate models with clear explanations of solutions. He wonders whether this is because the students knew their work was going to be put up on the website. Reading through the summaries, he notes that even though all of the pairs wrote correct problems, some students were not able to explain how to determine whether a problem requires multiplication or division. Tomorrow he’ll have students discuss the problems while doing a virtual gallery walk on the website. He’ll have students select some to be featured on the website by using the polling tool to have them vote for their favorites. He’ll also have students pick four multiplication and four division problems to save in their notebooks to use as a personal reference.