

Learning Measurement

The world is filled with references to measurements that limit children's activities. It's no wonder children strive to be "big" when they often hear adults remarking, "That's too big a piece of cake for you," "That's too far for you to walk," "You're not old enough," and "You have to weigh 60 pounds before you may use a seat belt without a booster seat." Children may not have a set goal in mind, but they are delighted the first time they find themselves eye-to-eye with an adult. As they grow, their understanding of the concept of measuring also grows as they have experiences that teach them the meaning behind the adults' comments.

Confusion About Size

One situation that can confuse children about size is viewing photographs of creatures that have been enlarged to show details. The seemingly huge spider or earthworm is easier to contemplate when a coin is included in the photograph to show the scale. Coins and hands are measurement tools that bridge from early "play" experiences to lessons teaching about measuring with standardized measuring tools. By comparing an object such as a block with an equal length in coins placed end-to-end, students begin to understand that the numbers on a ruler have meaning.

Volume can be particularly challenging to teach. Following a recipe is one way to teach measuring volume; another is the following re-useable (and dry) activity. Cut off the bot-

tom and pointed tops of two clear-plastic soda bottles (1-liter and 2-liter) and trim them to make two cylinders with identical volumes but different shapes (one tall and narrow, and one short and broad). To do this, hold one cylinder on a tray, partially fill with a volume of small dried beans, and mark the level they reach. Then pour that same volume of beans into the other column and mark the height. Trim the cylinders at the marks to get identical volumes. Ask children to point out the "biggest" of the two cylinders when empty. It's interesting that most, but not all, will choose the tall one, showing a familiarity with measuring height. By pouring the beans from one cylinder to the other, students will accept what is not immediately obvious—that the cylinders have identical volumes.

Measuring in Preschool

Measuring is part of the National Science Education Program Standard C (coordination with mathematics) and Content Standard A, science as inquiry, for grades K–4. The National Council of Teachers of Mathematics has specific measurement standards for grades preK–2 (see Internet Resources).

Measuring attributes of length, volume, weight, area, and time are introduced in early childhood play with blocks, at the water table, by using simple scales, with fabric



squares, and with timers. Experiences in comparing two similar but not identical objects such as blocks or bowls lay the foundation for precise measurements in later lessons.

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References

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academy Press.

Internet

National Council of Teachers of Mathematics (NCTM) Measurement Standard for Grades PreK–2
<http://standards.nctm.org/document/chapter4/meas.htm#bp1>

Measuring Hands

Objective:

To introduce measuring as a tool of scientists

Materials:

- Construction paper
- Pencils
- Tape
- Clear contact paper or lamination (optional)

1. Talk with students about size, asking for examples from their lives of objects that are large, medium, and small. Record the examples in lists by drawing or writing so students can see that some words, such as *dog*, *pizza*, or *bug* appear in more than one size category. Allow them to start new categories, such as *huge*.
2. Ask students to show with their hands the height of a big dog and then the size (diameter) of a large pizza. Depending on their experiences, they may discover that what is a big dog to one person is not necessarily a big dog to another, but pizza sizes are more standardized. Ask the students, “What if your family ordered a large pizza and the restaurant’s large size was only as big as this (small) plate?” Ask the class to suggest other situations where being able to communicate size is important, such as cutting a doorway for a big dog.
3. Tell your class that as a group you will be making a tool to measure how long things are—length. Have the students trace around one

hand with a pencil on construction paper. Encourage them to hold the fingers together to make the hand shape easier to cut out and to reduce tearing in later use. Students who finish quickly can make additional hands or decorate theirs. When they are finished, have them compare their hand length to objects in the classroom.

4. Now collect the hands and stick each one to a long piece of tape, with the fingertips just touching the bottom of the previous palm so that the hands lie in a long continuous line. Strengthen this “measuring hands” tool by laminating it or applying a long piece of clear packing tape to each side.
5. Use the measuring hands tool to compare lengths. How tall is the doorway? How wide? How long is the rug, a desk, or a pencil? Sometimes short children are reluctant to compare heights since taller height is associated with being grown up and therefore more competent. If size is a sensitive issue in your classroom, or competition is too great for measuring body size, try comparing the distance around children’s heads, as that measurement is almost always very similar, differing from person to person by just an inch or two. With use, students will realize that the measuring hands tool is useful for larger measurements but doesn’t give enough information to compare objects smaller than a single hand.



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With that realization, it is time for the students to begin working with standard measuring tools such as a 30-cm or 12-in ruler.

What's happening at
<http://science.nsta.org/earlyyearsblog>.

Making Measurement Fun

I introduced capacity to my kindergarteners with the story "I Know an Old Lady Who Swallowed a Fly." We discussed how many animals the lady had to "eat" until she was full. Next, we predicted which container would hold the most dry rice, a milk carton or a small plastic dish. Students filled the object they thought would hold the least amount, and we discussed what would happen when we poured the rice into the other container. Students then poured the rice from the first container to the second and made observations. Of course, all of this was done over a large plastic tub to catch loose rice. Later at centers, students explored the amount of rice other containers could hold.

*Danielle Patteson
 Kindergarten Teacher
 San Antonio, Texas*

I gave my second graders pieces of adding machine tape cut into 1 m lengths and asked the question, "How long is a meter?" Students worked in pairs with assorted "measuring units" (paper clips, Popsicle sticks, milk bottle lids, etc.) to "measure" the strip by lining up the items and tracing around them. Once this task was completed, the strips were hung side by side and compared. The children discovered that although each of the strips was the same length, the units used to do the measuring determined the strips' "length." For example, one strip had 8 straws drawn on it while another had 43 paper clips. Not only did students discover the need for a standard unit of measure, they also learned about the advantages and disadvantages of using longer or shorter standard units.

*Judith Longfield
 Assistant Professor, Indiana University
 Bloomington, Indiana*

Online, your colleagues are also discussing ...

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- Measurement

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<http://science.nsta.org/earlyyearsblog>.

Teacher's Picks

Peggy Ashbrook had so much fun researching this topic that she didn't want to share the job with another teacher. The Early Years column welcomes teachers to contact Peggy about sharing your picks on particular science topics at scienceissimple@yahoo.com.



Peggy Ashbrook

Books

Capacity and Length (Math Counts Series). Henry Pluckrose. 1995. Children's Press.

Clear text and photographs make this series a good resource for early readers.

How Big Is a Foot? Rolf Myller. 1991. Yearling.

This classic book is a humorous introduction to why measuring units are standardized. The story, measuring and building a bed for the Queen's birthday present, is adapted into a play in a lesson plan on the Utah Education Network website (see Internet resources, below).

How Tall, How Short, How Far Away? David A. Adler. 1999. Holiday House.

This is a good introduction to the development of measuring systems and standards for children who have had experience in measuring.

Measuring Penny. Loreen Leedy. 1997. Henry Holt.

Read this book to begin discussion about measuring different attributes. Dog owner Lisa finds out there are many things about a dog to measure when she works on a school assignment to measure something in as many ways as you can. (Refers to both English customary units and metric units.)

Internet

Count Us In, Australian Broadcasting Corporation
www.abc.net.au/countusin/default.htm

Self-correcting online games help children explore a variety of math concepts, from counting to estimating capacity, without becoming frustrated.

The Path to Math: Measurement with Young Children, Illinois Early Learning Project,

www.illinoisearlylearning.org/tipsheets/measure.htm

This site lists many ideas for including measurement in the daily rhythm of the early childhood classroom.

How Big Is a Foot? Utah Education Network
www.uen.org/Lessonplan/preview.cgi?LPid=10729

A first-grade activity introducing nonstandard measurement, with a worksheet to practice estimating and measuring lengths and a script for a play based on the book *How Big Is a Foot?* by Rolf Myller.