

Lesson Plan 2: Tales, Tasks, Tools, and Talk

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Grade Levels: 3–5

CCSSM Domain: Measurement and Data

- Solve problems involving measurement and conversion of measurements from a larger to a smaller unit. (4.MD)
- Represent and interpret data. (2.MD)

Mathematical Practices:

- Reason abstractly and quantitatively. (MP.2)
- Construct viable arguments and critique the reasoning of others. (MP.3)
- 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:

Great Estimations, written by Bruce Goldstone

Greater Estimations, written by Bruce Goldstone

Materials*:

- One copy of Activity Sheet 2: The Great Estimations Contest Activity Sheet per student
- An attached strand of raffle tickets
- A plastic container of gummy sharks
- A glass jar of seashells
- A nylon rope
- A plastic baggie of sand
- A glass jar of fish counters
- A Mason jar full of pebbles
- Clipboards (optional)—one per student or group
- Tape measures in customary and metric units (extension)
- Scales in customary and metric units (extension)
- Capacity measurement tools in customary and metric units (extension)

Note:* The selected items are given **as suggestions. The teacher may opt to provide other items for students’ estimation based on availability, or to fit the activity within the context of an integrated teaching unit. These items were selected to integrate estimation with U.S. customary and metric units within a teaching theme of “A Day at the Beach.”

Discussion of the Mathematics

Both book selections complement this activity. In each book, Bruce Goldstone provides information and student-friendly examples that lead elementary-grade students to estimate quantities of objects. Strategies for estimating, such as Eye Training to quickly recognize groups of ten, hundreds, and thousands; Clustering; and Box and Count are shared. This activity builds from these estimation strategies as students are challenged to interconnect their developing number sense with their evolving personal frames of reference for standard units of length, weight, and capacity in both the customary and metric system. Students can enjoy the friendly competition of trying to be closest to the actual measurements without going over. When students are encouraged to estimate before they measure, the act of estimation “helps students to focus on the attribute being measured and the measuring process, provides students’ intrinsic motivation for accuracy, and develops students’ familiarity with standard units” (Van de Walle and Lovin 2006, p. 228).

Highlighting the Mathematical Practice

Attend to precision. Developing students’ measurement sense and quantitative literacy requires two critical components: estimation and personal experience. As students begin to develop familiarity with standard measurement units for length, weight, and capacity, they begin to develop personal frames of reference for an inch, a foot, a meter, a gram, a cup, a liter, etc. that can be used to help them become better estimators. Developing skills in estimating the value of quantities, whether discrete (e.g., the number of gummy sharks in a plastic container) or continuous measurements (e.g., the length of a rope), requires practice. As students gain more experience in estimating different attributes of common objects within their environment, they attend to the reasonableness and the magnitude of their estimations and can begin to formulate rationales to justify their thinking.

Before the Activity

- The Great Estimations Contest has a wide adaptability in scope and format for the elementary classroom. This activity can be structured for one class session as students work collaboratively in pairs, or the activity can be designed as a week-long, on-going experiential center for students to estimate and to reason individually. In either case, you will need to decide on a workable structure and timeframe for his or her students.
- Collect and clearly label the items to be used within The Great Estimations Contest. Depending on the measurement units being used and the level of accuracy expected from the students, the you will need to carefully measure the attributes of the objects the students will be estimating. By having the actual measurements for the objects, the teacher can adequately scaffold the students’ estimating experiences and support the development of their estimation skills.

Launching the Activity

- Before beginning The Great Estimations Contest, share short sections of the book through an interactive read-aloud to highlight the different estimation strategies. Additionally, review relevant vocabulary for measurement terms, and lead a whole-class discussion about the importance of personal frames of reference for customary and metric measurement units.

During the Activity

- Distribute The Great Estimations Contest Activity Sheet and a clipboard (optional) to each student or group of students. Pairs or groups of three work best in younger grades; older elementary students

should be encouraged to work independently with some opportunities for collaboration and discussion after the estimation activity.

- Students should be given adequate time at each estimation station to explore, to share, and to compare and contrast their estimation reasoning and justifications with their peers. As students move through the estimation stations for the selected objects, each should record his or her best estimate for the attribute being considered on Activity Sheet 2.
- Interact with students as they are estimating and recording to collect formative assessment information. Guiding questions to monitor students' understanding could be: What is your frame of reference for the measurement unit you are using? How did you determine that your estimation is reasonable? What relevant comparisons are you considering when you come up with your estimate?
- After each student has completed his or her estimations, a whole-class discussion should follow. Several students should be asked to share their estimation for each object in addition to their rationale for *why* their estimation makes sense. As students communicate their estimation strategies and their thinking with each other, the class is given the opportunity to listen and to critique the reasoning of their peers.
- Small prizes or classroom rewards could be given to students whose estimations of individual objects are closest to the actual measurement, to students who have made the most accurate overall estimates, and to students who have made the most improvement in their estimation skills.

Extending the Activity

- As added reinforcement for the act of measuring, students working individually or in small groups can model finding the actual measurement of the item's attributes by using tape measures, scales, and capacity tools. Once actual measurements are known, students could be expected to use their flexible understanding of mathematical operations to calculate the difference between their estimate and the actual measurement. An additional column on The Great Estimations Contest Activity Sheet can easily accommodate this calculation.
- In upper elementary grades, students could be asked to make conversions of their estimations or measurements within the same measurement system. For example, students could be asked to calculate the capacity of the plastic baggie of sand in smaller units (e.g., ounces) or in larger units (e.g., quarts or pints).
- Because Measurement and Data are intrinsically linked throughout the Common Core State Standards for Mathematics K–5, older students could be asked to calculate the measures of central tendency (mean, median, mode[s]) for their estimates of each item. Further, students could interpret the meaning of their central tendency calculations within the context of the class' responses.
- International students may have greater success making reasonable estimates in metric units; opportunities should be given to these students to explore and estimate standard U.S. customary units. Similarly, U.S. students may need more experiences with standard metric units.

Follow-Up Activity

- The Great Estimations Contest is a fun, engaging way to build students' measurement sense and quantitative literacy. These skills can be supported and developed throughout the school year by the repeated use of this activity structure but with different items, attributes, and units for students to consider. As the students collaborate inductively and deductively in The Great Estimations Contest on

a weekly or biweekly basis, their estimation and measurement skills will improve. These two skills are critical components of quantitative literacy.

- To connect with home and families, students could be encouraged to create their own Great Estimations Contest for their family members. Information and results could be shared through a Family Math Night, through a classroom newsletter, or through an e-mail.

References

Goldstone, Bruce. 2006. *Great Estimations*. New York: Henry Holt and Company.

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