

CircleTM Time MAGAZINE



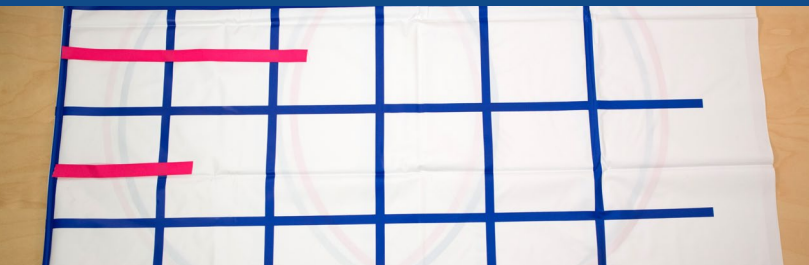
Use various units to measure and compare objects.

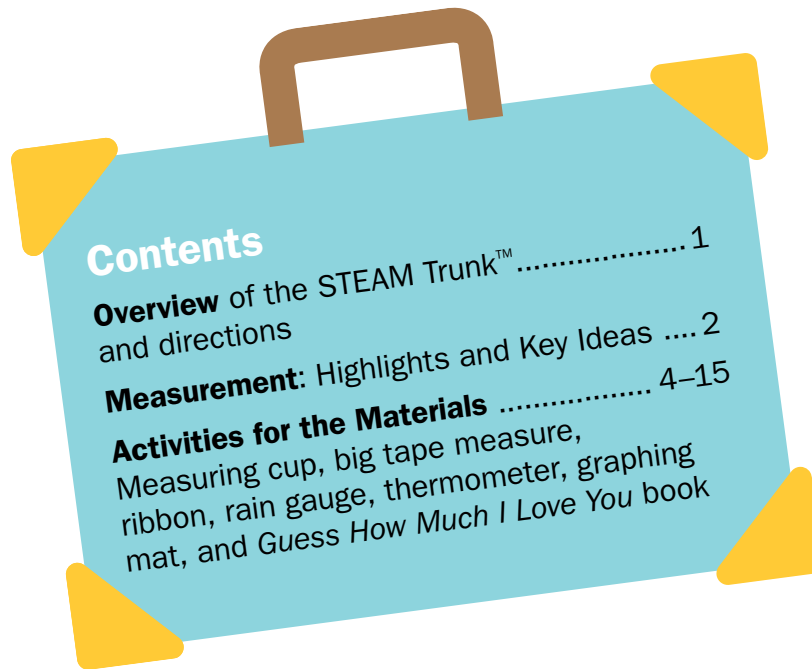


Encourage children to explore measuring tools and have fun with them.



Talk, sing songs, and read books about physical attributes of objects.





childcare quality & early learning
CENTER FOR RESEARCH AND PROFESSIONAL DEVELOPMENT
University of Washington



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MEASUREMENT:

Highlights and Key Ideas



Measurement is an application of mathematics to real-life tasks. It involves two main ideas:

Describing physical attributes. Measurement is using numbers to describe physical characteristics or attributes of objects such as their width, length, weight, area, and volume. Children experience and learn about these concepts as they actively explore the world around them.

Using measurement tools. Measurement is based on using equal-size units that are repeated and counted. Children should become familiar with standard measurement tools (rulers, scales, measuring cups, thermometers, and clocks). They can also use nonstandard units, such as hands, footsteps, blocks, paper clips, string, ribbon, and containers to measure and compare objects.

Mathematizing means bringing out the math in what children are doing. Focus on measurement concepts by making comments and asking questions as children explore object dimensions and measurement tools. You mathematize as you:

- Talk about physical characteristics or attributes such as length, weight, size, distance, speed, temperature, or time.
- Provide interesting objects for children to measure using standard and nonstandard measurement tools.
- Sing songs and read books that describe physical attributes and dimensions.

Supporting Dual Language Learners

- Describe physical characteristics or attributes using words in children's home languages.
- Use gestures, movement, and pictures.

Individualizing

- For extra support, use larger units (blocks) for measuring.
- For extra support, provide additional opportunities.
- For extra support, allow more time to finish tasks.
- For additional challenge, encourage children to make thoughtful predictions about the length of

curved surfaces. Then help them measure using ribbon that can be straightened out.

- For additional challenge, offer more complex novel words and engage children in more back-and-forth conversations to prompt higher level thinking.

Cultural Responsiveness

- Acknowledge that some children may come from families that use the metric system.
- Measure objects using various units of measurement such as meters, grams, liters, and the Celsius scale.

For guidance on what children know and experience about math, refer to the Washington State Early Learning and Development Guidelines (<https://www.del.wa.gov/helpful-resources/washington-state-early-learning-and-developmental-guidelines>) and the Head Start Early Learning Outcomes Framework (<https://eclkc.ohs.acf.hhs.gov/interactive-head-start-early-learning-outcomes-framework-ages-birth-five>). Here are some highlights related to this trunk of materials:

Learning About My World: Measurement

Infants learn about physical characteristics of objects during everyday activities and routines. Educators can expose infants to measurement tools and objects that differ in size, weight, and capacity. They can talk about dimensions such as big, little, hot, cold, sing songs, and read books about attributes and measurement concepts.

- Play with toys and things of different shapes and sizes.
- Convey simple ideas related to quantity and weight.

Toddlers begin to learn about measurement by exploring attributes of objects. Educators can use words that describe physical attributes (*long, short, wide, far*) during daily activities. They can provide opportunities to compare objects based on physical properties (*Who is taller? Which is heavier?*), introduce children to various measurement tools, and engage children in activities where they can measure objects using nonstandard units (*This rug is five giant steps long. Let's stack blocks to see which is taller*).

- Identify quantity and comparisons, such as all, some, none. Use comparison words correctly, such as bigger and smaller, more and less.
- Explore measuring tools, such as measuring cups, or a ruler.

With **preschoolers**, educators provide opportunities to describe objects by their physical attributes and dimensions. Encourage children to use standard and nonstandard measurement tools to describe and compare objects by size, length, height, weight, or capacity. Ask questions about quantities, and create simple problems that involve measuring and comparing objects.

- Compare size by sight, feel, and comparing to hands, feet, etc. (visual and tactile math).
- Compare two objects by length, weight, or size.
- Use gestures or words to make comparisons (larger, smaller, shorter, taller).
- Explore and use measuring tools in play (such as a ruler, measuring cups, or parts of the body).
- Describe objects using size words (big, small, tall, short).
- Order three objects by one characteristic, (such as from smallest to largest).

Measuring Cup

With this standard measuring tool, children can explore measurement and experiment with volume while doing what they love: pouring, scooping, filling, and dumping.



Activities

Encourage **infants** to explore with their senses. Show them how to drop objects into the cup. Use simple words to narrate what is happening to the quantity when they drop objects in and take objects out (more, less, empty, full).

Toddlers love to fill and empty containers. Provide a variety of materials to explore using the measuring cup (e.g., counting collections, sand, and water.) Talk about what children are doing. Use words to compare weight, quantity, and volume when the measuring cup is filled to different levels.

Preschool children can attend better to the standard measurement on the measuring cup. Focus children's attention on the number markers and ask them to use the numbers to explain how much is in the cup. Encourage them to experiment with the amount that they put in and take out. Play guessing games to see if they can predict what will happen.



Developing Measurement Skills

Using measuring cups provides opportunities to address the following measurement skills; additionally, you can use these to create learning goals:

- Explore standard measuring tools.
- Recognize and use words that describe size, length, volume, and weight.
- Compare two objects by size, height, weight, and volume.
- Use words to describe objects of different sizes (long, short, tall, small, wide, narrow) and make comparisons (longer, taller, shorter, wider, narrower.)

Mathematizing Teaching Moves

- Ask children to describe how the containers are the same or different, based on a single attribute (larger, taller/shorter, wider/narrower, heavier/lighter).
- Talk about parts of whole by explaining how half of the measuring cup is a part of the whole cup.
- Give gentle prompts to guide children who need extra help through the motions of measuring.
- Use gestures such as your fingers, hands, and arms to highlight measurement words like “a little,” “more,” “a lot.”

Extension

Encourage children to find other containers and line them up from small to large and talk about how they are same and different.

TALK about it!

- “The cup is full! Now it’s empty!”
- “Wow! The bucket feels heavier with more blocks in it!”
- “I see you are adding more balls into the cup.”
- “How does it feel now that you added more/dumped some out?”
- “How many scoops do you think it will take to fill the measuring cup using this smaller container? What is your prediction?”

Big Tape Measure

Invite children to explore how this standard measurement tool works. Encourage them to use it to describe a variety of objects and compare objects by length, width, or height.

Activities

Show **toddlers** how to use the measuring tape to measure length, width, or height. Measure children to see how tall they are. Encourage toddlers to work together and pull out the measuring tape as long it will go to measure something very long.

With **preschoolers**, explain the difference between standard and non-standard measurement tools. Let them measure the distance between landmarks (inside or outside), then compare the measurement to the same distance in foot steps. Let them measure their friends, then mark the measurements on a growth chart.



Developing Measurement Skills

Using a tape measure provides opportunities to address the following measurement skills; additionally, you can use these to create learning goals:

- Explore standard measuring tools.
- Describe and compare objects by size, length, width, and height.
- Use words to make and describe comparisons.
- Order three objects by size, length, width, or height.

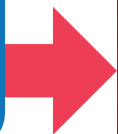


Mathematizing Teaching Moves

- **Follow children's lead** by observing what they look at, point to, and show curiosity about.
- **Model and provide prompts** to help preschoolers record their measurements.
- **Ask open-ended questions** to foster the use of more language and promote back-and-forth conversations.

Extension

Add blocks to a tower or take some away to make it taller or shorter. Encourage children to make predictions about the change in height. Measure it before and after to compare to compare and discuss.



TALK about it!

Comments and language modeling

- "Look at that! You are measuring your friend."
- "I'm going to guess that the table is longer than the rug."
- "Wow, that crayon is really short!"
- "Let's write it down, you are 34 inches tall."

Open-ended questions

- "I wonder what we could measure?"
- "How wide do you think the door is?"
- "Which one do you think will be longer?"
- "Why do you think you are taller than your friend?"
- "What would happen to the height of our tower if we added another block?"
- "Who do you think the tallest person in the room is? Why?"

Novel Words

- *Measure:* tape, ruler, yardstick
- *Units:* centimeters, inches, feet, meter
- *Size:* big, small
- *Height:* tall, short
- *Length:* long, short
- *Width:* wide, narrow
- *Comparison words:* taller, shorter, longer, wider, narrower, bigger, smaller, tallest, shortest

Ribbon

Things can be measured using both standard measurement tools and non-standard tools such as crayons, paper clips, and *ribbon*. Children can even use their hands and feet to measure. Use ribbon to introduce non-standard measurement tools.

Activities

Extension

Use ribbon to measure objects or body parts that curve. Show children how to wrap the ribbon around different parts of their body and mark the ribbon. Then stretch it out and measure it against a tape measure.

Toddlers will enjoy feeling the texture of the ribbon. Help toddlers use the ribbon to measure various objects in the environment, beginning with them! Measure their height, head circumference, feet, shoes, distance from the door to the cubbies, and other objects in the environment.

Encourage **preschool** children to measure various objects using a piece of ribbon. Go outside and let them choose different things to measure. Help them understand the importance of measuring end-to-end without overlapping the ribbon. Cut pieces of ribbon into different lengths to see if children can put them in order from shortest to longest.

Developing Measurement Skills

Using a ribbon provides opportunities to address the following measurement skills; additionally, you can use these to create learning goals:

- Explore non-standard measuring tools.
- Describe and compare objects by size, length, width, and height.
- Use words to make and describe comparisons.
- Order three objects by size, length, width, or height.



Mathematizing Teaching Moves

- Introduce words to describe the length, height, and width of the things they are measuring.
- Ask open ended questions that encourage children to describe their measurements and comparisons.
- Give gentle physical prompts to guide children who need extra help through the motions of measuring.
- Follow children's lead by helping them measure things that they point to and show curiosity about.
- Provide choices of things to measure.



TALK about it!

- "Look, the ribbon is soft and long."
- "You used your ribbon to measure, that's a non-standard measurement tool!"
- "It looks like your train is 5 ribbons long."
- "I see you are being careful not to overlap when you move the ribbon to measure."
- "You're comparing the two ribbons and it looks like one is shorter than the other."
- "I wonder how many ribbons' long this toy is?"
- "How are these two ribbons the same? Different?"

Rain Gauge

Make the most of a rainy day and bring some math to everyday weather activities! Use this rain gauge to measure how much rain has fallen during a period of time. It has two units of measurement: inches and centimeters.



Activities

Place this rain gauge outdoors in a wide open area and measure how much rain has fallen during the day. Or use a suction cup to fasten the gauge to a window. Observe and record the amount of rain daily. Graph the amount of rainfall or precipitation over multiple days or weeks.

Toddlers will enjoy checking out the amount of rain in the rain gauge at different times during the day. Take pictures or use a strip of tape each time you measure to help children compare levels. Point out how the level increases as more rain falls.

Preschool children can check the gauge each day to see how much it rains during a week or a month. They can record their readings on a "Weather Report" chart. You can also point out connections between the amount of rain and the length of time it rained or whether the rain fell heavily or lightly.

Developing Measurement Skills

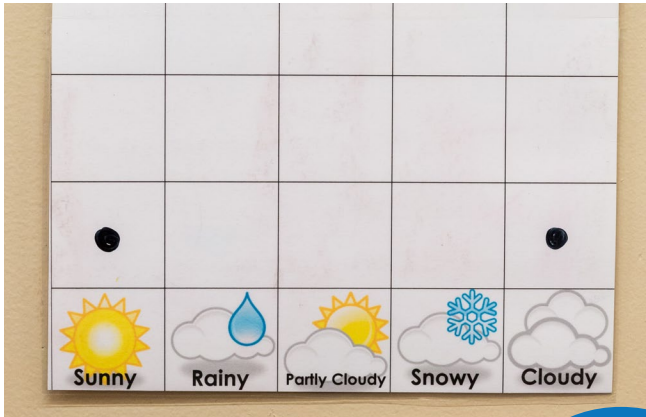
Using a rain gauge provides opportunities to address the following measurement skills; additionally, you can use these to create learning goals:

- Use height and duration attribute words such as high, low, long, short.
- Use comparison words like more, less, higher, lower, longer, shorter.



Mathematizing Teaching Moves

- Make it easier to understand the amount of rainfall. Stack blocks, use colored tape or a ruler to represent the height of the rainfall.
- Remind children that the number that matches the height of the rainfall is what tells how much rain has fallen.
- Observe and record the amount of rain daily. Graph the amount of rainfall or precipitation over multiple days or weeks.
- Explain that there are many ways to measure things.
- Have children make predictions about how much rain will fall on a given day.



TALK
about it!

Comments and language modeling

- “We use a rain gauge to collect and measure how much rain falls.”
- “Look for the number at the top of the rainfall.”

Open-ended questions

- “How can we find out which day it rained the most this week?”
- “What will happen if the rain continues?”
- “What if the rain stops?”



Novel Words

- Gauge, measure
- Rainfall, precipitation
- Units: Inches, centimeters
- Attributes: High, low, long, short
- Comparisons words: More, less, higher, lower

Thermometer

Use this thermometer to study the weather. Prepare a “Weather Report” chart with columns where you record temperatures monthly throughout the year, or weekly or daily during a more limited period of time. Use colored strips of paper or have children color columns that represent the temperature measured with the thermometer.

Activities

Help **toddlers** learn attributes (hot, warm, cold), comparison (warmer, colder) and measurement vocabulary (number names, degrees) as you check the temperature of the weather and record it on the weather chart. You can also use the thermometer to measure and compare temperatures indoors and outdoors.

Preschool children can read the thermometer to measure how hot or cold the weather is. They can record temperatures on the weather chart and make comparisons and predictions. Place the thermometer in a sensory table filled with water and add ice cubes or hot water so children can observe temperature change.

Developing Measurement Skills

Using a thermometer provides opportunities to address the following measurement skills; additionally, you can use these to create learning goals:

- Use temperature attribute words (hot, warm, cold).
- Use comparison words (warmer, colder, warmest, coldest).
- Understand that measurement is based on equal size units.

Mathematizing Teaching Moves

- Remind children that the height of the red liquid in the thermometer tells what the temperature is.
- Explain that the higher the red line is, the hotter the temperature.
- For children who need more challenge, explain that there are two temperature scales. Both use degrees as the standard unit of measurement but the degree Fahrenheit is smaller than the degree Celsius. In the Fahrenheit scale, water freezes at 32 degrees and boils at 212 degrees. In the Celsius scale, water freezes at zero degrees and boils at 100 degrees.

- Use nonstandard units (e.g., little and big hand cutouts, little and big blocks, taking small and big footsteps) to illustrate the difference between a degree Fahrenheit and a degree Celsius.

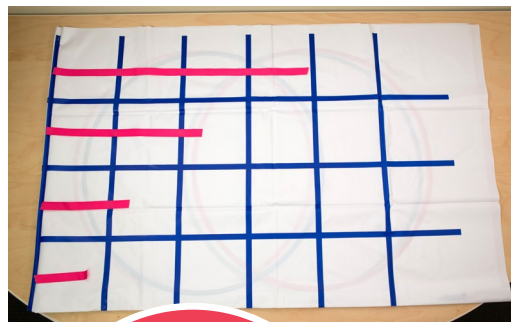
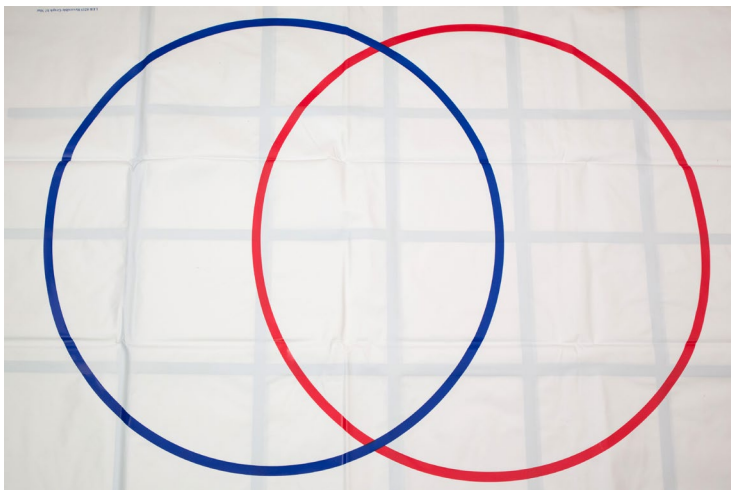
TALK
about it!

- “Thermometers show us how hot or cold things are.”
- “Thermometers measure the degree of hotness or coldness of the weather, our bodies, and objects like water, or an oven.”
- “The height of the red line tells us what the temperature is.”
- “There are two main ways to measure temperature: the Fahrenheit scale and the Celsius scale. In the U.S. we use the Fahrenheit scale.”
- “How can we find out what the weather is like today?”
- “How do we know that it’s colder outside than inside?”



Graphing Mat

This large graphing mat can be used to show mathematical information in a visual way with lines, shapes, colors, and even children's bodies! One side is a graph and the other is a Venn diagram for sorting and comparing. Graphs or charts are useful to show differences in the amounts of things or other numbers, make comparisons, and sort.



White board solution is the most effective way to clean off the graphing mat.

Before writing on the mat, test it to see if it can be erased.

Activities

Infants will enjoy crawling on and exploring the mat with their hands and listening to the crinkling sounds it makes. Start at the beginning of a row or column and encourage the infant to roll a ball or toy car across the mat. Use a large toy to mark where it stops, showing how far down the mat it went.

With **toddlers**, sort counting collections by one attribute (size, color, or length) and show how to graph the amount on the mat for each group, using a marker, stickers, or by placing each object on a square in the accurate row or column. Take the mat outside and have child up in front of a row or column, roll a large dice to see how many boxes to step or hop forward. Compare distances to see who is closest to the starting line and who moved the farthest.

Expose **preschool** children to the many things that can be measured or counted and then graphed. Take advantage of the size of this mat and use it for large group activities. Offer opportunities to vote or make choices then mark their vote by standing on the appropriate square. Invite them to compare and contrast objects by sorting them on the Venn diagram (Which animals go on land? Which animals go in the water? Which go on land and in water?).

Developing Measurement Skills

Using a graphing mat provides opportunities to address the following measurement skills; additionally, you can use these to create learning goals:

- Sort multiple objects by a single attribute.
- Compare sets of objects to determine which has more, less, or the same.
- Show amounts visually using lines, dots, shapes, and colors.
- Describe and compare objects by size, length, width, and height.
- Use words to make and describe comparisons.

Mathematizing Teaching Moves

- Expose infants to new words such as “near,” “close,” “far,” “closest,” and “farthest.”
- Show and explain how the graph makes it easy to see and compare amounts.
- Ask questions that encourage children to explain what the graph shows.
- Discuss comparisons between the amounts.
- Give gentle physical prompts to help children stand on the right square to mark their vote or preference.
- Provide gestures such as pointing to help children put their sticker or color in the accurate square to reflect their vote or preference.

Extension

Make a class growth chart! You can start at the beginning of the year and use the mat to track children's growth over time. Children will enjoy being able to see how much they have grown.



TALK about it!

- “Look how far you rolled the ball!”
- “I see a lot of kids standing in the row for the ‘The Itsy Bitsy Spider’ song.”
- “There are three more squares colored in for rice crackers. That means more kids voted to have rice crackers for snack time.”
- “Which toy do you like best?” (Offer a few choices to graph on the mat.)
- “What song should we sing next?” (Offer a few choices to graph on the mat.)
- “What do you see from the information on our graphing mat?”

Guess How Much I Love You

This book is about a young rabbit named Little Nutbrown Hare who describes how big his love is for Big Nutbrown Hare. Use this story to help children learn about measurement concepts such as length, width, height, and distance.

Activities

Encourage **infants** to explore the book. Talk about the pictures. Use gestures to demonstrate long and high. Encourage infants to stretch their arms out wide or raise them up high. Play the game, So Big. Ask, “How big are you?” Then say, “You are so big,” while gently stretching the infant’s arms above the head.

With **toddlers**, talk about the pictures. Stress the words, wide, long and high. Explain what they mean. Have children act out the actions of the book related to these concepts. Introduce comparisons. Mention that Big Nutbrown Hare has longer arms and can reach and hop higher than Little Nutbrown Hare.

After reading the book, ask **preschoolers** to demonstrate long, wide, high, tall and far by stretching their arms out and hopping high or far. Have children work in pairs and measure arm spans, heights, and hops using a ribbon or the measuring tape. Help them compare who stretches wider, who is taller, and who jumped farther.

Developing Measurement Skills

Reading this book provides opportunities to address the following measurement skills and to create these learning goals:

- Use gestures or words to describe objects of different sizes (long, short, tall, small, wide, narrow).
- Use words to make comparisons (longer, taller, shorter).
- Compare two objects by length and distance.
- Explore a variety of measurement tools.

Extension

Inch by Inch: The Garden Song. Use this book, and popular folk song, to introduce concepts of height and length.

Mathematizing Teaching Moves

- Read the book and focus on the words *wide*, *long*, *high*, and *as far as*.
- While reading, pause, make comments, and ask questions to help children understand the meaning of these concepts.
- Encourage children to perform the actions Little Nutbrown Hare uses to express his feelings.
- Accompany words with gestures and movement to illustrate measurement concepts.
- Ask children to give their own examples of animals that are tall or small.
- Use pictures or concrete objects (e.g., cutout pictures of hares or stuffed animal toys of different sizes) that children can compare by height, length, and width.

Extension

Children can make their own books describing how much they love someone or something. Send a few questions home to parents to ask toddlers about how much they love someone. For example, “How much is a lot of love? How much is a little love?”



Great measurement books:

- *Inch by Inch*
- *Just a Little Bit*
- *Weigh It*
- *Math World Making Graphs*
- *Time is When*

TALK about it!

Comments and language modeling

- “You are so big!”
- “You jumped farther because your ribbon is longer.”
- “Kasia has longer arms because 11 is more than 8.”

Open-ended questions

- “How high can you reach?”
- “How far can you hop?”
- “Who has longer arms?”
- “How do you know which is shorter?”

Novel Words

- *Wide, long, high, far*
- *Comparisons words: longer, higher, as far as, farther*

