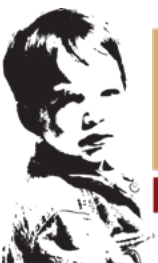




# TEACHING MEASUREMENT IN EARLY CHILDHOOD



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MONTESSORI



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# Table of Contents

Measurement - Direct Comparison - Sensorial.....	2
Measurement - Length.....	3
Measurement - Indirect Comparison - Sensorial .....	5
Measurement - Using Tools.....	9
Measurement Direct Comparison - Weight.....	11
Measurement Indirect Comparison - Weight .....	13
Measurement Using a Tool - Weight .....	15
Measurement - Direct Comparison - Volume .....	19
Measurement - Volume - Tools Introduction .....	21
Measurement - Volume - Tools 1 .....	23
Measurement - Volume - Tools 2.....	26

## Measuring Concepts and Teaching Points

Concept	Teaching Points
Identify the Attribute	children need to be introduced to the attributes of an object to prepare them for measuring. This is a natural outcome of the sensorial materials since the terms used are: large, small, heavy, light
Direct Comparison	children will compare one object to another and use language of comparison. “ <i>This</i> red rod is longer than <i>this</i> red rod.” Encourage children to line up the two objects at one end for comparison
Indirect Comparison	this method is used when two objects cannot be measured side by side and another tool is used. For example, measuring the base of a water container with a piece of string or paper clips, and comparing the length of the string to the side of a table.
Using Something to Measure	units of measure are used to help express the idea of how much something holds or weighs. Encouraging children to estimate how many cups a jug holds, or how many paper clips it may take to measure the length of a table is important. In addition, ask children to use different units of measure to measure the same object; for example use paper clips and an unsharpened pencil to measure the length of a table.

# Measurement - Direct Comparison - Sensorial

This area of the curriculum is a natural extension of both the Practical Life and the Sensorial areas. Practical life gives the sensorial experience of capacity, while Sensorial will offer practice in length, temperature, and weight. It is important that the children have real experiences with the tools used in measurement.

## Age

5 years and up

## Aim

Direct: Child will be introduced to the concept of length

Indirect: Child will be introduced to tools to measure length

## Materials

- 6 pictures of materials in the classroom which are rectangular in shape
- shortest red rod
- longest red rod

## Presentation - Direct Comparison

1. Invite a child to the lesson.
2. "Today, we are going to work with our red rods in a different way. I have the shortest red rod and the longest red rod on my rug, along with some pictures of Montessori materials."
3. "Let's look at this picture of the map of the United States. Please go get this map and bring it to the rug."
4. "When we **measure** the **length** of something, we are looking for how long it is. This map actually has four sides; which side would you like to measure?"
5. "Now that you have chosen a side, we need to compare the side to one of the red rods. Which rod would you like to use?"
6. Show the child how to line up the end of the red rod with the end of the map.
7. If the child chooses the longest rod a statement is made that the longest red rod is longer than the side of the map.
8. If the child chooses the shortest red rod a statement is made that the side of the map is longer than the smallest red rod.
9. Continue with the remaining pictures of rectangular objects as long as the child shows interest.

# Measurement - Length

## Age

5 years and up

## Aim

Direct: Child will be introduced to the concept of length

Indirect: Child will be introduced to tools to measure length

## Materials

- 6 pictures of materials in the classroom which are rectangular in shape
- Number rods
- Numerals

## Presentation 1

1. Invite a child to the lesson.
2. "We have compared the longest and shortest red rods to these materials. This time, let's do it a little differently."
3. "Let's look at this picture of the map of the United States again."
4. "When we measure the **length** of something, we are looking for how long it is. This map actually has four sides; let's measure the **base** of the map."
5. "Now that you have chosen a side, we need to compare the side to the longest Number Rod."
6. Choose the longest Number Rod and take it to the map cabinet with the map still housed in it.
7. Place the end of the longest Number Rod on the edge of the map. "Is the longest rod too long?. (Yes)
8. "Let's find another rod that is closer to the length of the base of this map."
9. Once a red rod is chosen place the numeral associated with that rod next to the picture of the material.
10. Continue with the remaining rectangular pictures as long as the child is interested.
11. Return the work to the shelf.

## Presentation 2

1. Invite a child to the lesson.
2. "We have compared the longest and shortest red rods to these materials. This time, let's do it a little differently."
3. "Let's look at this picture of the map of the United States again. Please go get this map and bring it to the rug."
4. "When we measure the length of something, we are looking for how long it is. This map actually has four sides; which side would you like to measure?"
5. "Now that you have chosen a side, we need to compare the side to the shortest red rod."
6. Place the end of the shortest red rod on the edge of the map. Count how many red rods it takes to measure the length of the map. If there is not an even number of red rods say, "The length of this map is 5 red rods and a little bit more."
7. Continue with the remaining rectangular pictures as long as the child is interested.
8. Return the work to the shelf.

## Variation

1. Introduce other pictures of materials.
2. Choose a different red rod with which to measure.
3. Sequence materials in order from shortest to longest

# Measurement - Indirect Comparison - Sensorial

## Age

5 years and up

## Aim

Direct: Child will develop skills in comparing long and short

Indirect: Child will develop skills in linear measurement

Child will develop skills in estimating length

## Materials

- 6 pictures of materials in the classroom which are circular in shape
- String
- Scissors
- Shortest red rod

## Presentation 1

1. Invite a child to the lesson.
2. "We have used the longest and shortest red rods to measure some materials, this time, let's do it a little differently."
3. "Let's look at this picture of the globe. Let's say I wanted to measure the base of the globe; could I use the red rods?"
4. "No, I could not because I cannot bend the red rods around."
5. "I have an idea; let's use a length of string to measure around the base of the globe."
6. Have the child bring the globe to the rug. Take one end of the piece of string and unravel the string to measure the circumference of the base.
7. Have the child cut the string at the appropriate place.
8. Place the string vertically beneath the picture of the globe.
9. Continue with the remaining circular pictures as long as the child is interested.
10. Return the work to the shelf.

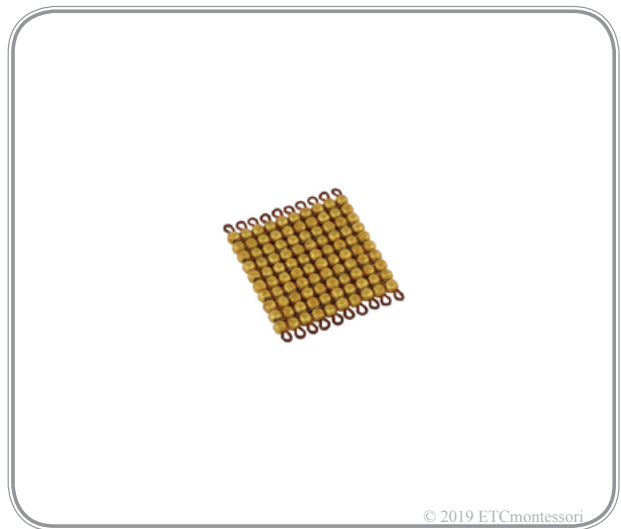
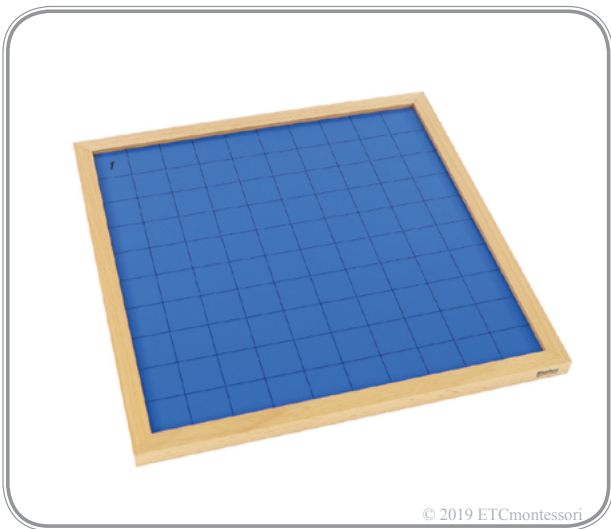


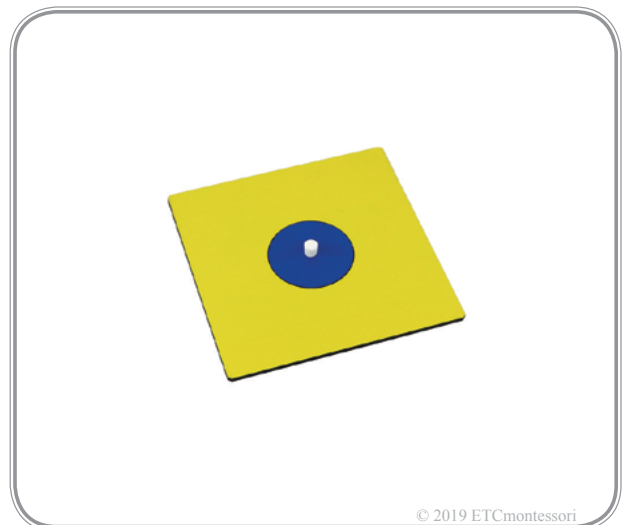
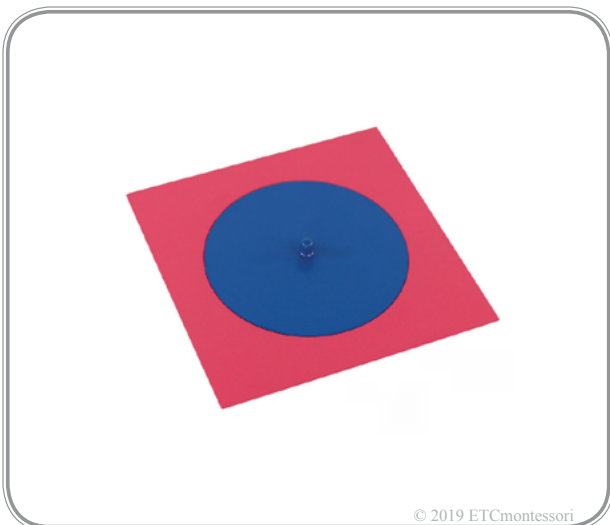
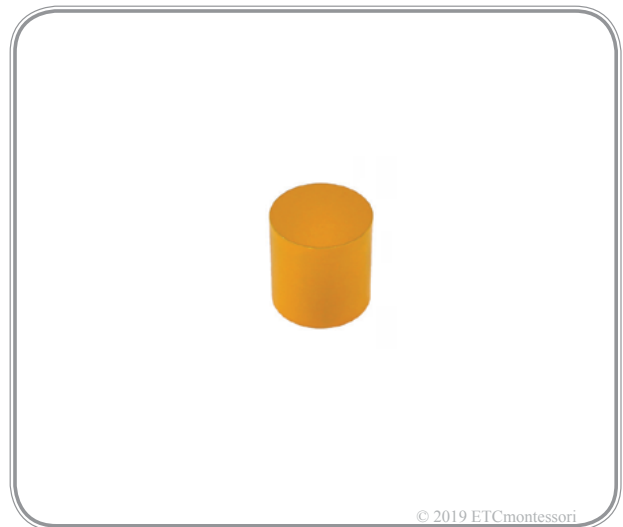
## Presentation 2

1. Invite a child to the lesson.
2. “We have used string to measure the base of circular objects. This time, let’s do it a little differently.”
3. “Let’s measure the base of the globe again, but this time I want to compare its length to the length of the shortest red rod.”
4. Have the child measure the base of the globe and compare it to the shortest red rod.
5. “The length of the base of the globe is longer than the length of the red rod.”
6. Continue with the remaining circular pictures as long as the child is interested.
7. Return the work to the shelf.

## Extensions

1. Introduce other pictures of materials.
2. Sequence materials in order from shortest to longest.





# Measurement - Using Tools

## Age

5 years and up

## Aim

Direct: Child will develop skill in using nonstandard tool to measure

Indirect: Child will develop skills in linear measurement

## Materials

- Paper clips
- Measurement record sheet


## Presentation



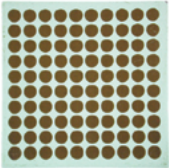





1. Invite a child to the lesson.
2. "We have used several things to measure; the red rods and string. Today, we are going to use paper clips."
3. Show the child how to "string" the paper clips together to make a "**ruler**".
4. Introduce the child to the measurement record sheet.
5. Ask the child to first guess how many paper clips it will take to measure a particular dimension. Have the child record that under the "guess" column.
6. Ask the child to make a "ruler" from the paper clips of his guess and then compare this "ruler" to the object.
7. Have the child record the actual number of paper clips needed in the ruler to measure one dimension of the object.
8. Continue with the remaining pictures.
9. Return the work to the shelf.

## Extensions

1. Introduce other pictures of materials.
2. Measure another dimension of the object and compare this second dimension to the first dimension.

# Measurement Record Sheet

Use a  to measure these items.

Object	Guess	Actual
		
		
		
		
		
		
		
		

# Measurement Direct Comparison - Weight

## Age

5 years and up

## Aim

Direct: Child will be introduced to the concept of weight

Indirect: Child will be introduced to tools to measure weight

## Materials

- baric tablets (lightest - blond wood, medium - brown wood, heaviest - dark wood)
- rubber bands or hair ties

## Presentation

1. Invite a child to the lesson.
2. "Today, we are going to work with our baric tablets in a different way. I have the 3 sets of baric tablets and some hair ties."
3. "I want you to take three of the lightest baric tablets and bind them together with one hair tie."
4. "Now, look around the classroom and find one object that is **heavier** than this set of three light baric tablets. How will you judge whether your object is heavier?"
5. Allow the child to explain that they will use their hands to find and compare an object that is heavier than the set of three light baric tablets.
6. Ask the child to find an object and share their judgment with you.
7. "Now, I want you to take four of the medium baric tablets and bind them together with one hair tie. Look around the room and see if you can find an object that is **lighter** than this set of four medium baric tablets. How will you judge whether your object is lighter?"
8. Allow the child to explain that they will use their hands to find and compare an object that is heavier than the set of four medium baric tablets.
9. Ask the child to find an object and share their judgment with you.
10. "This time, I want you to take five of the heaviest baric tablets and bind them together with one hair tie."
11. "Look around the classroom and find one object that is **equal** to this set of five heavy baric tablets."
12. Ask the child to find an object and share their judgment with you.
13. Continue with more objects as long as the child shows interest.



### Extensions

1. Change the number of tablets in the sets.
2. Find two objects to compare with each set, one lighter and one heavier.
3. Find three objects to compare with each set, one lighter, one heavier, and one equal.

# Measurement Indirect Comparison - Weight

## Age

5 years and up

## Aim

Direct: Child will be introduced to the concept of weight of objects in relationship to each other

Indirect: Child will be introduced to tools to measure weight

## Materials

- set of pictures of objects (set 1 for initial presentation)
- set of baric tablets tied as a set as in the previous presentation (3 light, 4 medium, 5 heavy)
- set of labels which say **lighter**, **same**, **heavier**

## Presentation

1. Invite a child to the lesson.
2. "Today, we are going to work with our baric tablets in a different way. I have the 3 sets of baric tablets and some hair ties."
3. "But first, I want you to collect the objects in the classroom shown by these pictures."
4. Allow the child to collect the objects in the pictures from set one and place them on the rug.
5. "I want you to put these objects in order from the lightest to the heaviest. How do you think you might do this?"
6. Encourage the child to come up with their own ideas based on their experiences. It could be that they use their hands to gauge each object and then seriate; begin with the most obvious and then seriate; or any other reasonable method of measurement.
7. "Now that the objects are ordered from the lightest to the heaviest, we need to compare all of these objects to the baric tablets."
8. Place the first set of baric tablets (3 light) at the top of the rug. Beneath these baric tablets place the labels **lighter**, **same**, and **heavier**.
9. Read the labels for the child as you place them.
10. "How do you think you might place the objects now? Under which label would you place each object? How do you know they are placed correctly?"
11. Encourage the child to explain their process to you.
12. Continue this process with the set of 4 medium baric tablets and the 5 heaviest baric tablets or as long as the child shows interest.



## Control of Error

1. The weight of each object in comparison to each other

## Extensions

1. Use other objects from the classroom
2. Bind different sets of baric tablets



# Measurement Using a Tool - Weight

## Aim

Direct: Child will be introduced to tools to measure weight with non-standard units

Indirect: Child will be introduced to tools with standard units for weight

## Materials

- pan scale, baric tablets, box of cubes

## Presentation

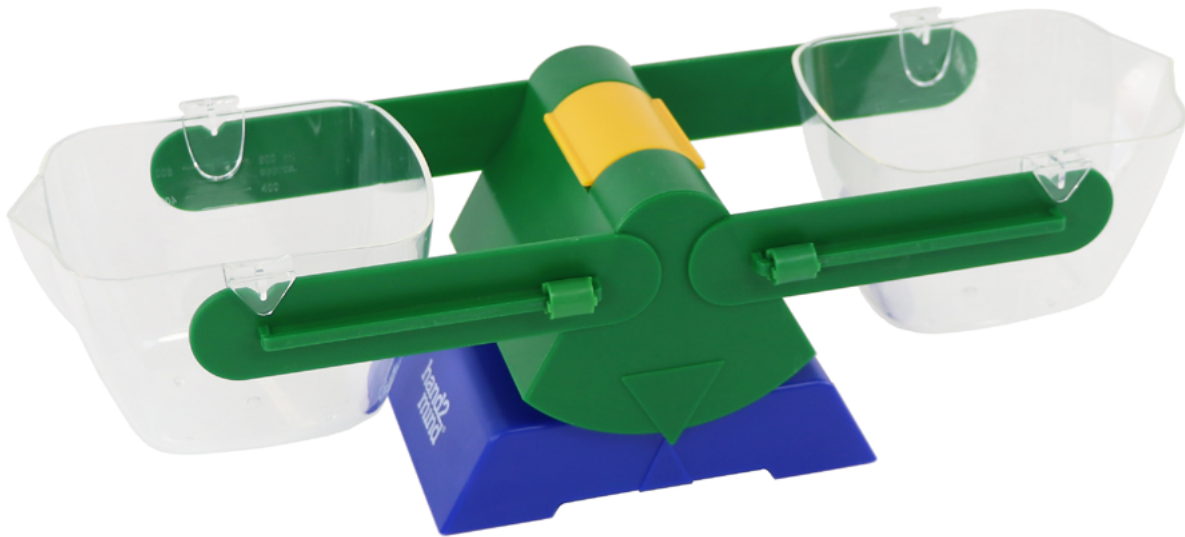
1. Invite a child to the lesson.
2. "Today, we are going to work with weight in a different way, but first we need a tool to use. This is a **pan scale**."
3. "If you were to take the lightest baric tablet and place it in one of the pans, what would happen?"
4. Child should be able to state that the side with the object would go down. If they are not able to do so, allow them to experiment.
5. "What do we need to do to get the pan scale to **balance** again, but still have the lightest baric tablet in the pan?"
6. Initially, the child should be able to say that placing another light baric tablet should make the pan scale balance. Allow the child to explain their ideas and experiment.
7. "Instead of using the same baric tablet to make the scale balance, I want to use these cubes to make the scale balance. If we use these cubes on the right hand side of the pan scale, how many do you think it would take to make the pan scale balanced again?"
8. Encourage the child to estimate the number of cubes.
9. Allow the child to place the cubes on the right hand side of the pan scale and count how many it took to balance the lightest baric tablet.
10. Continue with the medium and heaviest baric tablets or until the child is no longer interested.

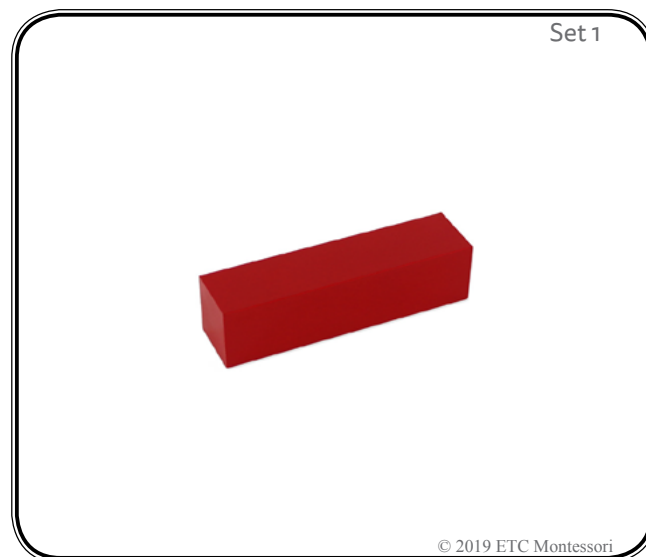
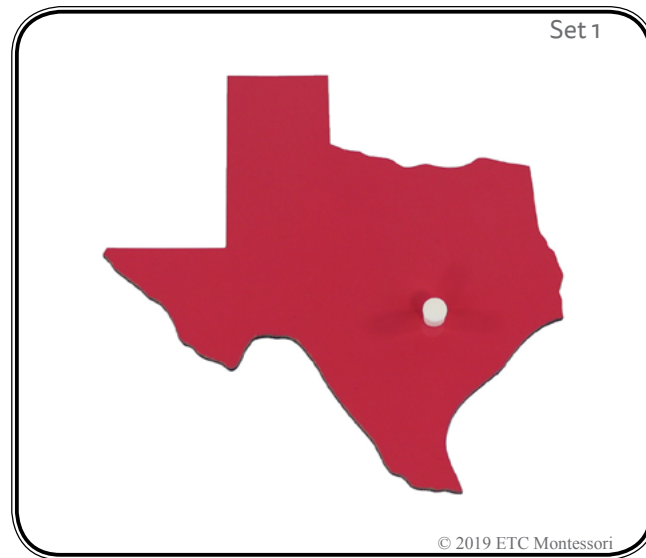
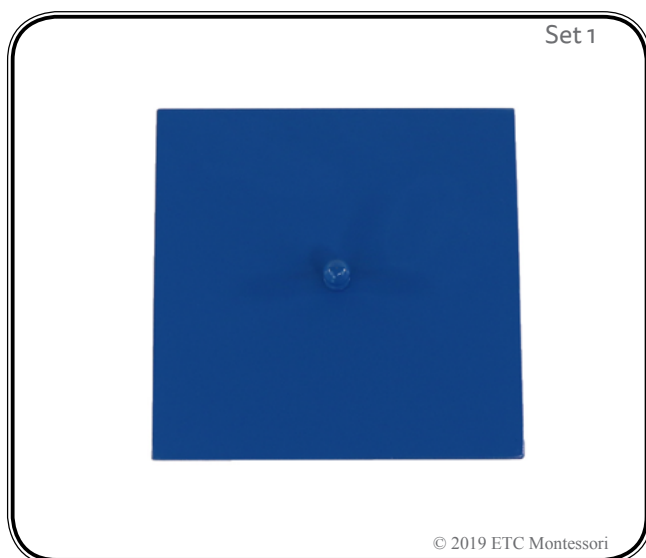
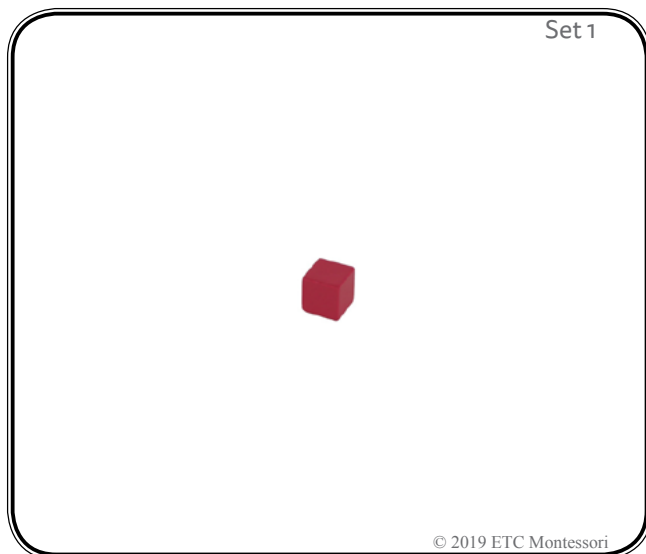
## Control of Error

1. The pan scale is balanced
2. It takes more cubes to balance the medium and heavy baric tablets than the lightest baric tablet

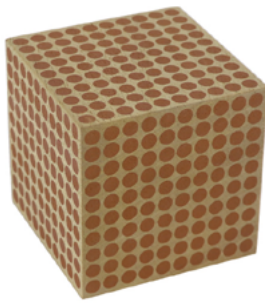
## Extensions

1. Work with multiple baric tablets.
2. Use different types of cubes or other objects for units of measurement.





Set 2



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Set 2



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Set 2



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# Measurement - Direct Comparison - Volume

## Aim

Direct: child will be introduced to tools to measure volume and non-standard units

Indirect: child will have experience in conservation of volume

## Materials

- miscellaneous cups (small, medium, large) each of the following filled with colored water: 100 ml beaker, 50 ml beaker, 50 ml graduated cylinder, 10 ml graduated cylinder, 5 ml graduated cylinder, tray, sponge, or
- [Graduated Cylinder Pour Activity \(EC-0103\)](#)

## Presentation

1. Invite the child to the lesson.
2. "Today, we are going to work with pouring in a different way. These containers are used to hold **liquids**, and when we want to know how much space these liquids take up, we say we are measuring their **volume**."
3. Take one beaker. "This is like a cup with a pouring spout. It is called a **beaker**."
4. Ask the child to point out other beakers in the collection.
5. Take one of the graduated cylinders. "This is a narrow cylinder with a spout. It is called a **graduated cylinder**."
6. Ask the child to point out other graduated cylinders in the collection.
7. Take the largest cup and place it on the table.
8. "If you wanted to fill this large cup with water, which one of these beakers or graduated cylinders would you use?"
9. Allow the child to experiment with the volume of each of the beakers or graduated cylinders.
10. Return the water to the original beaker or graduated cylinder with each exploration.
11. Place the smallest cup on the table.
12. "If you wanted to fill this small cup with water, which one of these beakers or graduated cylinders would you use?"
13. Allow the child to experiment with the volume of each of the beakers or graduated cylinders.
14. Return the water to the original beaker or graduated cylinder with each exploration.
15. Place the medium cup on the table.
16. "Can you predict which beaker or graduated cylinder will fill this cup? Check to see if you are correct."
17. Return the water to the original beaker or graduated cylinder with each prediction.
18. Have the child clean the tray and restore the materials to the shelf.



## Control of Error

1. Overfilling of the cups
2. Marking lines on the graduated cylinder and beakers

## Extensions

1. Fill different cups
2. Use beans, rice, or lentils instead of water



# Measurement - Volume - Tools Introduction

## Age

5 years and up

## Aim

Direct: to be introduced to volume measurement tools

Indirect: to begin to conserve volume

## Materials

- 100 ml beaker, 50 ml beaker, 100 ml graduated cylinder, water source, tray, sponge or
- [Scientific Pour Activity \(Item: EC -0102\)](#)

## Presentation

1. Invite the child to the lesson.
2. "Let's look at this graduated cylinder and beakers. Which one do you think hold the most liquid? Which one do you think hold the least liquid? Where would you place this third container?"
3. Ask the child to sort the containers from those that hold the least to the most.
4. Ask the child to fill the 50 ml beaker. "How many times do you think you need to fill this small beaker to fill the other beaker?"
5. Allow the child to experiment.
6. "How many times do you think you need to fill this small beaker to fill the graduated cylinder?"
7. Allow the child to experiment.
8. "How many times do you think you need to fill the larger beaker to fill the graduated cylinder?"
9. Allow the child to experiment.



## Control of Error

1. Overfilling of the cups
2. Marking lines on the graduated cylinder and beakers

## Extensions

1. Use different items for pouring
2. Use different beakers or graduated cylinders



# Measurement - Volume - Tools 1

## Age

5 years and up

## Aim

Direct: to be introduced to volume measurement tools

Indirect: to begin to conserve volume

## Materials

- 5 ml test tube, 15 ml test tube, 25 ml test tube, 50 ml test tube, pipette 250 ml flask filled with water, test tube rack, tray, test tube brush, or
- [Test Tube Transfer Activity \(Item: EC-0104\)](#)

## Presentation

1. Invite the child to the lesson.
2. "This is another way to work with volume tools. The **flask** is filled with water."
3. Point to the test tubes, "These are called **test tubes**. Please sort them from the smallest to the largest. They will stay still when you keep them in the **test tube rack**."
4. Pick up the pipette. "This is like the baster, or the eye dropper. In science it is called a **pipette**."
5. "We have a tally sheet to help us keep track of our work. We will use the pipette to see how many times we can fill the test tubes."
6. Ask the child to predict the number of times it will take to fill the smallest test tube to the top line by filling the pipette.
7. Have the child record their prediction.
8. Demonstrate how to fill the pipette by squeezing on the bulb, placing it in the beaker, and releasing the bulb. Try and fill the pipette as much as possible.
9. As they fill the smallest test tube, have the child record in the "actual" column the number of repetitions.
10. Continue with each combination on the tally sheets as long as the child is interested.
11. When the child has finished ask them to restore the water back into the beaker, and wipe the tray.
12. Take the test tube rack to the sink with the test tubes and the test tube brush.
13. Demonstrate how to clean the test tubes with the brush and dry them in upside down on the pegs in the test tube rack.
14. Ask the child to return the test tube rack to the tray and then to the shelf.

## Control of Error

1. Overfilling of the test tubes
2. Marking lines on the test tubes


## Extensions

1. Use different sized pipettes
2. Use different sized test tubes



# Volume Measurement Record Sheet

Use the  to measure these test tubes.

Test Tube	Guess	Actual
		
		
		
		

# Measurement - Volume - Tools 2

## Age

5 years and above

## Aim

Direct: to be introduced to volume measurement tools

Indirect: to begin to conserve volume

## Materials

- 100 ml beaker, 50 ml graduated cylinder, 10 ml graduated cylinder, 5 ml graduated cylinder, water source, tray, sponge, tally sheet

## Presentation

1. Invite the child to the lesson.
2. "Today, we are going to see how many times it takes to fill the different containers."
3. Ask the child to sort the graduated cylinders from smallest to largest and place the beaker next to the largest graduated cylinder.
4. "Sometimes, it is hard to remember how many times it took to fill each container. Let's use this tally sheet to record how many times it takes to fill one container with another container."
5. Introduce the tally sheet to the child.
6. "Let's take the smallest graduated cylinder and fill it with water to the top line. How many of these small graduated cylinders do you think it takes to fill the next sized cylinder?"
7. Ask the child to predict and to record their prediction on the tally sheet.
8. Have the child fill the smallest graduated cylinder with water to the top line and carefully pour it into the next sized graduated cylinder. "Did that fill the next sized graduated cylinder?" (no)
9. "This was one full small graduated cylinder." Place one tally mark in the "actual" column.
10. Continue with the smallest graduated cylinder until the next sized graduated cylinder is filled to the top line. Record a tally mark in the actual column with each pouring.
11. Return the water from the graduated cylinder to the water resource.
12. Continue with the next comparison on the tally sheet as long as the child is interested.

## Control of Error

1. Overfilling the graduated cylinders
2. Filling to the lines




# Volume Measurement Record Sheet

How many does it take?

Graduated Cylinder	Guess	Actual
		
		
		

# Volume Measurement Record Sheet

How many does it take?

Graduated Cylinder	Guess	Actual
		
		
		



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