

# Unit 11 Research



In addition to learning about number and shape, early childhood also includes development of measurement, which is a fundamental aspect of mathematics that connects geometry and number.

In its most basic form, measurement is the process of determining the size of an object. To measure a quantity (with respect to a given measurable attribute, such as length, area, or volume) a unit must be chosen. Children begin with nonstandard units: craft sticks to measure the length of a classroom rug; square 1" tiles to measure the area of a table; cube-shaped blocks to measure a book. So when a unit is chosen, a measurement is the number of those units. An important idea about units which children learn gradually is that when measuring a given object, the larger the unit used to measure, the smaller the total number of units. Because the concept of units underlies core ideas in number, geometry and measurement, it has been recommended as a central focus for early childhood mathematics education.<sup>(1)</sup>

The development of measurement skills usually starts with directly comparing objects along one dimension. Thus children generally succeed in measuring length prior to area and volume.<sup>(2)</sup> Starfall Math introduces children to nonstandard measures to determine the length and height of classroom objects, and offers many activities for practice in ordering objects by length.

An important feature of their learning during this period is that children have difficulty understanding units of measure. Young children can be successful at measurement when given appropriate instruction. Both research with children and interviews with teachers support claims that (a) the principles of measurement are difficult for children, (b) they require more attention in school than is usually given, (c) time needs to first be spent in informal measurement, in which the use of measurement principles is evident, and (d) transition from informal to formal measurement needs much more time and care.<sup>(3)</sup>

Children's early competency in measurement is facilitated by play with structured materials, such as unit blocks, pattern blocks, and measuring tiles, and strengthened through opportunities to reflect on and discuss their experiences. Research on the learning of shapes and certain aspects of visual literacy suggests the inclusion of these topics in the early years can be powerful.<sup>(4)</sup> Starfall Math affords children many opportunities to describe measurable attributes of objects and compare two objects with a common measurable attribute.

(1) Sophian, C. (2007). Rethinking the starting point for mathematics learning. In O.N. Saracho and B. Spodek (eds.), *Contemporary Perspectives in Early Childhood Education: Mathematics, Science, and Technology in Early Childhood Education* (pp. 21-44). New York: Information Age.

(2) Hart, K. (1984). Which comes first – length, area, or volume? *Arithmetic Teacher*, 31. 66-18, 26 – 27.

(3) Irvin, K.D., Vistro-Yu, C.P., and Eil, F.R. (2004). Understanding linear measurement: A comparison of Filipino and New Zealand children. *Mathematics Education Research Journal*, 16(2), 3-24.

(4) National Mathematics Advisory Panel. (2008). *Foundations for Success: The Final Report of the National Mathematics Advisory Panel*. Washington, DC: U.S. Department of Education.

# Unit 11 Frequently Asked Questions

***The Starfall Math Curriculum seems to spend a great deal of time on measurement activities. How can this fit into the schedule and still allow time to achieve all of the other standards?***

Unfortunately, with the shift from the concept of Kindergarten as a developmentally appropriate setting that included a housekeeping area, sandbox, and large and small block centers, to a much more academic setting, young children do not have as much opportunity to practice measurement skills in a play environment as they once did. Experimenting with measurement takes time because it must be hands-on, so measurement activities are included throughout the curriculum, with a focus on measurement in Unit 11. Children need to manipulate and experiment with measurement concepts in order for real understanding to occur.

***Only nonstandard measurement is included in the program. Wouldn't it be better to introduce children to a ruler and other standard measurement tools?***

It is important for children to understand the concept of measurement in a developmentally-appropriate way. It is also important to teach the underlying concepts before introducing more difficult units of measure such as measuring tapes and rulers, etc. Concepts such as always measuring from the baseline, or always measuring with the same-sized unit of measurement (paper clip, craft stick, cube, etc), and estimating length and height are emphasized and practiced throughout all of the measurement activities.

Later in the program children are introduced to standard units of measurement, but they are not required to use them to measure.