

Mathematics: The Language of STEM

Actual Size

Taylor Bean

CONTENT AND TASK DECISIONS

Grade Level(s): 2-3

Description of the Task: Using real life measurements involving animals, people, things, and places from nonfiction books, students will accurately model those measurements around the classroom using the given unit. Students will also remeasure using another standard unit and/or a nonstandard unit.

Indiana Mathematics Content Standards: 2.M.2: Estimate and measure the length of an object by selecting and using appropriate tools, such as rulers, yardsticks, meter sticks, and measuring tapes to the nearest inch, foot, yard, centimeter and meter.

And 2.M.3: Understand that the length of an object does not change regardless of the units used. 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.

Indiana Mathematics Process Standards: P.S. 5 and P.S. 6

Mathematics Content Goals: measuring objects/distances using various units, comparing measurements of the same object/distance using 2 different units

Language Objectives: Verbally explain process for measuring an object/distance using appropriate words for tools and units of measurement

Materials:

- nonfiction books that include measurements (If You Had Animal Teeth, Hair, Feet, Ears, Actual Size, Prehistoric Actual Size, National Geographic Weird But True, Guinness World Book of Records)
- rulers
- tape measures
- yard/meter sticks
- masking tape
- markers
- items for nonstandard measurement (pencils, linking cubes, coins, books)

THE LESSON

Before:

- **Activate prior knowledge,**
- Student Actions: Estimate how long, tall, high some items in the classroom are, share estimations with partner/classroom, justify and defend reasons for their estimates, critique others' estimates and explain reasoning
- Teacher Actions: Ask for estimates for various classroom items, facilitate discussion between students and encourage justification for reasoning, share a unique and interesting measurement from one of the nonfiction books, ask students for estimates/comparisons with items in the classroom/school

- **Be sure the problem is understood**, explain the activity to the students: Students will be working in pairs. They will use a nonfiction text to find a real life length/distance that they would like to recreate in the classroom. Students will record the length/distance and then use the appropriate tool to measure the length/distance on the classroom floor or wall, mark the starting and ending points with masking tape, and label the tape with what was measured.
- **Establish clear expectations**, review techniques for measuring objects using various tools. Review proper use of measuring tools and classroom books. As a class, establish a number of measurements that students should find and record (Ex. Will everyone be able to find and record at least two measurements?). Discuss strategies to use if a student is stuck with part of the task.

During: Students will be working with partners to research measurements in real-world data/books. Students will be recording this information, selecting appropriate tools, and displaying their measurements in the classroom with masking tape.

- **Let go**, facilitate students collecting and organizing materials, give students space to begin their research, ask open-ended questions, and give students chances to discuss their thinking with each other and with you.
- **Listen actively**, as you move around the room, listen to student conversations. Look for opportunities to engage with students about their measuring processes, the ways they record data, the justifications for the tools they select, and any connections or noticings they have as they collect their data. Listen for agreement or disagreement between partners and within groups. Encourage meaningful, constructive discussion. Encourage students to explain their thinking and problem solving methods. Listen for students coming to consensus on their ideas.
- **Provide appropriate support**. Be sure students find a length/distance to recreate. Ask students how they selected a tool to use, what their process is for measuring a length/distance, and how their length/distance changes when they measure it with different units. Encourage students to make their thinking visible in multiple ways: drawing, labeling, writing, mathematics, modeling with tiles, and speaking.
- **Provide worthwhile extensions**. See Challenge activities included at the end of this lesson.

After: Students come together first in small groups and then as a whole class to share their thinking and discuss strategies, patterns and relationships they have discovered. Students will share a measurement with the class and explain their process to measure it using a given unit and tool. Students will make comparisons between the lengths/distance of their peers and between the same length/distance measured in different units. Students will discuss the tools and processes of their peers and determine if they are correct and/or efficient.

- **Promote a mathematical community of learners**. Students work with their partners and another pair of students to make a group of 4. Each pair should share their measurements, measuring tool, and process for measuring. Then the four students will compare their measurements. Are the measurements similar? Did they use the same units? Can students compare their measurements and data? Did students use similar methods to find their measurements? Is one method more efficient than another? Then bring groups together for a whole class discussion.
- **Listen actively without evaluation**. As students present their solutions, mention specific things that they did and mention what that did for you and for the audience or ask a question about why students made that choice. Examples: “I noticed that you labeled the length on a sketch. That helped us see how you measured your object.” and “You wrote a math equation for converting feet to inches. Why did you do that? How did it help you?”

- **Make connections.** Ask students to find similarities and differences in the ways they measured their lengths or distances. Have students share different methods for measuring using various tools. Last, have students make connections between their measurements and the measurements of other pairs.
- **Summarize main ideas** Use student presentations of solutions to generate a lists of strategies for measuring. Have students generate some possible rules for measuring length, selecting measurement tools and unit, and comparing lengths that could be generalized and used to solve future problems. Ask questions as needed to insure that students' explanations of their processes and measurement are understood by everyone. Discuss that a given length/distance can be named using different units of measurement. The actual length does not change. Discuss comparisons between students lengths/distances.

ASSESSMENT

Observe: Look for where in the process students are successful. Can they measure lengths? Can they select and use an appropriate tool? Are students using tools correctly? Are students recording measurements around the room? Are students comparing measurements with their peers? Are students using classroom items to perform nonstandard measurements?

Ask:

What unit does your measurement use? How do you know?

Why did you measure your length that way?

What is another way to measure your length with a different tool?

How did you measure the length/width of your selected data?

Is there another way to measure your length?

Can you show your thinking in a different way? With sentences? With numbers? With a picture or model?

What unit did you use for your measurement?

How would you measure that using a ruler?

What nonstandard unit will you use to measure that?

How does your measurement compare with _____?

What is your length/distance in _____ [units]?

How does your length/distance compare with _____'s?"

CHALLENGES! Try one of these to grow your brain even more!

- Now that you've displayed your length, can you draw a picture of the item you are measuring in real-life size?
- Find another length and display it next to your first length. How do they compare? How many of the shorter length would it take to equal the longer length?
- Now that you've displayed your length, choose a different unit and measure it again. How do the numbers for each measurement compare? Are the two measurements equal or not? How do you know?
- How many of your lengths would it take to stretch across the classroom? How many would it take to stretch down the hall or across the gym?

Measurement Notes and Ideas

What length or distance did you choose?	What tool will you use? How will you measure your length or distance? Draw a sketch of your length or use this space to show your thinking.