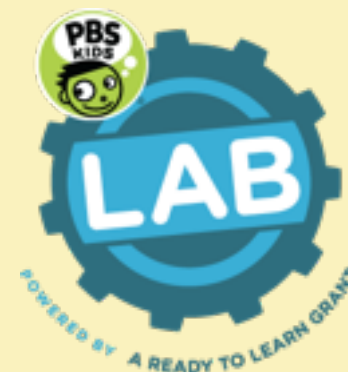




Measuring Length

Teaching Tips: First Grade

Using Best Instructional Practices with Educational Media to Enhance Learning



**Boston University
School of Education**

October 1, 2015

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Unit Overview



	CCSS: Mathematics	Key Vocabulary	Watch Together	Play Together	Explore with a Friend	Share at Home
Lesson 1	• Make sense of problems and persevere in solving them. • Construct viable arguments and critique the reasoning of others. • Use appropriate tools strategically. • Attend to precision. • Express the length of an object as a whole number of length units by laying out multiple copies of the shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.	measurement, length, distance, precise, defeat, diagram, persevere, visualize	Defeating the Hydraclops	Blob Chase (app)	Blob Chase (app)	Parent Letter
Lesson 2	• Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tape. • Use appropriate tools strategically. • Attend to precision.	ruler, standard, inch, foot, shrink, bridge the gap	Otto Is Shrinking	Down the Tubes	Down the Tubes	Parent Letter
Lesson 3	• Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tape. • Use appropriate tools strategically. • Attend to precision.	yardstick, yard, efficient, appropriate	Defeating the Hydraclops	Classroom Chart: Measuring Length	Down the Tubes	Parent Letter

Maintain Brisk Pacing

Research demonstrates that “brisk” pacing is related to greater content coverage, increased motivation and engagement, and, in turn, higher levels of student achievement.

- **Note the time allocated to each component of the lesson.** Monitor the length of your teaching and children’s turns so that all activities are completed within the allocated time.
- **Establish a predetermined system for calling on children** to work at the whiteboard. For example, write each child’s name on a Popsicle stick and place the sticks in a jar. To call a child to the board, draw a stick from the jar. When a child’s name is selected, set that stick aside, leaving only the sticks of children not yet chosen.
- **Invite all selected children to the whiteboard at the same time** when more than one child will be playing.
- **Limit time spent in Turn and Talk to 10–15 seconds** to maintain attention and focus.

Engage All Children

When children are highly focused and engaged, they attain higher levels of achievement.

- **Position children so they do not block the screen** when they stand at the whiteboard, so that everybody can see the videos, games, images, and activities.
- **Involve all children in thinking about the correct answers** even if it is not their turn at the whiteboard.
 - Use strategies such as Turn and Talk. For example, ask all children to tell a partner the answer they would choose, or if they agree/disagree with a stated choice.
 - When the child at the whiteboard gives an answer, invite all the others to show “thumbs up” if they agree with the answer or “thumbs down” if they disagree.
- **Observe children’s understanding of key concepts.** When most children demonstrate understanding by rapidly choosing correct responses, wrap up the lesson.
- **When partners share a tablet, position the device between them** so that it is easily accessible to both.

Support Independent Learning

When teachers notice and name the learning strategies children use, children are more likely to become strategic and independent learners.

Use Key Vocabulary Frequently

When children have many opportunities to hear and use new vocabulary words, they are more likely to acquire and use the words on their own.

- **Repeat key words as often as possible** during the lesson, as well as during other parts of the school day when use of these words is appropriate.
- **Ask children to use key words** while playing the games.
 - When children are at the whiteboard, encourage them to use key words to describe their actions. For example, “The **length** of the gap is four tubes.”
 - When children are invited to turn and talk, encourage them to use key words. For example, “One foot is shorter than one **yard**.”

Mediate Game Play

When well-developed educational media programs are effectively joined with a sound classroom curriculum, children demonstrate high levels of motivation and engagement as well as notable increases in early literacy and mathematics skills and knowledge.

- **Load the game on the computer and minimize it before you begin the lesson.** This allows you to optimize instructional time by beginning game play as soon as you and the children are ready.
- **Preview the screen to explain what children will do.** Point out game features such as selecting objects, moving objects, and repeating the game instructions.
- **Quickly mute/unmute the sound by using the mute button** on the top row of the computer keyboard. You can also use the volume down/up buttons on the keyboard, or the volume controls on the interactive whiteboard, to adjust the sound.
- **If the touch function doesn’t work, use your computer to click on the item the child touches.**
- **Establish a routine for quick distribution of individual tablets or whiteboards.** For example, choose one child in each row of children to pass items.
- **Prepare for the worst!** Have a dry erase board or manipulatives available to carry out activities intended for the interactive whiteboard (such as visualizing the length of a gap in a row of blocks).

Lesson 1: Preview



Video: Defeating the Hydraclops (9:30)

Preview the video:

pbskids.org/lab/videos/bu_videos/16/

It's arrival day for the Hydraclops, a monstrous creature that rises out of the lake every one hundred years to destroy the world. Luckily, when Oscar was five years old he created a powerful weapon to defeat the Hydraclops, along with a map showing where he buried the weapon. The map uses nonstandard units of measurement (teddy bear, granola bar, shoe) to indicate where Oscar, Olive, and Otto must dig to find the treasure boxes that lead to the weapon.

The Problem: Oscar, Olive, and Otto must find the weapon before the Hydraclops destroys the world.



Game: Blob Chase (App*)

pbskids.org/apps/odd-squad-blob-chase.html

A blue blob has escaped and split into lots of smaller blobs. Players need to get the blobs back into a container by filling gaps in passageways with the correct number of units (solid blocks and tubes).

The game increases in difficulty through 60 levels. Beginning in Level 7, players need to remove the correct number of units blocking a passageway. In Level 11, players add and subtract units. At some levels, players have to figure out the best sequence for adding and subtracting units.

*Teachers can get a free gift code to purchase this app at pbskids.org/giftcodes

Helpful Background

The lesson begins with a Unit Launch to familiarize children with key concepts and vocabulary related to measuring length. These ideas will be developed over the course of the unit using a Measurement concept map (page 10). Display this where you can easily access it and all children can see it, since you will add to it in each lesson.

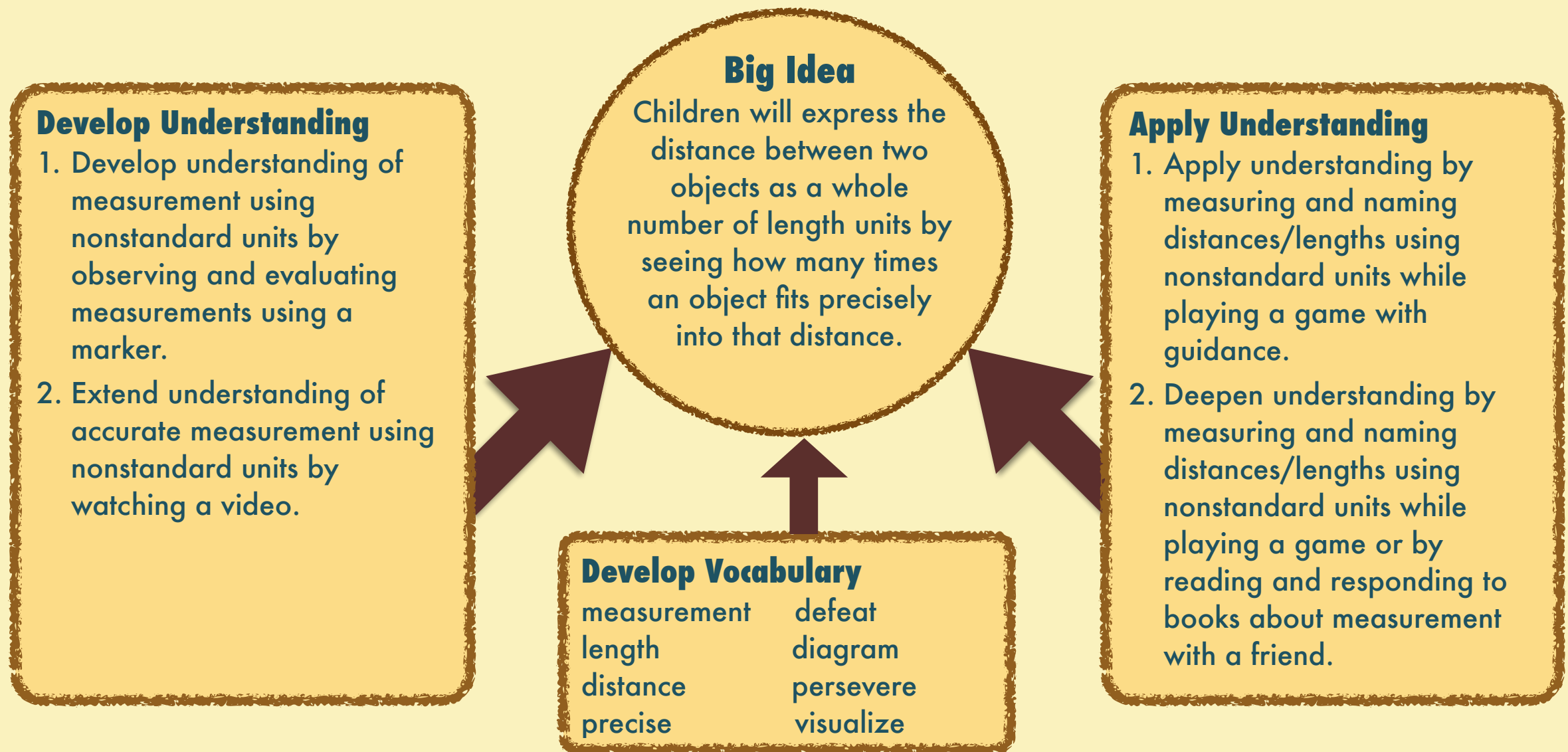
Usually, we measure with standard units, which means they are universally available and the same size for everyone who uses them. In this lesson, children will explore measurement with nonstandard units (e.g., teddy bear, shoe) invented and unknown outside the local context.

The Blob Chase game is available only as a tablet app. To display the game on an interactive whiteboard, you will need a VGA adapter plugged into your tablet and a VGA extension cord (at least 6–10 feet long) plugged into the tablet and interactive whiteboard.

The lesson begins with Level 2 of the game. You need to complete Level 1 at least once to unlock Level 2.



Lesson 1: Big Idea



Make sure to:

- Emphasize and reinforce that, to measure correctly, there should be no gaps as children move the measuring object from one location to the next.
- Prompt children to describe distance using nonstandard units of measurement. (For example: "The distance is ten markers long.")

Lesson 1: Objectives



Unit Launch

Introduce measurement with a concept map.

Build Background

Activate and build children's background knowledge.

Watch Together

Introduce or review math concepts and hear new vocabulary in context.

Get Ready to Play

Preview the game.

Play Together

Play a teacher-led game.

Explore with a Friend

Practice with one or more partners at a learning station.

Review, Connect, Reflect

Review big idea, connect to home, and evaluate student learning.

In this lesson, children will:

- persevere in problem solving (mathematical practice)
- create arguments and critique the reasoning of others (mathematical practice)
- use appropriate tools (mathematical practice)
- attend to precision (mathematical practice)
- express the distance between two places or objects as a whole number of length units by laying out multiple copies of the shorter object (the length unit) end to end
- understand that the length measurement of a distance or an object is the number of same-size length units that span it with no gaps or overlaps
- acquire and use vocabulary and concepts such as **measurement, length, distance, precise, defeat, diagram, persevere, and visualize**
- read and respond to books about measurement
- use technology to learn, working individually and in groups



Lesson 1: Unit Launch



DAY 1 Time: 5 minutes

Teacher Prep

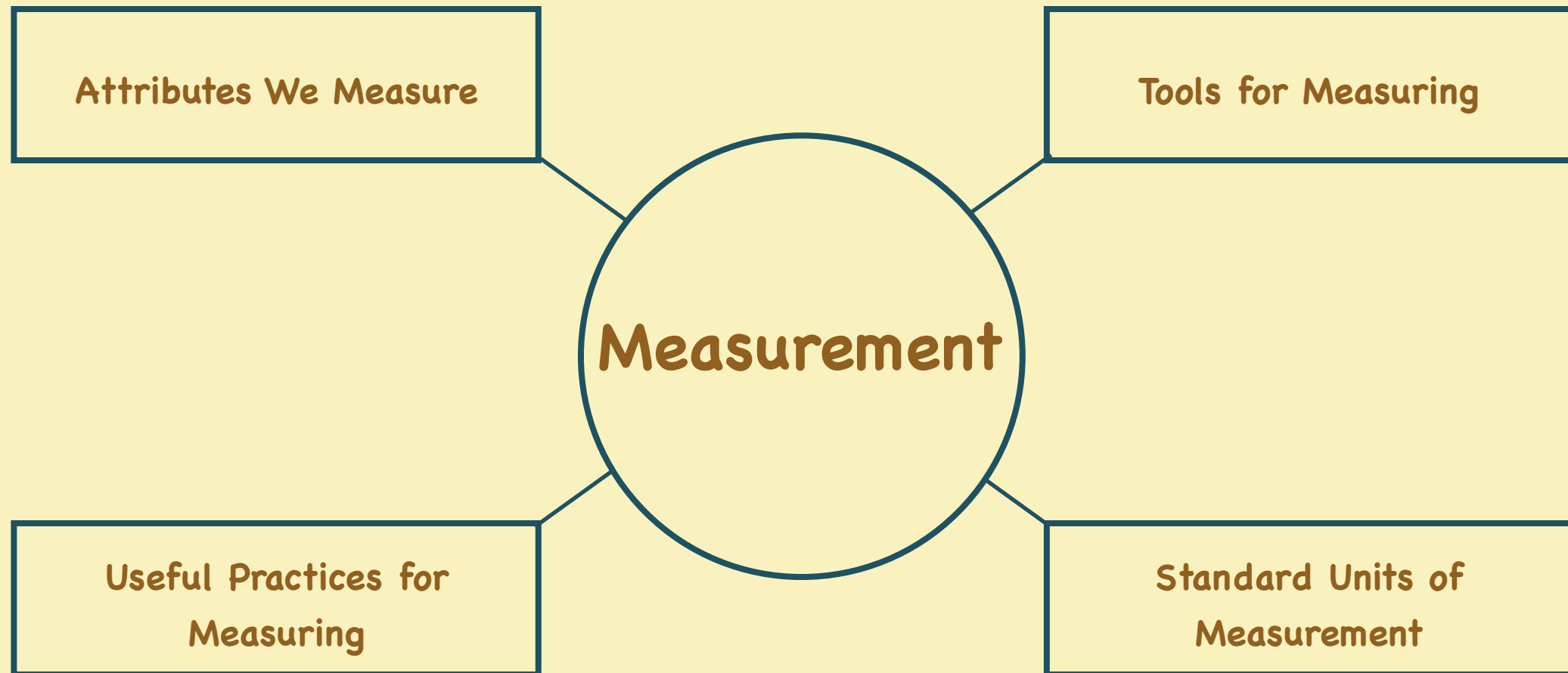
1. Create the Measurement concept map shown on page 10 for display on an easel or bulletin board.
2. Launch the video *Defeating the Hydraclops*. Press pause to stop the video from playing, then minimize it to place it on the dock for easy access.
pbskids.org/lab/videos/bu_videos/16/
3. Download the Blob Chase app on your tablet (get a free gift code at pbskids.org/giftcodes). Complete Level 1 to unlock Level 2. Make sure you can display your tablet screen on the whiteboard with a VGA connector or a wireless connection.
itunes.apple.com/us/app/odd-squad-blob-chase/id953230894?mt=8
play.google.com/store/apps/details?id=org.pbskids.blobchase&hl=en
4. Gather a class set of tablets and make sure they all have the Blob Chase game with Level 2 unlocked and open.

To introduce the concept of **measurement**, display the Measurement concept map and tell children that in this unit they will learn about **measurement**—a way of finding a number that shows an amount or size of something.

Point to the box titled Attributes We Measure and explain that an attribute tells us something about an object or a space. Knowing about attributes can help us describe how an object or a space looks (for example, is it long or short?) or how an object feels (for example, is it heavy or light?).

Write the words **length** and **distance** on the map, linked to Attributes We Measure, and explain that **length** is the space, or **distance**, between two points.

Concept Map: Measurement





Lesson 1: Build Background



DAY 1 Time: 5 minutes

To develop an understanding of **length**, invite two children to stand at different **distances** from the interactive whiteboard, with the first child significantly closer to the board than the second child. Tell the class that you will **measure** the **length**, or **distance**, each child is from the board, using a marker.

- Ask: *Will it take more markers to **measure** [first child's] or [second child's] **distance** from the whiteboard?*
- Call on a child to answer and explain why. (One child is much farther away, so that will take more markers.) Ask others to show thumbs up if they agree or thumbs down if they disagree.

To demonstrate, **measure** the **distance** from the first child to the board, moving the marker across the floor. As you count the units, call children's attention to the way you are **precisely** placing the marker from end to end without leaving gaps. Describe the **length** and record it on the whiteboard. (For example: Morgan's **distance** from the whiteboard is ten markers.)

Next, repeat these steps with the second child, but this time be obviously **imprecise** as you move the marker along the **distance**, so that it appears as if fewer markers are required to **measure** the **distance**.

- Say: *It took me [ten] markers to **measure** [closer child's] **distance** to the board but only [seven] markers to **measure** [farther child's] **distance**. This doesn't seem to make sense. Can someone explain what I did wrong?*
- Call on a child to tell why the second **measurement** is incorrect. Recast the child's response using the word **precise**. (For example: *I wasn't **precise** when I moved the marker.*)
- Measure the distance from the child farther away, this time moving the marker **precisely**, to obtain the correct measurement.

Draw children's attention to the box on the concept map labeled Useful Practices for Measuring and write **be precise**. Explain that if we **measure** carelessly, or without being **precise**, the **measurements** are incorrect and not helpful in solving problems.



Lesson 1: Watch Together



DAY 1 Time: 15 minutes

To introduce the mathematical practices of **persevering** and being persistent, display the video *Defeating the Hydraclops*. Before viewing, explain that a monster called a Hydraclops is going to invade the town, and the Odd Squad agents must find a way to **defeat** it—to keep it from harming the world. Tell children that Oscar has buried a weapon that can **defeat** the Hydraclops, and the agents must use his **diagram**, or map, to find it. Explain that to find the weapon, the agents must be **precise** in their **measurements**, and they must also **persevere**—that means they must keep trying even when it gets very hard or they become confused. Write the word **persevere** on the concept map linked to Useful Practices for Measuring.

Tell children that as they view they should pay attention to how the agents **measure distances** to figure out where to dig.

Press play and watch the video together. Be prepared to pause the video:

- after Oscar uses the teddy bear to **measure** and says, “And ten!”
- after Oscar uses a pencil to **measure**, then stands up and says, “Here.”
- after Olive **measures** with the shoe Oscar had when he was five years old and the agents count to one hundred.

At each stopping point, ask:

- *What did the agents use to **measure the distance** to figure out where to dig?*
- *What did the agents do to **measure precisely**? (placed a hand at the end of the object used for **measuring**, made sure not to leave gaps as they moved the object)*

After the second and third stopping points, ask:

- *What did the agents do to **persevere**? (used a pencil instead of a granola bar; figured out why the shoe Oscar was wearing did not lead them to the treasure chest; didn’t give up when it got hard; talked together and kept trying until they found a solution)*

Before watching the rest of the video, ask children to tell their partners what kind of weapon they think will be in the treasure chest.

Finish watching the video, then have children give a thumbs up if they thought a smelly sock would be the weapon used to **defeat** the hydraclops, or a thumbs down if they didn’t. Close the video.

Lesson 1: Wrap Up (Day 1)

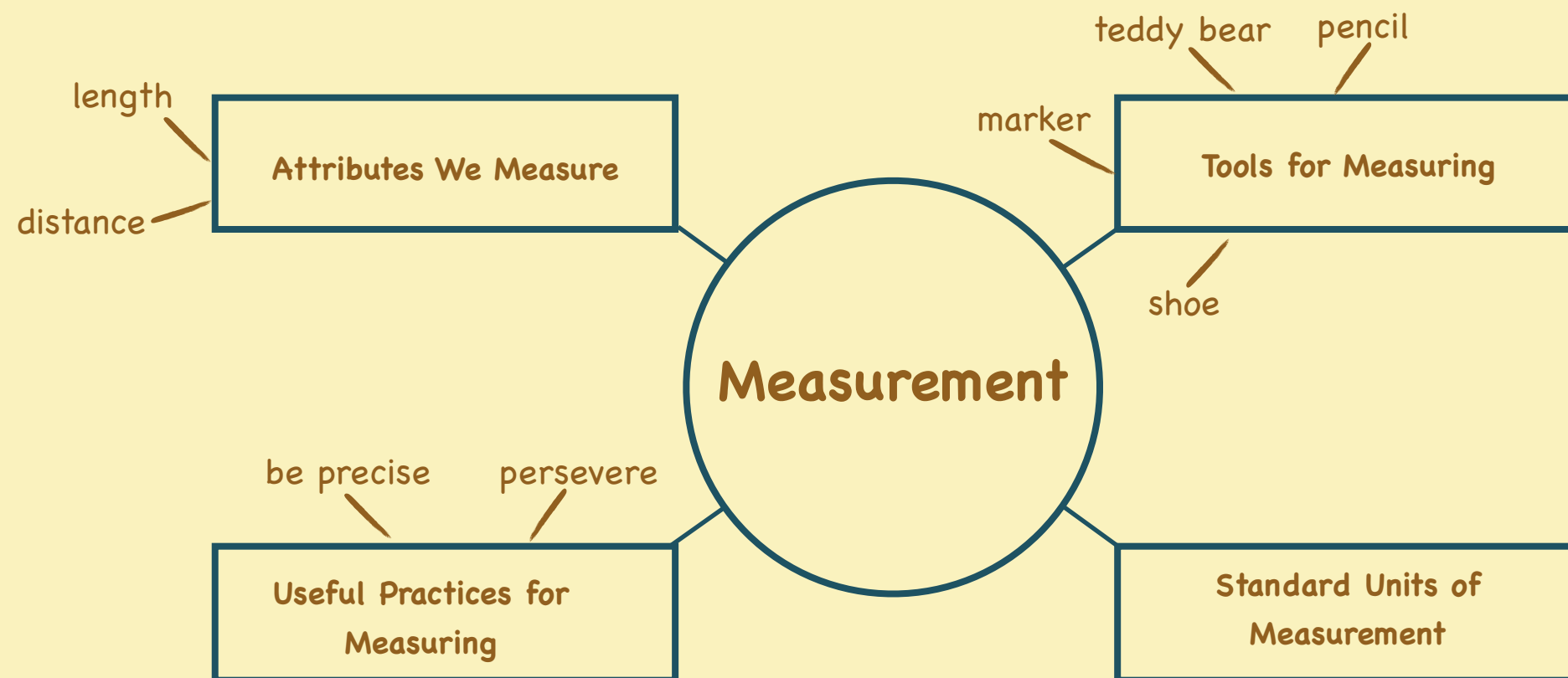


DAY 1 Time: 5 minutes

Return to the Measurement concept map and ask:

- What attributes did we **measure** today?
- What tools did we and the Odd Squad agents use to **measure**? (Add **teddy bear**, **pencil**, **shoe** to the concept map.)
- What useful practices did we use to help us **measure** correctly?

Tell children that in the next lesson they will continue to learn about **measurement** by playing an *Odd Squad* game.





Lesson 1: Get Ready to Play



DAY 2 Time: 5 minutes

To review the big ideas about **measurement** from the previous lesson, prominently display the Measurement concept map. Pointing to each box, prompt children to recall the big ideas. (For example, ask: *What attributes did we learn about yesterday?*) Explain that as they play the game Blob Chase, they will again **measure length** by seeing how many times an object fits into a space.

Display Level 2 of the game Blob Chase on your tablet and the interactive whiteboard (using a VGA connector and extension cord). Since children cannot interact with the game on the whiteboard, you will test their answers on your tablet (displayed on the whiteboard), while they play on their tablets.

Describe the purpose of the game.

- Tell children that an imaginary creature, called a blob, has escaped and split into lots of smaller blobs; to collect them, children must fill the gaps along the path so the blobs will walk into a container.

Connect the game to the previous lesson.

- Explain that, as they did previously, they will **measure distance** by seeing how many times an object fits in the space with no gaps as objects are placed end to end.

Explain the technology features of the game.

- On the screen, point out the blobs, the gaps, and the container.
- Point to a block and explain that this is the object they will use to **measure the length** of the gap. Point to the gadgets on the left side of the screen and explain that they will choose the gadget that will add the correct number of blocks to fill the gap. For example, the gadget labeled +3 will fill a gap that is three blocks long.
- Using your tablet, demonstrate how to drag the +3 gadget to a gap, drawing their attention to how the gadget displays the number of blocks it will add.
- Point out the HINT button and tell children they can select it if they need to hear the instructions again.
- Distribute tablets to each pair of children, with the Blob Chase app open to Level 2.



Lesson 1: Play Together, Part 1



DAY 2 Time: 10 minutes

To help children **measure precisely**, point out the block and the first gap, then prompt them to **visualize**—to picture in their minds—how many blocks will fit into the gap.

- Ask: *How many blocks long do you think this gap is?*
- Call on a child to answer and explain his/her reasoning.
- Ask the rest of the class to show thumbs up (agree) or thumbs down (disagree).

Be sure to emphasize the concept of **length** by using phrases such as “the gap is three blocks long.”

To test the answer, move that gadget on your tablet and have the children do this on their tablets.

- If the answer is correct, model how to express the answer in units of **length**. For example: *Two blocks fit the gap, so the gap is two blocks long.* Then repeat these steps to fill the second gap.
- If the answer is incorrect, repeat the steps:
 1. **Visualize** blocks to fill the gap.
 2. Test the answer.
 3. Express the answer using units of **length**.

After all the blobs are in the container, choose REPLAY if children need more practice at this easy level. If most children are ready for a greater challenge, choose NEXT and proceed to Play Together (Part 2).



Lesson 1: Play Together, Part 2



DAY 2 Time: 15 minutes

Familiarize children with new game features in Level 3:

- The unit of **measurement** changes from a block to a piece of tube, and the **distance** they will **measure** is vertical—top to bottom—instead of horizontal, or side to side.
- Call children’s attention to the **length** of one tube and point out that the blobs exit from the side of the tube, not the top. This means children must add enough pieces of tube so that the blobs can come out the side to go into the container. If they choose a **length** with too few tubes, the blobs will end up back where they started.

Play the game:

- Ask children to **visualize** how much longer the tube must be to get the blobs to a level where they can walk toward the container.
- Call on a child to share the answer. Remember to prompt the child to express the answer as units of **length**. For example: “The tube needs to be two pieces of tube longer.” It may be helpful to post a sentence stem as a reminder (e.g., The tube needs to be ____ pieces of tube longer.)
- Ask the rest of the class to show thumbs up (agree) or thumbs down (disagree).
- Test the answer on your tablet while other children do the same on their tablets.
 - If the answer is correct, repeat the steps to fill the next gap.
 - If the answer is incorrect, again have children **visualize** the number of tube pieces that fit the gap, express the answer using units of **length**, and test the answer.

Continue playing until most children are using correct language to describe the **length** of a gap or the missing pieces of tube. As you end the game, return to the concept map and write the word **visualize** connected to Useful Practices for Measuring. Remind children that in this game, they used another useful **measuring** practice: They helped the blobs get to the container by **visualizing** the **length** of the gap and estimating how many pieces of tube they needed to put the blobs on a path to the container.

Close the game.



Lesson 1: Explore with a Friend



DAY 2 Learning Center Time: 10 minutes

Option 1: If children need practice understanding the concept of using objects to **measure length** and naming the unit of **length**, set up a learning center where children can play Blob Chase. As they play, ensure that they are actively considering the number of blocks or pieces of tube they will need to fill each gap (or complete the tube) and that they are naming the unit of **length**. Ask:

- *How long is the gap that you are trying to fill? (Or: How much longer does the tube need to be?) How do you know?*

Option 2: If children need a greater challenge, create a learning center where children will **measure** the **distance** between two points using an object (such as a marker, pencil, or shoe). As they work together, observe to see that they are **measuring precisely** by using a finger or hand to mark where to place the object, leaving no gaps as they move it. (If the **length** isn't a whole number, explain that they can say the **distance** is a little more or less than the whole number **distance**.) Ask:

- *How long is the **distance** you **measured**?*
- *How do you know your answer is correct? (used a finger to **measure precisely** without leaving gaps)*

Option 3: To reinforce key concepts, create a learning center where children can read and discuss children's books related to **measuring length**. Suggestions include:

- *How Big Is a Foot?*, by Rolf Myller
- *Is a Blue Whale the Biggest Thing There Is?*, by Robert E. Wells
- *Measuring Penny*, by Loreen Leedy
- *Super Sand Castle Saturday*, by Stuart J. Murphy

Differentiated Learning

In this part of the lesson, you may assign children to learning centers based on their learning needs.

Use **Option 1** for children who need need practice visualizing and naming units of length. Most children will be able to play the game successfully on their own.

Use **Option 2** to provide more challenge. Consider which children will be able to complete the task on their own and which will need teacher guidance, then group them accordingly.

Use **Option 3** to provide all children with opportunities to learn more about mathematical ideas through reading. As you assign children to this learning center, remind them to connect what they've learned about measurement as they read and discuss the books.



Lesson 1: Review, Connect, Reflect



DAY 2 Time: 5 minutes

To support children's independent learning, return to the concept map. Point to each box and review what they have learned so far about **measurement**. To emphasize the new information from this lesson, ask:

- When we use an object to **measure** the **distance** between two points, what do we need to do to be **precise**? (leave no gaps when placing the object)
- What should we do if it is difficult to find a solution to problem? (keep working on it and **persevere** by trying different ideas and talking with others)
- When we use an object to **measure** the **distance** between two points, how should we describe the **length**? (name the unit of **measure**; e.g., the chair is ten pencils from the easel)

To connect to home:

- Tell children: Teach a family member what you learned about **measurement**. Choose a **distance** to **measure** (for example, the **distance** between the kitchen table and the sink). Then choose an object as a **measuring** tool (for example, a shoe or a stuffed animal). Remember to use useful practices for **measuring**—be **precise** and **persevere** even when it is hard!
- Help parents support children's use of these ideas and strategies by sending the parent letter home with children.

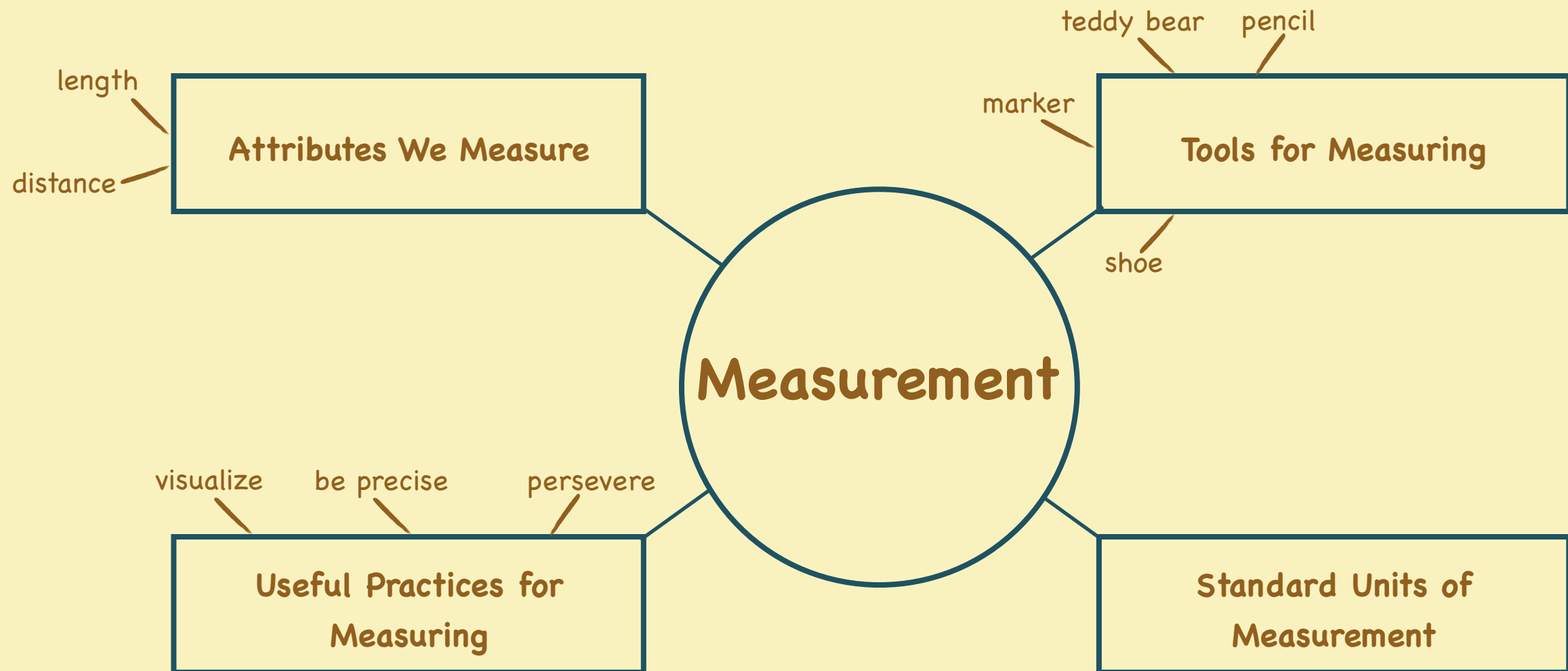
Teacher Reflection

- Did most children measure precisely? *If not, have children practice measuring by placing an object end-to-end without gaps.*
- Were most children engaged with the content while playing the game on a tablet? *If not, play again with a focus on having children respond to the content-related questions outlined in Play Together, Part 1.*
- Did most children use new vocabulary (measurement, length, distance, precise, diagram, persevere, and visualize) during and after this activity? *If not, review the words briefly and use them repeatedly as you continue to play this and other activities. Prompt children to use the words on their own.*

Concept Map: Measurement



NOTE: This is how the concept map looks with key vocabulary from Lesson 1.



Lesson 2: Preview



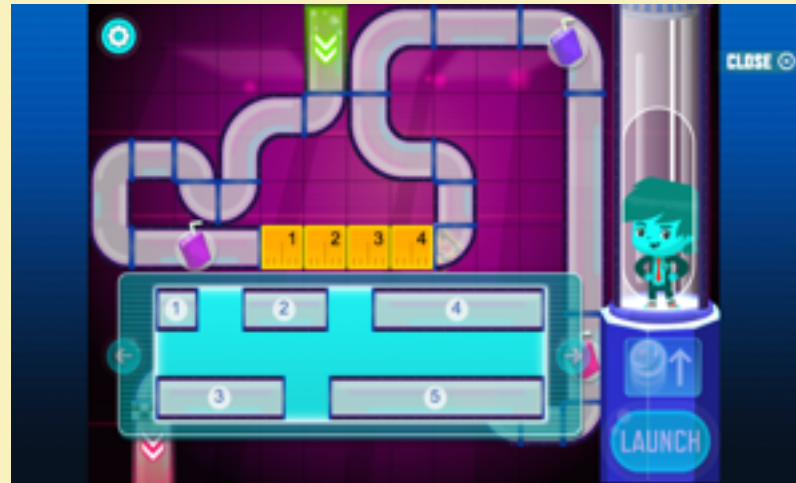
Video: Otto Is Shrinking (8:20)

Preview the video:
pbskids.org/lab/videos/bu_videos/17/

Olive thinks she's grown because she is now taller than Otto. But it turns out that Otto is shrinking. Oscar uses a tape measure to check Otto's height. He's four feet, a foot shorter than he used to be, because he ate the "shrinking potato" salad that was in the fridge.

In their quest to find the "growing potato" that will stop Otto from shrinking, the agents need to measure the upside-down-inator, several recorders, and some rope.

The Problem: The Odd Squad agents must find the potato that will turn Agent Otto back to his original height.



Game: Down the Tubes

Preview the game: pbskids.org/oddsquad/games/downthetubes

The tube system Odd Squad agents rely on to get around is broken. Players need to measure the gaps in the tubes, then choose the right-size tube to fill each empty space. As the game progresses, players need to fill more gaps and use more than one piece of tube to fill some of them. They can also choose different types of tube pieces, such as ones with fish bowls or colored balls.

The game increases in difficulty through 30 levels. Beginning in Level 8, players must also rotate tube pieces to close gaps. At Level 11, they can rotate tubes in different ways to create different paths for an agent.

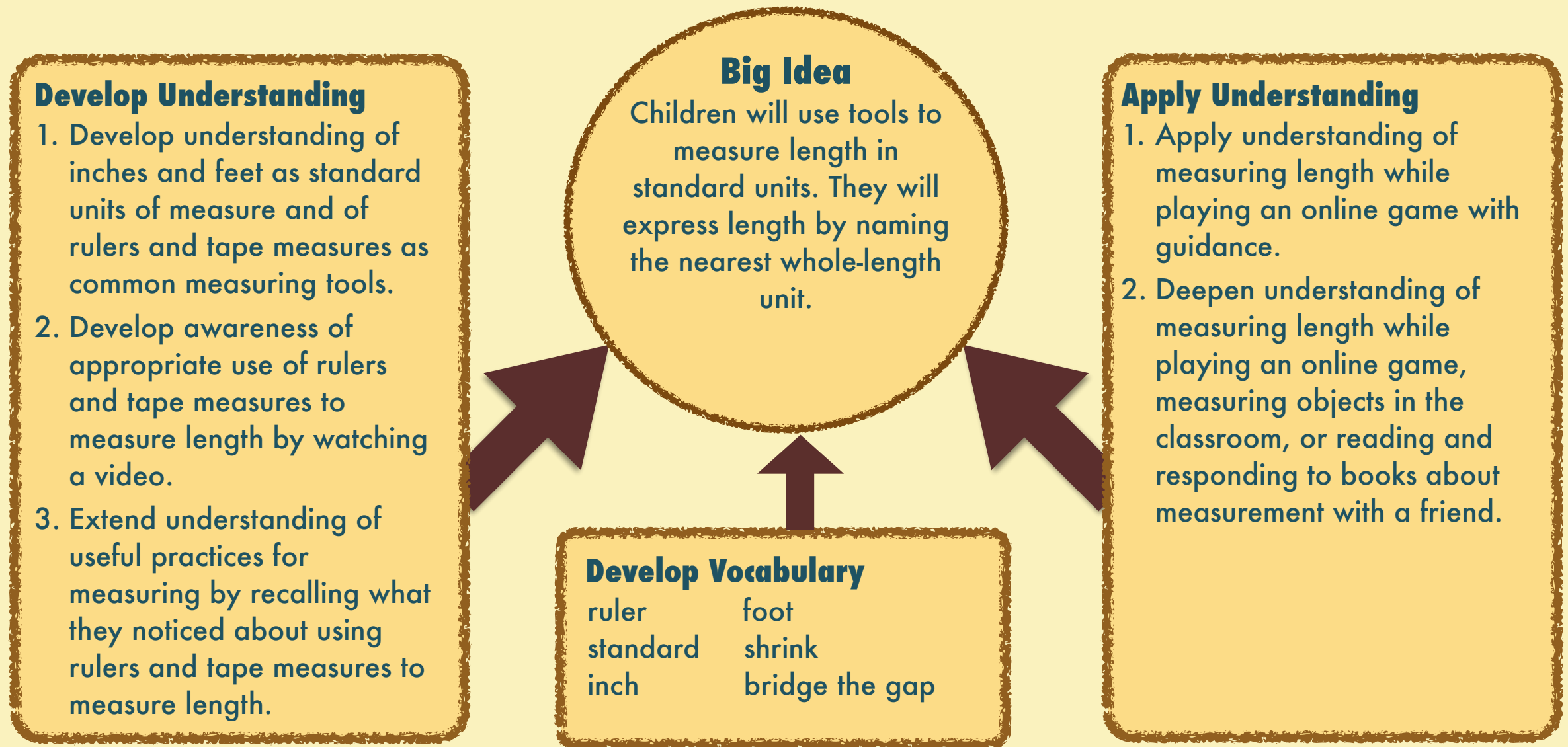
Helpful Background

The lesson introduces inches and feet as standard units of measurement. Children will continue adding to the Measurement concept map throughout the lesson, so be sure to display it where everyone can see it.

The measuring tool in the game Down the Tubes is called a ruler, but it more closely resembles a tape measure. The lesson prompts teachers to refer to the tool as a tape measure.

In higher levels of the game, the focus broadens beyond measurement to include problem solving using spatial reasoning as players rotate tubes to create different pathways for the agent. Have children continue to focus on measuring the gaps as they play higher levels.

Lesson 2: Big Idea



Make sure to emphasize:

- A ruler is read from left to right, like words in a sentence.
- The left end of the ruler is always zero, even if it's not labeled.
- The distance from the left end of the ruler or tape measure to the "1" represents 1 inch or 1 foot; the distance from the "1" to the "2" is also 1 inch or 1 foot; the two together equal 2 inches or 2 feet.

Lesson 2: Objectives



Build Background

Activate and build children's background knowledge.

Watch Together

Introduce or review math concepts and hear new vocabulary in context.

Get Ready to Play

Preview the game.

Play Together

Play a teacher-led game.

Explore with a Friend

Practice with one or more partners at a learning center.

Review, Connect, Reflect

Review big idea, connect to home, and evaluate student learning.

In this lesson, children will:

- measure the length of an object using rulers and tape measures
- use appropriate tools (mathematical practice)
- attend to precision (mathematical practice)
- acquire and use vocabulary and concepts such as **ruler, standard, inch, foot, shrink, and bridge the gap**
- read and respond to books about measurement
- use technology to learn, working individually and in groups



Lesson 2: Build Background, Part 1



DAY 1 Time: 5 minutes

Teacher Prep

1. Display the Measurement concept map on an easel or bulletin board.
2. Gather 12-inch rulers for each pair of children.
3. Open the video *Otto Is Shrinking*. Pause the video and minimize it to place it on the dock for easy access.
pbskids.org/lab/videos/bu_videos/17/
4. Open the game Down the Tubes. Minimize the game to place it on the dock.
pbskids.org/oddsquad/games/downthetubes
5. If you have a class set of tablets, gather them to pass out to children in pairs for Play Together and Explore with a Friend. They should all have the Down the Tubes game open to Level 1.

Display the Measurement concept map and explain that in this lesson children will continue to learn about measuring length. To develop their understanding of the need for a **standard** unit of measure:

- Place a chair a short distance from the interactive whiteboard and invite a child to be your helper. Explain that you will each measure the distance from the chair to a corner of the whiteboard using your feet.
- Walk along placing one foot directly in front of the other, heel to toe, counting the number of “feet” from the chair to the whiteboard. Write the number on the board, then have the child use his/her feet to measure the distance and write this number next to yours.
- Call children’s attention to the different number of “feet” and ask why the measurements differ—did you or the child do something wrong when you measured? Prompt the children to share their thinking with their partners.
- Call on a pair of children to explain their thinking, and, if necessary, help them understand that the measurements are different because your foot is longer than the child’s foot, so it took fewer of your feet to measure the same distance.



Lesson 2: Build Background, Part 2



DAY 1 Time: 5 minutes

To develop children's understanding of a **ruler** as a **standard** measuring tool and of **inch** and **foot** as **standard** units of measure:

- Explain that when we use nonstandard measurements such as our feet, the measurement changes from person to person. To solve this problem, we can use **standard** or common tools to measure, and a **ruler** is one of those tools. When we use a **standard** tool the distance is always the same regardless of who does the measuring.
- Give each child a 12-**inch ruler** and explain that each **ruler** is one **foot** in length. Prompt children to compare their **rulers** with each other and emphasize that every **ruler** is the same—one **foot** is a **standard** unit of measure so it doesn't change.
- Point out the distance from the left end of the **ruler** to the number 1 and explain that this short length or distance is called an **inch** and there are 12 **inches** in a **foot**. Show children that each **inch** is marked by a line and a number, then have them count with you as you count **inches** along the length of the **ruler**.
- On the concept map, write **ruler** linked to Tools for Measuring, and write **foot** and **inch** linked to Standard Units of Measurement. Repeat that **rulers** are tools to measure length in **feet** and **inches**.



Lesson 2: Watch Together



DAY 1 Time: 15 minutes

To demonstrate using appropriate tools and measuring skills to solve problems, display the video *Otto Is Shrinking*. Before viewing, explain that in the video Otto is **shrinking**—he’s getting smaller and smaller—and Odd Squad agents must use their measuring skills to solve the problem. Tell children that after they watch, you will ask them to share their favorite parts of the video and to describe the tools and strategies the agents used.

After watching the video, have children turn and tell their partners their favorite part. After about 15 seconds, ask a few children to share their ideas.

To help children recall the ways Odd Squad agents used what they know about measurement to solve the problem, ask:

- *What did the agents measure?* (Otto’s height, the upside-down-inator, recorders, ropes)
- *What measuring tools did the agents use?* (tape measure, **ruler**)
- *What units of measure did the agents use?* (**inches, feet**)
- *What useful practices for measuring did the agents use?*
 - lined up the end of the tape measure/**ruler** with the end of the object they measured
 - placed a finger at the end of the tape measure/**ruler** and slid it along as they counted each **inch/foot**, starting at the number 1
 - read the tape measure/**ruler** from left to right, like reading the words in a sentence

Close the video.

Return to the Measurement concept map. Pointing to each box, guide children to add new information. If children need help adding new information, ask:

- *What attributes did the agents measure?* (Add **height** to the concept map.)
- *What tools did the agents use?* (Add **tape measure** to the concept map.)
- *What measuring practices did we use?* (Add: **line up the ruler, slide your finger along to count units, read the ruler from left to right.**)

Tell children that in the next lesson they will practice what they’ve learned about measurement by playing an *Odd Squad* game.



Lesson 2: Get Ready to Play



DAY 2 Time: 5 minutes

To help children recall what they've learned about measurement, display the Measurement concept map. Pointing to each box, ask children to recall important ideas from the previous lesson. Call special attention to the useful practices for using a **ruler** or tape measure:

- line up the **ruler**
- slide your finger along to count units
- read the **ruler** from left to right

Describe the purpose of the game.

- Tell children that the tubes the Odd Squad agents use to travel are not working because they have gaps. They must figure out the length of each empty space so they can **bridge the gap**, or fill it.

Connect the game to the previous lesson.

- Explain that, as they did previously, they will use a measuring tool (a **ruler**/tape measure) to measure length.

Review the technology features of the game.

- Display the game Down the Tubes. Watch the video, press START, and choose Level 1. Have children listen to Olive's instructions.
- Point out the gap and demonstrate how to drag the arrow to measure the gap.
- Describe the length of the gap. For example: *The gap is five units long, so to **bridge the gap** I need a piece of tube that is five units long.* Demonstrate choosing a tube to fill the gap. Then select the arrow or LAUNCH button to send the agent through the tubes.
- Choose NEXT to proceed to Level 2.

Lesson 2: Play Together



DAY 2 Time: 15 minutes

Tablet Option: If you have a class set of tablets, pass them out to children in pairs. Explain that while two children play the game at the whiteboard, others will follow the same instructions as they play on the tablets. Have all children play Level 1 together on the tablet.

Beginning at Level 2, invite two children to the whiteboard. Instruct the first child to measure the gap closest to the top of the screen. When the measurement and pieces of tubes are showing, ask:

- *How long is the gap? (4 units)*
- *How long does the piece of tube need to be to fill this gap? (4 units)*

Have one child choose the correct piece of tube, then have the other child measure the remaining gap. Once the measurement and pieces of tubes are showing, ask:

- *How long is the gap? (7 units)*
- *Since we don't have a piece of tube that is seven units long, what can do to **bridge the gap**? (use more than one piece of tube)*

Have a child pick any of the tubes to begin filling the gap. Ask: *How can we use the tape measure to figure out how long the next piece of tube must be to **bridge the gap**? (count the number of length units that still need to be filled)*

Demonstrate the reasoning:

- *Say: [Diego] chose the tube that is [3] units long, and the tape measure still shows units [4 through 7].*
- *As you slide your finger under each of the remaining units on the tape measure, count each unit aloud (e.g., say 1 unit as you reach the 4, 2 units as you reach the 5) until you have counted all the remaining units.*
- *Then have a child test the answer by choosing a piece of tube that will **bridge** the remaining gap. Have a child launch the agent.*

Select NEXT and repeat these steps with new pairs of children at the board. Continue playing 2–4 more levels, until most children are able to measure and name the length of the gaps. Before ending the game, review key concepts of the lesson. Ask:

- *What are some **standard** units we can use to measure length (**inches** and **feet**)*
- *How do we use a **ruler** or a tape measure to find the length of an object? (line it up, move a finger along to count, read left to right)*



Lesson 2: Explore with a Friend



DAY 2 Learning Center Time: 10 minutes

Option 1: If children need practice using a tape measure, create a learning center where they can play Down the Tubes. As they play, observe to make certain they are using the tape measure correctly and that they are naming the unit of length. Ask:

- *How long is the gap you are trying to fill? How do you know?*

Option 2: To provide a greater challenge, create a learning center where children can use **rulers** to measure the length of objects. Explain that if the measurement is not precisely at the **inch** mark, they should choose the number that is closest to the length of the object. As they work together to measure, ensure that they are using the **ruler** correctly. Ask:

- *What did you do to get a precise measurement?*
- *How long is the object that you are measuring?*
- *How do you know how long the object is?*

Option 3: To reinforce key concepts, create a learning center where children can read and discuss children's books related to measuring length. Suggestions include:

- *George Shrinks*, by William Joyce
- *How Long or How Wide?*, by Brian P. Cleary
- *How Tall, How Short, How Far Away?*, by David Adler
- *Inch by Inch*, by Leo Lionni

Differentiated Learning

In this part of the lesson, you may assign children to learning centers based on their learning needs.

Use **Option 1** for children who need practice using a tape measure and visualizing the distance between two points. Most children will be able to play the game successfully on their own.

Use **Option 2** to provide more challenge. Children will need to know how to use a ruler to measure. Consider which children will be able to complete the task on their own and which will need teacher guidance, then group them accordingly.

Use **Option 3** to provide all children opportunities to learn more about mathematical ideas through reading. As you assign children to this learning center, remind them to connect what they've learned about measurement as they read and discuss the books.



Lesson 2: Review, Connect, Reflect



DAY 2 Time: 5 minutes

To support children's independent learning, return to the concept map. Point to each box and review what they have learned so far about measurement. To emphasize the new information from this lesson, ask:

- What are some **standard** units we can use to measure length? (**inches** and **feet**)
- How do we use a **ruler** or a tape measure to find the length of an object?
 - Line up the end of the **ruler** or tape measure with the end of the object you are measuring.
 - Place a finger at the end of the **ruler** or tape measure and slide it along as you count each inch or **foot**.
 - Read the **ruler** or tape measure from left to right like reading the words in a sentence.

To connect to home:

- Tell children: *Teach a family member what you learned about measurement. Use a **ruler** or a tape measure to figure out the height of your family members or friends.*
- Help parents support children's use of these ideas and strategies by sending the parent letter home with children.

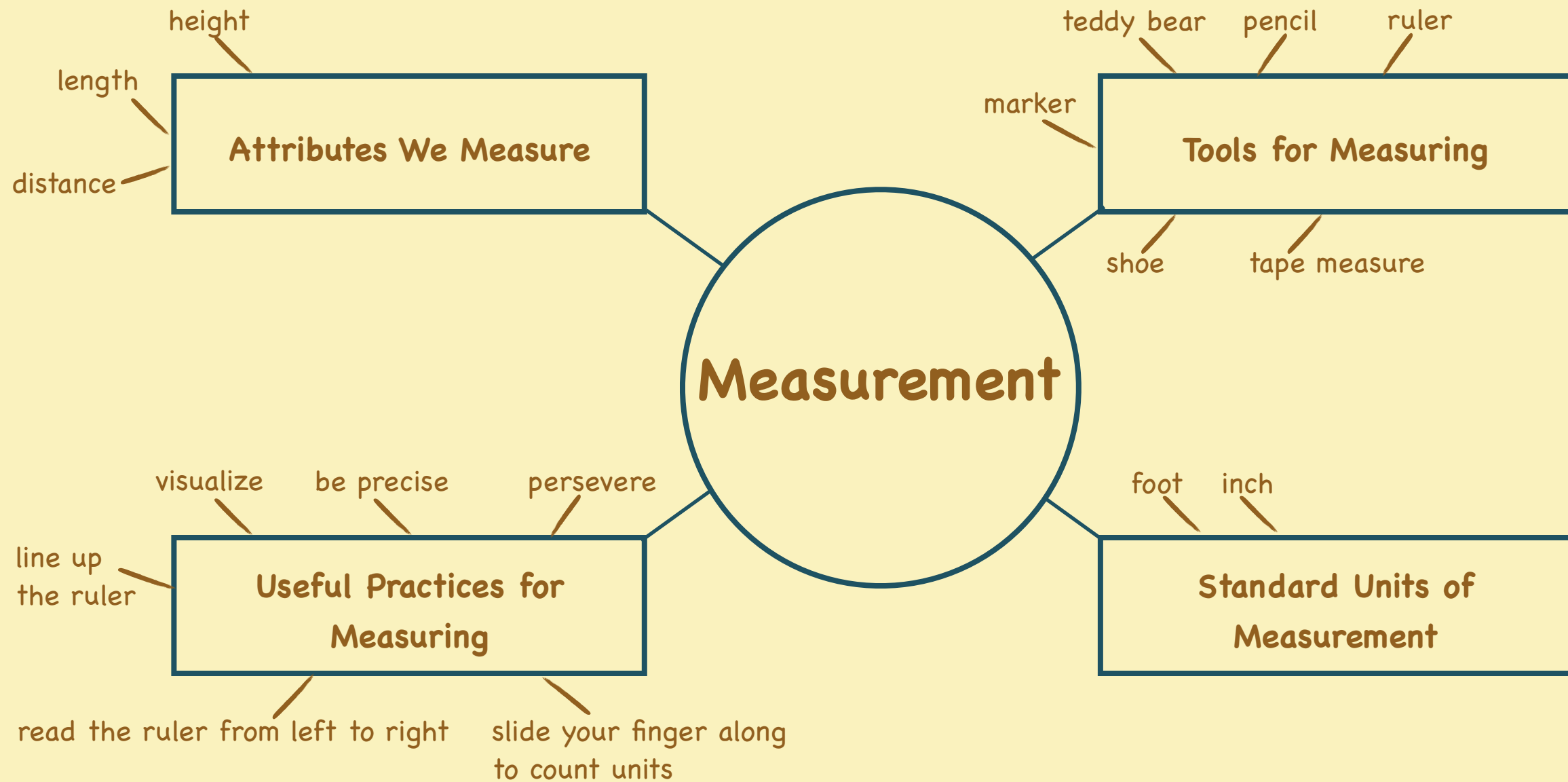
Teacher Reflection

- Did most children recall important ideas and participate in discussion of the video? *If not, gather children who were notably quiet during the discussion and view the video again, this time pausing after agents measure each object to ask the discussion questions (page 25).*
- Did most children use the ruler and tape measure to measure correctly? *If not, implement the Learning Center Option 2 as a teacher-directed activity, demonstrating useful practices, guiding practice, and then observing independent practice.*
- Did most children use new vocabulary (ruler, standard, inch, foot, bridge the gap) during and after this activity? *If not, review the words briefly and use them repeatedly as you continue to play this and other activities. Prompt children to use the words on their own.*

Concept Map: Measurement



NOTE: This is how the concept map looks with key vocabulary from Lessons 1–2.



Lesson 3: Preview



Video: Defeating the Hydraclops (9:30)
Preview the video:
pbskids.org/lab/videos/bu_videos/16/

It’s arrival day for the Hydraclops, a monstrous creature that rises out of the lake every one hundred years to destroy the world. Luckily, when Oscar was five years old he created a powerful weapon to defeat the Hydraclops, along with a map showing where he buried the weapon. The map uses nonstandard units of measurement (teddy bear, granola bar, shoe) to indicate where Oscar, Olive, and Otto must dig to find the treasure boxes that lead to the weapon.

The Problem: Oscar, Olive, and Otto must find the weapon before the Hydraclops destroys the world.

Helpful Background
Children will watch the same video they saw in Lesson 1. However, instead of focusing on measuring length precisely, as they did in Lesson 1, children will focus on using different units to measure length.

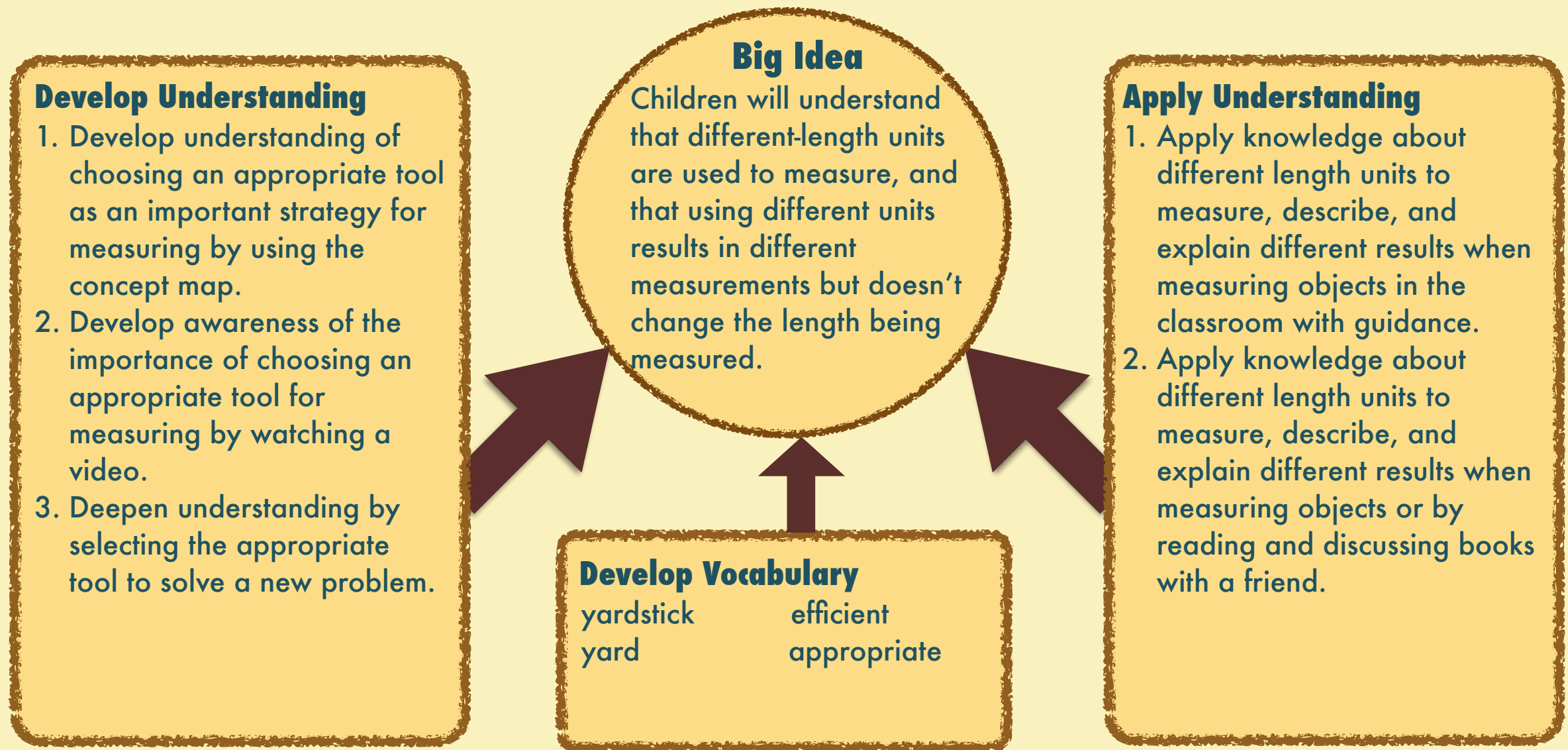
You will need to prepare this classroom chart for a measuring activity with groups of 4–5 children in Play Together. Modify this example to fit the number of groups you form and the particular objects you choose to have students measure.

During the activity, children will complete a worksheet (see page 38). This, too, will need to be modified based on the number of groups and the objects you choose to have children measure.

Measuring Length

Objects to Measure	Measuring Tools		
	Yardstick	Ruler	Pencil
Teacher’s Desk			
Group 1			
Group 2			
Longest Wall			
Group 1			
Group 2			
Whiteboard			
Group 3			
Group 4			
Bookshelf			
Group 3			
Group 4			
Easel			
Group 5			
Group 6			
Table			
Group 5			
Group 6			

Lesson 3: Big Idea



Make sure to:

- Prompt children to explain why more units are needed when measuring with smaller-length units and why fewer units are needed when measuring with longer-length units.



Lesson 3: Objectives

Build Background

Activate and build children's background knowledge.

Watch Together

Introduce or review math concepts and hear new vocabulary in context.

Get Ready to Play

Preview the game.

Play Together

Play a teacher-led game.

Explore with a Friend

Practice with one or more partners at a learning center.

Review, Connect, Reflect

Review big idea, connect to home, and evaluate student learning.

In this lesson, children will:

- measure the length of an object using rulers and yardsticks (and nonstandard measures such as a pencil)
- express the distance between two places or objects as a whole number of length units by laying out multiple copies of the shorter object (the length unit) end to end
- use appropriate tools (mathematical practice)
- attend to precision and efficiency (mathematical practice)
- acquire and use vocabulary and concepts such as **yardstick**, **yard**, **efficient**, and **appropriate**
- read and respond to books about measurement
- use technology to learn, working individually and in groups

Lesson 3: Build Background



DAY 1 Time: 5 minutes

Teacher Prep

1. Display the Measurement concept map on an easel or bulletin board.
2. Open the video *Defeating the Hydraclops*. Pause the video and minimize it to place it on the dock.
pbskids.org/lab/videos/bu_videos/16/
3. Measure and mark two points in the classroom that are four yards apart, for use during Get Ready to Play.
4. Prepare the Measuring Length classroom chart for display on an easel or bulletin board (see page 31).
5. Place yardsticks and 12-inch rulers by objects to be measured in Play Together. Gather different-length pencils for each group of 4–5 children.
6. Make copies of the Measuring Length Worksheet for each child to record measurements (see page 38).

To review information from previous lessons and introduce new information, display the Measurement concept map. Point to each box and review the related ideas, beginning with Attributes We Measure, progressing to Tools for Measuring and Standard Units of Measure, and ending with Useful Practices for Measuring.

Tell children that in this lesson they will learn another useful practice—choosing the **appropriate** tool. Explain that in this context, **appropriate** means the tool that is most helpful in solving the problem or finding the correct answer.

On the concept map, record the phrase **use the appropriate tool** linked to Useful Practices for Measuring.



Lesson 3: Watch Together



DAY 1 Time: 15 minutes

To develop understanding of the importance of choosing the **appropriate** tool to measure, display the video *Rise of the Hydraclops*. Before viewing, explain to children that they viewed this video in an earlier lesson to learn how to measure length by being precise and leaving no gaps. Tell them that this time, as they watch and listen, they should pay special attention to why the size of the length unit—Oscar’s two different-size shoes—is important.

Pause after Oscar uses the pencil to measure, then stands up and says, “Here.” Ask:

- *What did the agents do when they weren’t able to use the granola bar to measure the distance? (used a pencil that was the same length)*
- *Why was it okay to use the pencil to measure the distance instead of the granola bar? (they’re both the same length)*

Pause after the agents find the treasure chest and run off to save the day, shouting “Yaaaah!” Ask:

- *Why didn’t Oscar find the treasure chest using his footsteps? (he needed to measure with the length of his five-year-old foot)*
- *Was the distance that Oscar measured with his current footsteps too long or too short? (too long, because his feet are longer than when he was five, so the same number of footsteps now measures a longer distance)*

Finish watching the video. Then prompt children to turn and tell their partners a useful practice the agents used to measure the distance to the treasure chest. Remind them to use the concept map if they need help recalling a useful practice.

Close the video.

To conclude this part of the lesson, tell children that today they learned about measuring with different objects that are the same length. Explain that in the next part of the lesson, they will learn about using measuring tools that are different lengths.



Lesson 3: Get Ready to Play



DAY 2 Time: 5 minutes

To review important information from previous lessons on measurement, prominently display the Measurement concept map. Remind children that they will continue to learn about measurement using tools that are different lengths.

Connect the activity to previous lessons.

- Call children's attention to the concept map and review Tools for Measuring. Add the word **yardstick** to the concept map. Display a **yardstick** and explain that it is another measuring tool.
- Tell children that a **yard** is also a standard unit of measure and add **yard** to the concept map linked to Standard Units of Measure. Explain that this type of **yard** is different from the kind of **yard** you have around a house—a play **yard** or a backyard. In measurement, a **yard** is a unit of measure and it's longer than a foot—there are three feet in a **yard**.

Develop new understanding.

Explain that when measuring lengths in different units, measurements differ but the length or distance remains the same.

- Position two children approximately 4 **yards** away from each other. Invite two other children to measure the distance between the first two children. Give one child a **yardstick** and the other a ruler.
- After each child measures, write the measurement on a whiteboard or easel.
- Point out the different measurements (4 **yards** with the **yardstick**, 12 feet with the ruler) and ask: *Why are these measurements different?* Have children turn and tell their partners what they think and why.
- Call on a pair of children to share their thinking. (One foot is a shorter unit than one **yard**; we needed more feet to fill the same distance.)

Tell children that when we are measuring long distances, using longer units is more **efficient**—that means we are able to find a measurement that is accurate and does not waste time or energy. On the concept map, record the words **be efficient** linked to Useful Practices for Measuring.

Lesson 3: Play Together



DAY 2 Time: 15 minutes

Display the Measuring Length classroom chart, which lists objects to be measured (see page 31). Place a **yardstick** and a ruler by each object that children will measure. Divide the class into groups of 4–5 children and give each group a different-length pencil.

Tell children that each group will measure two objects and each object will be measured using three measuring tools—the **yardstick** and ruler placed by each object and the pencil given to each group.

- Provide each child with a copy of the Measuring Length Worksheet (page 38). Explain that they will measure each object assigned to them using the three measurement tools, and they will record the length on the worksheet.
- Assign each group two objects to measure, and rotate the order so that only one group at a time is measuring each object.
- Tell children that if an object measures between two numbers they should use words like “a little more than” or “a little less than” to describe the length (e.g., a little more than 7 inches; a little less than 8 **yards**).

When all groups have completed measuring the two objects assigned to them, reconvene the class. Have a child from each group record their measurements on the classroom chart. After all the numbers are recorded, point to the measurements for the first object.

- Prompt children to look closely at the measurements recorded by each group. Have them turn and tell their partners one thing they notice.
- Ask a few children to share and explain their observations with the class. As children respond, be sure to emphasize that actual length or distances do not change when measured by different length units. If necessary, prompt children to notice and explain each of these measurements. For example:
 - Length in **yards** is a smaller number than length in feet, because a **yard** is a longer unit.
 - Length in feet is a smaller number than length in pencils, because a foot is a longer unit than a pencil.
 - When objects were measured with standard units (**yards** or feet), the length was the same or almost the same for all groups.
 - Length measured with pencils is different for every group because pencils are a nonstandard unit of measure.
- To help children choose **appropriate** tools for measuring, point to each object measured and ask them to decide which tool is most accurate and **efficient**. Invite a few children to share their answers and reasoning.

Explain to children that as they continue to measure objects and distances on their own and with a friend, they must think about which measuring tools will help them to find both accurate and **efficient** measurements.

Lesson 3: Play Together

Measuring Length Worksheet



Measurements			
	Yardstick	Ruler	Pencil
long side of teacher desk			
longest wall			
long side of a whiteboard			
short side of a bookshelf			
short side of an easel			
long side of a table			



Lesson 3: Explore with a Friend



DAY 2 Learning Center Time: 10 minutes

Option 1: To deepen understanding that the size of different length units changes the measurement but not the actual length, create a learning center where children will use different units (inch, foot, **yard**) to measure various objects or distances (e.g., the height of a table, whiteboard, or bookshelf). Have children record their measurements on a worksheet similar to the Measuring Length Worksheet. As children explore:

- Say: *Your measurements differed when you measured in inches, feet, and **yards**. Does this mean that the length of the object was different? Why or why not?*
- Ask: *Which measuring tool is most **efficient** for this object or distance? Why?*

Option 2: If children need practice measuring using a tape measure or visualizing and expressing distances in length units (the focus of Lesson 2), create a learning center where they can play Down the Tubes. As they play, observe to make certain they are using the tape measure correctly. To prompt them to use length units to describe the gap they are trying to fill, post a sentence stem as a model. For example, "The gap is ____ blocks long."

Option 3: Create a learning center where children can read and discuss children's books that reinforce ideas related to measuring length. Suggestions include:

- *Actual Size*, by Steve Jenkins
- *If You Were an Inch or a Centimeter*, by Marcie Aboff
- *Millions to Measure*, by David M. Schwartz
- *Racing Around*, by Stuart J. Murphy

Differentiated Learning

In this part of the lesson, you may assign children to learning centers based on their learning needs.

Use **Option 1** to deepen understanding that measuring with different length units results in different measurements but does not change the length or distance measured. Consider which children will be able to complete the task on their own and which will need teacher guidance, then group them accordingly.

Use **Option 2** for children whose understanding of visualizing and estimating distance or length (from Lesson 2) is still emerging.

Use **Option 3** to provide all children with opportunities to learn more about mathematical ideas through reading. As you assign children to this learning center, remind them to connect what they've learned about measurement as they read and discuss the books.



Lesson 3: Review, Connect, Reflect



DAY 2 Time: 5 minutes

To support children's independent learning, return to the concept map. Point to each box and review what they have learned so far about measurement.

To emphasize the new information from this lesson, remind them that measuring tools can be different length units. Good mathematicians choose the measuring tool that helps them be most **efficient**—to get an accurate measurement without wasting time or energy.

To connect to home:

- Tell children: Show a parent or sibling how to measure **efficiently** by using a **yardstick** or a broomstick to measure a long object (such as a bed or table) and a ruler or a pencil to measure a short object (such as a toothbrush or spoon).
- Help parents support children's use of these ideas and strategies by sending the parent letter home with children.

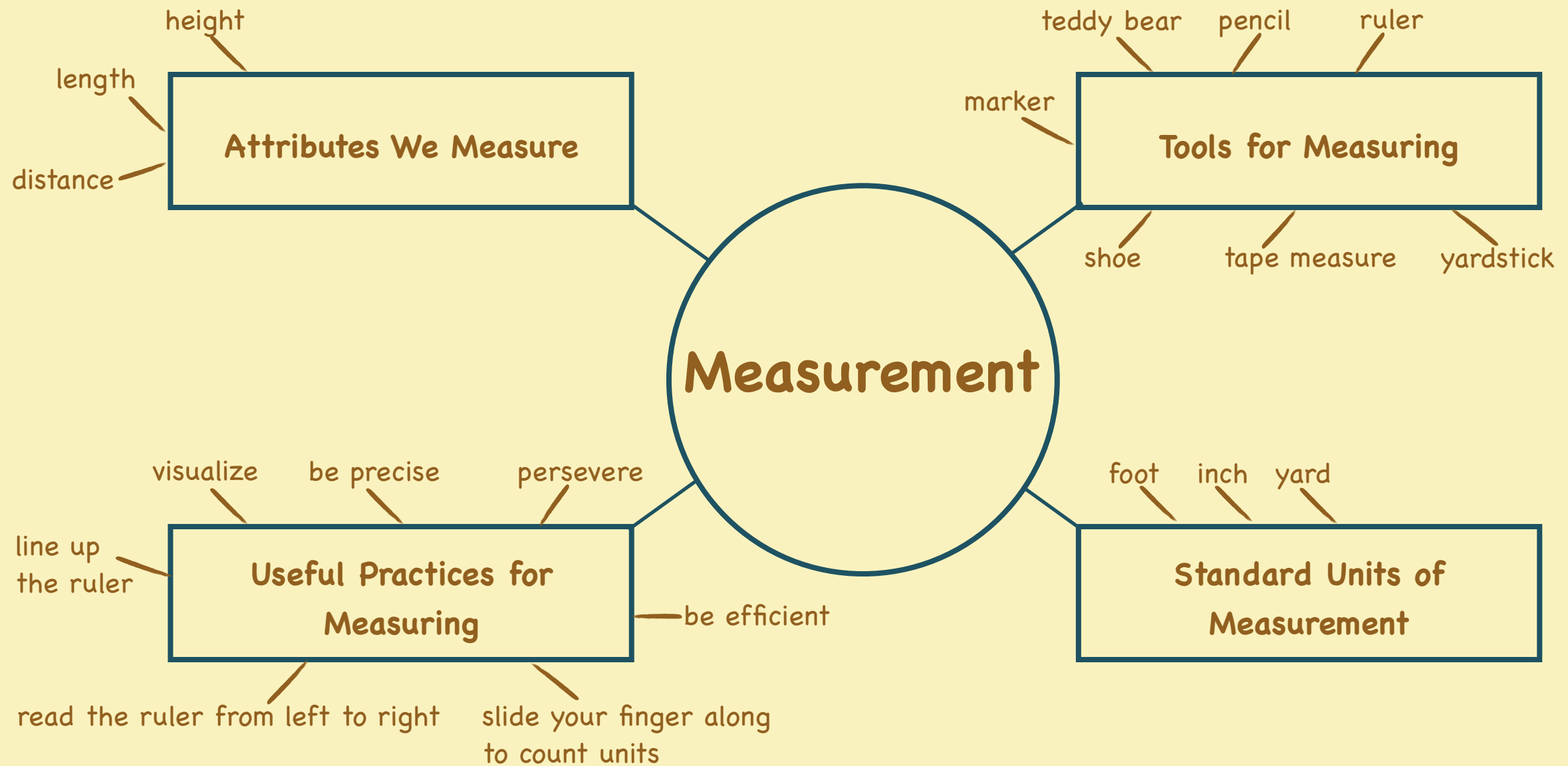
Teacher Reflection

- Did most children understand why Oscar's use of his five-year-old shoe resulted in an incorrect measurement? *If not, gather children who were notably quiet during the discussion and view the video again, this time pausing as Oscar displays all of his shoes. Pause the video, pointing out the different sizes and developing understanding that smaller shoes require more steps and longer shoes fewer steps.*
- Were most children able to explain why measurements differed when they measured the same length or distance using a ruler, yardstick, and shoe? *If not, gather the children who need additional help and implement the Learning Center Option 1 as a teacher-directed activity, demonstrating that when you use a longer length unit (yard), you need fewer to fit in a distance than when you use a shorter length unit (feet).*



Concept Map: Measurement

NOTE: This is how the concept map looks with key vocabulary from Lessons 1–3.





	Lesson 1	Lesson 2	Lesson 3
Measurement and Data			
1.MD.A.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.	•		
2.MD.A.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.		•	•
Mathematical Practice			
MP1 Make sense of problems and persevere in solving them.	•		
MP3 Construct viable arguments and critique the reasoning of others.	•		
MP5 Use appropriate tools strategically.	•	•	•
MP6 Attend to precision.	•	•	•



	Lesson 1	Lesson 2	Lesson 3
Vocabulary Acquisition and Use			
L.1.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 1 reading and content, choosing flexibly from an array of strategies.	●	●	●
L.1.5 With guidance and support from adults, demonstrate understanding of word relationships and nuances in word meanings.	●	●	●
L.1.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., <i>because</i>).	●	●	●

Alignment to ISTE Technology Standards: Students



Contents

	Lesson 1	Lesson 2	Lesson 3
2. Communication and Collaboration			
a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.	●	●	●
d. Contribute to project teams to produce original works or solve problems.	●	●	●
4. Critical Thinking, Problem Solving, and Decision Making			
b. Plan and manage activities to develop a solution or complete a project.	●	●	●
5. Digital Citizenship			
a. Advocate and practice safe, legal, and responsible use of information and technology.	●	●	●
b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.	●	●	●
6. Technology Operations and Concepts			
a. Understand and use technology systems.	●	●	●
b. Select and use applications effectively and productively.	●	●	●

Alignment to ISTE Technology Standards: Teachers



Contents

	Lesson 1	Lesson 2	Lesson 3
1. Facilitate and Inspire Student Learning and Creativity			
a. Promote, support, and model creative and innovative thinking and inventiveness.	●	●	●
c. Promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes.	●	●	●
d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments.	●	●	●
2. Design and Develop Digital-Age Learning Experiences and Assessments			
a. Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity.	●	●	●
b. Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress.	●	●	●
3. Model Digital-Age Work and Learning			
a. Demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations.	●	●	●
b. Collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation.	●	●	●
c. Communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital-age media and formats.	●	●	●
4. Promote and Model Digital Citizenship and Responsibility			
c. Promote and model digital etiquette and responsible social interactions related to the use of technology and information.	●	●	●



These lessons were developed by PBS in partnership with the Boston University School of Education.

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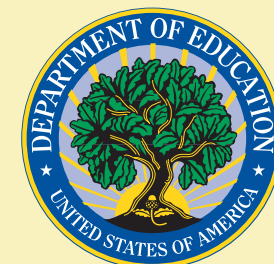
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The contents of these Teaching Tips were developed under a grant from the U.S. Department of Education. However, the contents do not necessarily represent the policy of the U.S. Department of Education, and you should not assume endorsement by the Federal Government.

[PR/Award No. U295A100025, CFDA No. 84.295A]



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