

GRADE 2 & 3 MATHEMATICS: Measuring Nature (Standard Units)

Summary of Learning Opportunity

This lesson is connected to another Teaching and Learning Story about using natural objects as referents to measure the length of other objects. In the main part of this lesson, I wanted students to practice their estimation skills against standard measurements, so that they could start to form a mental picture of the size of a centimeter or millimeter. I taught students how to accurately measure objects using a ruler and introduced standard metric units for length. I showed students two referents (the end point of a paper clip and their pointer fingernail). They used these referents to estimate the length of various objects, then used their rulers to accurately measure the objects. Students then described their findings to me orally and explained their process for estimating and measuring. Overall, students were highly engaged in this activity because they were very interested in describing the objects that we had found in nature.

Mathematics Grade 2 & 3	Learning Standards	Competencies	<p>Reasoning and analyzing</p> <ul style="list-style-type: none"> Estimate reasonably Model mathematics in contextualized experiences <p>Communicating and Representing</p> <ul style="list-style-type: none"> Represent mathematical ideas in concrete, pictorial and symbolic forms
		Content	<p>Grade 2</p> <ul style="list-style-type: none"> Direct linear measurement, introducing standard metric units <p>Grade 3</p> <ul style="list-style-type: none"> Measurement, using standard units (linear, mass and capacity)

Foundational Math Connections

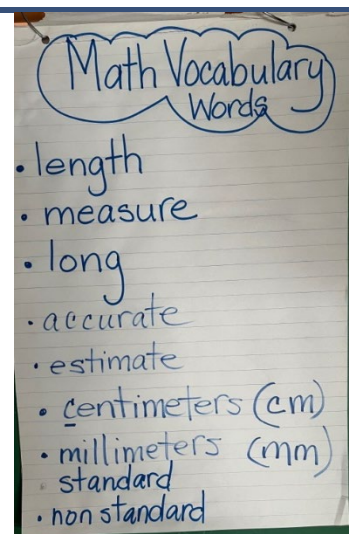
Instruction and Assessment

MATHEMATICS:
Geometry and
Measurement (Spatial
Sense) – *Measurement*

1. Prior learning and context building:

In a previous activity, we went into the natural area near our school to find objects (pinecones, rocks, leaves) to use to measure sticks. We practiced estimating the lengths of the sticks using the natural objects as referents.

We discussed as a class that the problem with these measurements is that we need to be more accurate or exact, and measurements using different sized objects from nature would be different every time. I used a picture book (*Jim and the Beanstalk* by Raymond Briggs) to give further context to this idea. We added more math vocabulary words to our chart from our discussion, prior knowledge and the book.



2. Teacher-led lesson:

In the main part of the lesson, I wanted students to practice their estimation skills again, this time against standard measurements, so that they could start to form a mental picture of the size of a centimeter or millimeter. I showed the students two referents, the width of the end of a paperclip (mm), and the width of their pointer fingernail (cm).

I did a directed lesson with the students to observe their rulers and identify the mm and cm marks. I demonstrated how to place the 0 on the edge of the object and then count the centimeters or millimeters. We also counted the lines to see how many mm are in a cm. We measured the referents with a ruler and discussed using the referents to help us estimate the lengths of other objects, in mm or cm.

We also discussed the importance of using appropriately-sized units.

Teacher: "What standard measuring unit would you use for your stick? Why not use mm?"

Students: "It would take forever to measure!"

3. Student exploration:

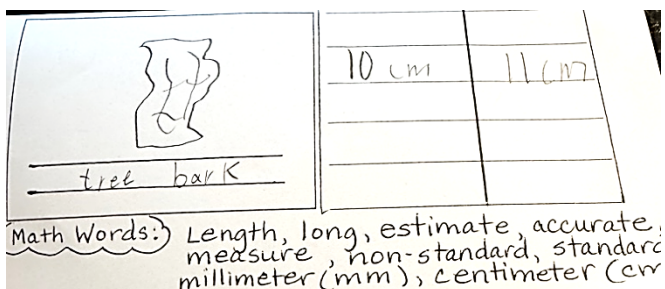
I set up stations for students to examine objects that we had collected from the local environment: shells, arbutus flowers, bark, beach glass, cedar branches, pieces of wood, pine cones, hemlock cones, fir cones, salal, etc. Students were asked to use the referents (paper clip end point and fingernail) to estimate the lengths of the various objects. Then they used rulers to measure the actual length. Students recorded both their estimates and actual measurements.

4. Assessment:

An excerpt from my assessment rubric can be found above. I used the K-4 Mathematics Foundational Learning Progressions to give further detail about what students need to do to achieve the Learning Standards.

Developing	Proficient	Extending
<ul style="list-style-type: none"> I measure length using objects in nature such as cones, leaves, and rocks I estimate length using non-standard units. I measure some objects and record length using standard units, such as millimeters, and centimeters. I use simple math words to explain my measuring. 	<ul style="list-style-type: none"> I measure length using centimetres and metres confidently. I estimate length using standard units (mm, cm) I accurately measure and record length using standard units I explain my measuring process clearly using math words. I can demonstrate my measuring in concrete, pictorial, and symbolic forms. 	<ul style="list-style-type: none"> I measure length using mm, centimetres and metres and can use decimals (e.g. 5.5 cm) I measure and record length using standard units precisely. I explain my measuring process in detail using math words.

Demonstrations of Student Learning, Teacher's Assessment, and Reflection



Student A: Proficient




Student A was able to draw, estimate and accurately measure with a ruler three items from nature. They then compared their estimate with their accurate measurement. Student A proudly shared that they were very close with their estimate and that they knew how to use standard measurement. Student A was able to naturally repeat and use measurement vocabulary to describe their process.

Student B: Proficient

Student B, in grade 2, was extremely engaged in this lesson. They loved the storybook and made the connection right away to the importance of accurate measuring. Student B was inspired by and chose the large piece of beach glass to measure. This student estimated "Mr. Big" beach glass to be 4 cm and then measured it accurately at 3.8 cm. They then explained to me that they were so close and only "2 mm" different from their estimation. They were enthusiastic about using mathematical language to communicate their findings.

Student B is proficient as they could use estimation and accurately measure an object using standard units of mm and cm.

Measuring Nature Objects

DRAW	Estimate	Accurate (mm, cm)
 <u>Beach Glass</u>	20 mm	
 <u>Mr. Big Beach Glass</u>	4 cm	3.8 cm
 <u>Red beach glass</u>	21 mm	

Math Words: Length, long, estimate, accurate, measure, non-standard, standard, millimeter (mm), centimeter (cm)

Teacher's Reflection

I felt that the following were key successes in this lesson:

- Change in thinking about measurement
- Understanding of why we measure
- Connections to Core Competencies (reflective thinking, investigating, transferring knowledge, communication of process)
- Enjoyment/engagement

Having students measure natural objects that they found had many benefits! Students engaged in real-world learning, and they felt motivated to use their skills to measure cones, leaves, shells, beach glass, that they found interesting and had observed when walking in nature. Another positive aspect was in the communication of their learning. Students and teachers needed to use the language associated with measurement to describe the objects accurately.

In future lessons, my teaching team and I talked about using the school garden to continue measurement, introducing other vocabulary such as "height". In a culminating activity for this unit, teachers will ask students to design their own gardens based on the "Three Sisters" corn, beans, and squash — traditionally grown together by Indigenous peoples. These plants support each other and need space to grow well. This gives another important reason to have accurate measurements.