

Measuring Length with Different Size Popsicle Sticks



Popsicle Image: sugardoodle.net

Names _____

First thing we measured _____

Measurement using shorter Popsicle stick _____

Measurement using longer Popsicle stick _____

Second thing we measured _____

Measurement using shorter Popsicle stick _____

Measurement using longer Popsicle stick _____

What do you notice about the measurements?

Explain what you notice.

Task 5: Measuring Length with Different Size Popsicle Sticks

Level: Grades 1 or up

Prerequisite: Measurement of length, Composing and decomposing lengths,

Goals: Meaning of unit. Unit Iteration to measure an objects length. Understanding how unit size affects the number of units to measure the same object (unit compensation: the smaller the unit, the larger the measure; conversely, the larger the unit, the smaller the measure)

CCSSM: 2.MD.A.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. (Although this is a 2nd Grade CCSSM, students may need repeated exposure to this idea before they grasp this concept. Some younger students may understand, and some 2nd grade and older students may struggle with this idea.)

Materials: Popsicle sticks of two different lengths (from hobby store) and Recording Sheet. Note, for this activity, the same type of material is used for the non-standard unit (different sized popsicle sticks) to isolate and emphasize the unit characteristic of size so students are not distracted by other characteristics.

Student Grouping: Students may work in pairs or groups of three.

Launch:

In the past, we have chosen different tools to measure height. Who can tell me what you used to measure height? (linking cubes, sticky notes, string, etc...)

What do we know about measuring height and length? (units need to be the same size, and there are no gaps or overlaps of the units).

So, today, we are going to continue to explore length measurement. We are going to think about how the size of what we use to measure affects the number in the measurement result.

You and your partner(s) have 2 different sized Popsicle sticks and your recording sheet.

First, pick two objects in the room to measure. What might you pick? (math book, desk, pen or pencil, etc...).

Second, you will use the smaller unit to measure the length of the object.

Next, predict what the measure will be with the larger Popsicle sticks, and measure check your prediction.

Record each measure on your worksheet and explain what pattern you see.

Explore:

Students will be deciding what to measure and will complete the task. Watch students for correct measurement techniques. If possible, it is interesting to ask the students to measure the object at the same time to see if they notice that the person with the larger unit size finishes more quickly.

Summarize:

Ask pairs to report their measurements. Record these measurements on the board. Ask: So, what do you notice about these measurements? Is the (color1) straw shorter or longer than the (color2) straw? Are the measurements using the (color1) straw more or less than the measurements using the (color2) straw? How can you explain this?

What we see as important concepts in this task

This task highlights the idea of unit compensation, in which a smaller unit results in a larger measure, and conversely, a larger unit results in a smaller measure. This may be a difficult concept for second grade students, but they may notice that the smaller unit required that they use more units to cover the length and that the larger unit required fewer units to cover the length.

The idea of this task originated from the section “Changing Unit Sizes” in:

Van De Walle, J. A. (2004) *Elementary and Middle School Mathematics: Teaching Developmentally*, 5th Edition. (Pearson, Inc.: Boston). P. 321

Some Potential Answers to the Teacher Measurement Task Reflection Questions

What did I do to solve this task?

First, I measured 2 objects with the smaller unit. Second, I measured the same 3 objects with the larger unit. Both times, I was careful not to leave any gaps and not to overlap any units. I compared my measurements with my partner to verify their accuracy.

The space we measured was the same, but the size of the unit resulted in different numbers for the measurement.

Then we noticed that the units that were smaller resulted in larger measures because it takes more of the smaller units to fill the length. The opposite was true of the larger units. The larger units resulted in smaller measures because it took fewer of them to fill the length.

What measurement ideas allow me to do these things?

- Non-standard units
- Unit iteration (no gaps or overlaps)
- Unit size
- Unit compensation

How might my students solve this task?

Some common errors that students may make are:

- A. Using two different size units to measure the length of the object.
Sometimes students use a different unit size when they discover that their units do not “fit” the object they are measuring. In other words, they would come up with a fractional unit at the end.
- B. Students may have gaps or overlaps.
Again, this sometimes occurs when students find they have a fractional unit at the end, so they either space their units or overlap units so it “fits.”
- C. Students may not see the unit compensation pattern.

How will I respond to how my students might solve this task? What questions will ask them?

Some common errors that students may make are:

- A. Using two different size units to measure the length of the object.
Ask students to compare their measurements with their partner. In this case, they likely will have different measurements for the same object. Ask them to discover why their measurements are different.
- B. Students may have gaps or overlaps.
At this stage in measurement, this is a more common error because students are not sure how to handle measuring fractional units. You can handle this by saying, “So, this unit does not fit evenly at the end. How many units do you have? So the measure is a little more (or less) than ___ units.”
- C. Students may not see the unit compensation pattern.
The big idea of unit compensation is that the smaller the unit, the larger the measure. In this case, we want the students to notice that when the unit is smaller, the measurement number is larger. Also, when the unit is larger, the measurement number is smaller. Ask the following questions:
How do the two units you used to measure your objects compare in size?
How do the measurement results using the smaller unit compare to the measurements results using the larger unit?

Can you see a pattern? What is the pattern? Why do you think that is?