CONSTRUCTING TASK: Inch By Inch

Students will measure using strips of paper (non-standard units). Students will build a ruler beginning with inch units that they will glue to tagboard. Students will practice measuring with their ruler and compare it to a standard ruler. Students will create a line plot graph to collect and record the data of the objects they have measured to the nearest ¼ inch throughout the class.

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units – whole numbers, halves, or quarters.

(Refer to grade level overview for unpacked standards)

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

If students actually make simple measuring instruments using unit models with which they are familiar, it is more likely that they will understand how an instrument measures. A ruler is the most important measurement tool that primary students need to learn about. If students line up physical units, such as paper clips, along with a strip of tag board, and mark them off, they can see that it is the *spaces* on rulers, not the marks or numbers that are important. It is essential that the measurement with actual unit models be compared with measurement with using an instrument. The temptation is to carefully explain to students how to use these units to measure and then send them off to practice measuring. This approach will shift students' attention to the procedure (following your instruction) and away from developing an understanding of measurement using units. (Van de Walle p.72-72)

COMMON MISCONCEPTIONS

Students plot points based on understanding fractions as whole numbers instead of fractional parts. For example: Students order fractions using the numerator or students order unit fractions by the denominator.

ESSENTIAL QUESTIONS

- What estimation strategies are used in measurement?
- How is the appropriate unit for measurement determined?
- How is the reasonableness of a measurement determined?
- Why are units important in measurement?
- How can I determine length to the nearest ¼ or ½?

MATERIALS

- tag board
- paper
- ruler

GROUPING

Whole group or small group

NUMBER TALKS

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I (SMP 4, 5, 6, 7)

Cut strips of paper lengthwise (1-inch wide) from regular paper. Ask students what is a half and how could they find where a half is on the strip. Students will fold the strip in half. Have the students mark ½ on the folded line. Ask students: *if we needed to make this strip into 4 equal pieces/parts how could we do that?* Allow for exploration. Students will see that by folding a ½ in ½ it makes ¼.

Discussion: allow students to see that the strip is folded into 4 parts. Explain that the first fold is where 1 out of the four parts ends, have students label the next one 2/4 (two of 4 parts). Allow the conversation to take place that the second line is already labeled ½ and now it is going to be labeled 2 of 4 (2/4). What does that mean? Students will identify that they're the same. Label the last fold 3 of 4 or ¾.

Have students measure objects all around the room to the nearest ¼ **strip** and record their findings in there journal. **The strip is a non-standard unit of measurement and should be recognized as such**. Have students measure things that are longer than one strip to count a whole strip plus part. Example: the width of the desk is 2 strips and ¼ of a strip long.

Part II (SMP 1, 2, 4, 5, 6, 7)

Give the students a 1x1 inch square and repeat the entire process from day one. Allow students time to measure using a single inch square. Students will recognize how tedious it is to measure with a single inch square, and in many cases inaccurate. Give students (12) 1x1 squares and mark them into fourths with a pencil (not folded).

Place the folded inch square on top of the blank inch squares as a template for marking and place a dash to identify ¼ , 2/4, (1/2), and 3/4. *Keep asking students what ½ and 2/4 have in common.* Give students a tag board strip that is 1 inch wide. Have students create an inch ruler by gluing the MARKED 1x1 inch squares side by side.

After each student has created the ruler, have them measure things around the class using their newly created inch ruler. After 10-15 minutes of exploring engage students in a discussion in regards to the difficulties they encountered using their ruler (not labeled correctly, always had to count what square it was, etc)

Introduce a ruler with inches. Discuss and compare the similarities between the created ruler and the actual 12' ruler. Discuss how the actual ruler is more accurate and efficient. Have the student circulate the class measuring objects to the nearest ¼ of an inch using the actual ruler. Students create a line plot graph to collect and record the data of the objects they have measured throughout the class.

FORMATIVE ASSESSMENT QUESTIONS

- How did you determine ¼, ½, and ¾ on your strip of paper?
- Why is it important to have a standard unit of measurement?
- How does your "ruler" compare to the standard 12' ruler?
- Looking at your line plot graph, which measurement seems to be the most common among the classroom?

DIFFERENTIATION

Extension

- Measure around the classroom to the nearest ¼, ½ and whole inch using a broken ruler.

Intervention

- Spend additional time with the original strip from part one.
- Have students create an additional strip that is a different size and determine the ¼, ½, and ¾ marks. Have students compare the two strips and lead a discussion of the importance of standard measuring tools.