

Lesson Plan 3: Tales, Tasks, Tools, and Talk

Authors: Timothy S. McKeny, Derek J. Sturgill, and Gregory D. Foley

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Grade Levels: 2–4

CCSSM Domain: Measurement and Data

- Represent and interpret data. (3.MD)

CCSSM Domain: Geometry

- Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. (3.G)
- Reason with shapes and their attributes. (3.G)

Mathematical Practices:

- Construct viable arguments and critique the reasoning of others. (MP.3)
- Model with mathematics. (MP.4)
- Use appropriate tools strategically. (MP.5)
- Attend to precision. (MP.6)

National Governors Association Center for Best Practices and the Council of Chief State School Officers (NGA Center and CCSSO) 2010

Related children’s books: *Measuring Penny*, written and illustrated by Loreen Leedy

Materials:

- One copy of the Geometry and Measurement Discovery Hunt List per group
- One clipboard per group
- One digital camera (or cell phone camera) per group

Discussion of the Mathematics

This activity invites students in grades 3–5 into the intersection of geometry and measurement. Building from shape recognition and relevant geometric vocabulary in the primary grades, students will explore and identify items in their school environment that match the criteria in their Discovery Hunt List. As modeled by the student in *Measuring Penny*, who is challenged to measure an object in as many different ways as she can, students can expand their understanding of shape, their attributes, and measurement concepts through a systematic and geometric analysis of common, everyday objects. As students collaborate and collect their digital images of their Discovery Hunt items, they will reason mathematically, discuss their rationales in small groups, and justify their responses in verbal and written forms. This exemplifies the fact that “Measurement links to number, to algebra, to geometry, and to data

while providing a portal to the crucial mathematical practices of problem solving, reasoning, argumentation, modeling, and precision” (McKeny and Foley 2012, p. 318).

Highlighting the Mathematical Practices

Construct viable arguments and critique the reasoning of others and attend to precision. Working in pairs or groups of three, students will excitedly search every aspect of their immediate surroundings to find examples of familiar items that match the given geometry and measurement criteria on their Discovery Hunt List. Communication is an essential element in this activity as students must articulate, justify, and critique the thinking of their peers. This activity increases students’ attention to the geometric aspects of their surroundings while making sure the objects that they photograph conform to the measurement specifications for each item. Students will use their measurement tools to verify that their choices accurately represent the selected item’s criteria. As student groups share their digital data with peers in a whole-class setting, they are encouraged to engage their developing understanding of geometry and measurement by comparing, contrasting, and critiquing the thinking and reasoning of others. Blending U.S. customary and metric units requires students to think flexibly about both systems and the accuracy of their developing frames of reference.

Before the Activity

- About one week before the activity is implemented, send a letter home with students highlighting the learning outcomes and soliciting the use of a digital (or cell phone) camera on the day of the activity. Each pair or group of three students should have access to one digital device. You may need to obtain special permission from the school administration regarding the use of cell phones by students for educational purposes.
- Review the list of Discovery Hunt items for developmentally appropriate geometry and measurement vocabulary. Also, determine adequate boundaries for the students’ exploration and an adequate time frame for students to complete their work.
- In a whole-class discussion, review two-dimensional and three-dimensional geometric vocabulary and review common frames of reference for U.S. customary and metric units. Based on students’ recollection, provide additional scaffolding to support students’ understanding of shape, measurement units, and measurement tools.
- You and your students should discuss the appropriate use of technology and set clear expectations for students’ behavior and collaboration during the Discovery Hunt.

During the Activity

- Share the book *Measuring Penny* with students in a whole-class read-aloud. During the interactive reading, highlight the measurement assignment given to the class (Leedy 1997, pp. 4–5), and the ways in which the main character, Lisa, uses nonstandard and standard units of measurement to describe the many attributes of her dog, Penny.
- Distribute one copy of the Geometry and Measurement Discovery Hunt List, a clipboard, and a digital device to each group of students. You will need to give students the boundaries for the Discovery Hunt and the time frame in which students will need to complete their digital data collection.
- Students will use their materials to explore their surroundings and to find items that conform to the Geometry and Measurement Discovery Hunt List. They should collaborate in small groups to document and justify their data choices as they collect the digital data.

- You or a classroom aide, should scaffold the students’ Discovery Hunt experiences and collect formative assessment information from student groups. Questions to monitor students’ understanding could be:
 - How does your group know that the selected object matches the item’s criteria?
 - How do you know that your measurements are valid and precise?
 - Why did your group select this object to represent this geometric shape (or measurement unit)?
 - What other items could be used to illustrate item # ____?
- Once the time frame for the activity has elapsed, student groups should have an opportunity to download their digital data to a classroom computer and display their findings to the class. Structure the classroom discourse on the accuracy and precision of the students’ digital data collection.
- To bring closure to the activity, each student should select three different items from their group’s dataset. In detail, each student should describe the rationale for the object selection, the way(s) in which the object was measured, and the justification for how the object’s attribute fits within the given measurement parameters.

Extending the Activity

- The students could create a list of Geometry and Measurement Discovery Hunt items and structure a similar activity for the previous grade-level students in their school.
- After the students download their digital data to a classroom computer, they could import their pictures into a dynamic geometry software program (e.g., GeoGebra® or Geometer’s Sketchpad®) to highlight the object’s measured attribute and the precision of students’ measurement calculations.
- In their Discovery Hunt groups, students could use their digital data to create a photo album or slideshow presentation of their work. These student-generated artifacts could be shared with families, school colleagues, administrators, and professional organizations.

Follow-Up Activity

- To connect with home and families, students could be asked to engage their family members in their own Geometry and Measurement Discovery Hunt. These similar experiences may highlight items that are not readily found in the school setting or items that may have a specific, meaningful cultural connection.
- As the school year progresses, the Geometry and Measurement Discovery Hunt could be adapted to include items that incorporate greater accuracy of measurement, conversions within systems, angles measures, reflection and rotation symmetries, similarity, and congruence.

References

- Leedy, Loreen. 1997. *Measuring Penny*. New York: Henry Holt and Company.
- McKeny, Timothy S., and Gregory D. Foley. 2012/2013. “Tales, tasks, tools, and talk.” *Teaching Children Mathematics* 19 (December–January): 316–323.

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Van de Walle, John A., and LouAnn H. Lovin. 2006. "Developing Measurement Concepts." In *Teaching Student-centered Mathematics, Grades K–3*. Boston, MA: Allyn and Bacon.