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PROFESSIONAL DEVELOPMENT

Estimation Jar

A Lesson for Second Graders

by Susan Scharton

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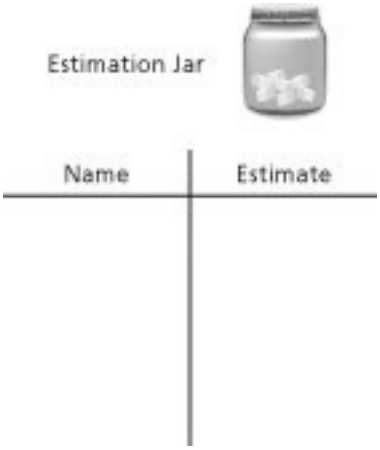
Estimation Jar *is excerpted from Susan Scharton's new book,* Teaching Number Sense, Grade 2 *(Math Solutions Publications, 2005), part of our new three-book series for grades K, 1, and 2 that focuses on the critical role number sense plays in students' math learning. This lesson is one in a series of estimation activities that Susan includes in Chapter 2, all aimed at helping students learn how to make reasonable estimates, test their estimates in a variety of ways, and develop their understanding of place value. At the end of the chapter, as for all chapters, Susan offers suggestions for linking assessment and instruction.*

I showed my students a quart-size jar half-filled with Unifix cubes. "I have filled this jar part-way with Unifix cubes. I didn't count the cubes that I put in, and I'm wondering now how many cubes there are. I want to make a 'smart guess' about how many cubes I think are in the jar." I then explained what I meant by a smart guess. I said, "When mathematicians make smart guesses, they are making *estimates.* Here they would think about the size of the jar and its contents. I want to know your estimate for how many cubes are in the jar. We're going to be recording our estimates on a class chart."

I showed the students the large chart I had posted on the board and set the jar on the chalkboard tray beneath it. I read the title of the chart: "Estimation Jar." Next to the title, I had drawn the jar with cubes filling it halfway.



I explained the chart's two labeled columns: "Name" and "Estimate." "When I call your table," I said, "each of you please come to the front of the room and write your name and your estimate in the proper columns on the chart. Then take a seat in a circle on the rug."

As they came up to the chart, some students first picked up the jar and examined it closely and then recorded their name and estimate. Others took a quick glance at the jar or the information already recorded on the chart and then added their own name and estimate.

When everyone had contributed, the chart showed estimates ranging from twelve to sixty-two.

I said, "Let's look at the information we've recorded. What do you notice about our chart?"

"There's a lot of numbers and names on the chart," Tina said.

"What do you notice about the numbers people wrote?" I asked.

"Some people wrote really big numbers, some really small numbers," said Elena.

"What do you mean by a 'big' number?" I inquired.

Elena explained, "Like, sixty-two is a big number and twelve is a small number."

"Can someone say that a different way?"

"Sixty-two is more than twelve," Daniel said.

"Do you mean that some people think there is a larger, or greater, number of cubes and some people think that there is a smaller, or lesser, number of cubes?"

"Yeah. Sixty-two is greater than twelve. Twelve is less than sixty-two," Jose said.

"What else do you notice about the numbers?" I asked.

Katie said, "Some numbers go in order."

"What do you mean?" I asked.

"Like when you count 'thirty-six, thirty-seven.' They go in order," Katie explained.

I then asked the class another question, "How did you come up with your estimate for how many cubes you think are in the jar?"

"It looked like thirty. That's why I wrote *thirty,"* Daniel said.

Tania added, "Forty-one is my favorite number."

Such answers are typical of beginning second-grade students. Repeated opportunities to estimate would help them develop a visual appreciation of size and quantity and establish benchmarks that they could use in future activities of this kind.

"We made our estimates," I said. "Now, how might we find out the number of cubes that are really in the jar?"

"Count them!" was the overwhelming response.

"How might we count them?"

"By ones," Jason said.

I asked Jason to come to the center of the rug. He dumped the cubes out of the jar and proceeded to count aloud using one-to-one correspondence. "Jason is keeping track of what he has already counted by moving each cube aside as he counts it," I said.

Jason found that twenty-five were in the jar. I recorded on the bottom of our chart and then read aloud what I'd written: *We counted by 1s. We got 25.*

"How else might we count the cubes?" I asked.

"By fives!" Patty stated.

"I wonder how many we will get if we count by fives," I responded. "I wonder if we will get more than twenty-five, less than twenty-five, or exactly twenty-five. Does anyone think we will get more than twenty-five?" Five hands went up. "Does anyone think our number will be less than twenty-five?" Three students raised their hands. "Does anyone think we will get exactly twenty-five?" About half of the students raised their hands. It is not unusual for students at this age to think that the quantity of a certain number of items will change if the method used to count them changes. I asked Patty to come to the center of the rug to demonstrate her approach.

She first put the cubes in groups of five scattered on the rug. Instead of counting out each group by ones, Patty seemed to visualize five and group the cubes accordingly. She counted aloud as she touched each group: "Five, ten, fifteen, twenty, twenty-five."

I said, "I am going to write down what Patty just helped us do." I recorded underneath the previous sentence and then read: *We counted by 5s. We got 25.*

"We got the same number when counting by fives as we got when counting by ones," I said. Some students looked surprised; others looked at me as if I had said something that was obvious; others looked puzzled.

Next I asked for a volunteer to count the cubes by tens. Derek came to the middle of the rug where the cubes were still in groups of five as Patty had arranged them. Before he began, I asked the class, "Do you remember what happened when we counted by ones and fives?"

"We got the same number!" exclaimed Carl.

"You're right," I said. "This time, I wonder how many cubes Derek will count. Will he get more than twenty-five, less than twenty-five, or exactly twenty-five?" I asked students to raise their hands as I called out each option. A few students thought there would be more, a few thought there would be less, and about half of the students thought the number of cubes would stay constant.

"If we count by tens, can you tell me how many groups of ten there would be? Hold up that many fingers." Students held up a range of fingers, from one to five.

I asked Derek to count the cubes. He put two groups of five together and said, "Ten." I asked him to explain why he had combined the groups. He said, "I know that five and five make ten. I don't need to count the cubes." Derek continued. He put another two groups together and said, "Twenty." He finished counting the rest by ones, touching them individually and saying, "Twenty-one, twenty-two, twenty-three, twenty-four, twenty-five."

"How many groups of ten did Derek make?" I asked.

The students answered, "Two."

"How many cubes were left?"

"Five!"

"So, what should I record on our chart?"

The students responded, "We counted by tens. We got twenty-five!" I recorded what they had said. I ended the session by asking the students, "So, what did we find out by doing the estimation jar today?"

"It took twenty-five cubes," Derek stated.

"We counted by ones and fives and tens," Tania added.

Sonia said, "We got the same number each time."

"It didn't matter how we counted. We still got the same number," Patty said.