

**Strategies that Support Children in the Area of Mathematics**

**Number Sense and Quantity**

* Provide opportunities for mobile infants and toddlers to experiment with full and empty.
* Make a tally chart and ask children to survey each other on a favorite topic. “Do you like strawberry or chocolate ice cream?”1
* Provide materials that allow children to explore one-to-one correspondence, such as nuts/bolts and cups/sauces. Children will also make one-to-one correspondence with any sets of materials they are playing with; for example, giving each bear a plate or ball. 2
* Use written numerals and encourage children to write them. For example, when they play store, encourage them to write size and price labels, orders, and the amount of the bill. 3
* Explore numbers and quantity by using measurement.
* Provide a variety of collections of objects for manipulating, organizing, comparing, and counting (plastic animals, cars, blocks, toy dishes, etc.)
* Identify small quantities of items (child saying: "I got two!" "More juice." Adult noting: "You found one of your shoes. Where's the other one?" "We have two dolls – one for each of you." "You have so many blocks!")
* Provide different sizes of containers and scoops during water and sand play. Use proportionate sizes (e.g. ¼ cup; ½ cup; 1 cup) when possible.
* Count small numbers of items during play or meal times (when child seems receptive and counting doesn't interfere with a goal that child is trying to achieve, such as carefully stacking blocks).

**Number Relationships and Operations**

* Encourage children to count all sorts of objects and events and to think about quantity and number. Teachers can use everyday experiences to promote concepts of number, counting, and one-to-one correspondence by posing questions such as, “Do we have enough chairs for everyone? How can we figure that out?” “Shall we count how many steps to the playground?” and “Who is third in line?”
* Arrange materials and use games and verbal encouragement to involve children in matching and sorting objects by color, shape, size, and other features; using one-to-one correspondence (one napkin at each person’s place at the table, for instance); and ordering a set of objects that vary in color, size, or another dimension (though not adept at seriation, preschoolers benefit from opportunities to try putting things in order).
* Draw children’s attention to numbers around them and what they are used for, such as finding addresses, prices of objects, and shoe sizes.
* Use strategies to help children learn to count accurately and efficiently, such as conveying to children that counting lets us know how many things there are in a group; pointing to each object in turn as the person counting (be it the child or the teacher) calls out each number name; and making use of fingers to count and encouraging children to do so.
* Highlight the relationships critical to developing number concepts and operations, such as the parts that make up a whole (a concept that underlies addition and subtraction). A teacher might say, “Brian is showing us how old his brother is by holding up six fingers. Can anyone think of another way to show six?”
* Help children to become familiar with the skills and vocabulary of estimating, such as using words regularly including more than, less/fewer than, about, near, approximately, and in between; asking children to estimate how much, how long, or how many (“How many shovelfuls do you think it will take to fill that bucket?”). During snack, sand or water play, art activities, and other opportune times, teachers can then encourage children to test for the actual answer; and making it a point to return to a problem type to allow children to try again. As children begin to make judgments closer and closer to the real count, they hone their estimation skills. Teachers should stress that it is not important for children to get the “right” answer, but to see how close they can come. Provide a variety of collections of objects for manipulating, organizing, comparing, and counting (plastic animals, cars, blocks, toy dishes, etc.)
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**Patterning and Classification**

* Explore the size and shapes of objects through various means, ex. Banging, dropping etc.)
* Encourage children to sort objects by attributes.
* Use a variety of classroom materials to replicate patterns.
* Play games with repetition, for example, peek-a-boo.
* Move objects to rhythmic sounds or songs.
* Provide predictable yet flexible daily routines. Although the exact mealtime may vary slightly on a daily basis, always wash hands before meals and brush teeth afterwards so that children gain an understanding of daily patterns.
* Provide opportunity for children to notice patterns in songs or stories (For example, the song Head, Shoulders, Knees, and Toes and the book Goodnight Moon provide a repetitive sequence that young children enjoy. Eventually they begin to anticipate the pattern of motions in the song or of spotting the mouse in the book).
* Use language and point out logical sequences in daily routines ("First the sock goes on then your shoe.").
* Ask the children to predict what might happen next during familiar stories ("What do you think the bunny will do next?"), routines ("What do you think we will do when you're done with snack?"), and play experiences ("What do you think will happen if you add another block"?)
* .Provide opportunities and sufficient time for children to explore materials and observe their environment – at their pace.
* Provide opportunities for toddlers to assemble and then explore collections (walk to the park to collect fallen leaves that will be used to fill the sensory table).
* Compare objects and point out differences in color, shape, and size.
* Provide an environment that includes a variety of age-appropriate manipulatives (blocks, interlocking blocks such as DUPLO®, links), collections (plastic animals, cars, leaves, rocks), dramatic play props (variety of clothing, dishes, dolls) and art materials (fabric samples, tongue depressors, sticks) in different colors, shapes, and sizes to offer classifying and sorting experiences throughout the day.
* Use language and point out similarities and differences in, for example, toys and blocks, as toddlers put them on the shelf during cleanup time.
* Provide opportunities for toddlers to sort objects according to a characteristic ("Can we find all of the blue trucks?" "Can we find a fatter stick?").
* Provide safe opportunities for children to observe, explore and investigate natural objects (indoors and outside) such as non-toxic leaves, flowers, and plants or time to observe ants on the sidewalk or fish in an aquarium

**Measurement, Comparison and Ordering**

* Compare the weights of two objects by pulling a toy, using measures or water displacement.
* With infants and toddlers use sanitized tops to liquid detergents, fabric softeners and mouthwashes to bang together, nest stack, use to fill and empty; explore concepts of size, shape, color, texture; sort and classify by size, shape, color, texture; use in water to fill, pour scoop.
* Understand and use measurement words such as “big” and “hot”.
* Find and point to different sized objects, ex. The tiny mouse in the book “Goodnight Moon”.
* Use tools for measurement, for example a cup or scale. Provide materials for toddlers to explore and compare sizes (various sized cups in water table to sort by size, to empty and fill, or to nest or stack; various sized like-figurines such as cats and kittens as props, or various dishware in the dramatic play area).
* Use language to compare dimensions such as overall size, height, weight, or loudness. Infants and toddlers tend to use terms such as big, too big, loud, and too loud as comparisons. Expand the comparison and vocabulary with other qualifiers such as little, quiet, hard, soft, heavy, light, short, tall, high, or low.
* Ask prediction questions ("Do you think this ball will float?" or "How many jumps do you think it will take to get to the sandbox?").

**Geometry and Spatial Sense**

* Provide opportunities for mobile infants and toddlers to explore spatial relations (set up spaces/materials for them to climb in boxes, on structures, or under tables).
* Use language to describe relationships amongst materials using words such as "next to", "on", "under", "in", "out".
* Provide opportunities for children to build two-dimensional and three-dimensional shapes by putting simple shapes together, use various types/shapes of blocks [fabric, wooden, cardboard, paper towel tubes cut into proportionate sizes (e.g. full tube/ 1/2 tube / 1/4 tube)], interlocking blocks such as links, nesting/stacking materials, playdough).
* Provide opportunities for children to experience how shapes can transform (provide cube-or ball-shaped clay pieces for the children to flatten; place ice cubes in water table so children can observe them melting).
* Use geoboards and elastics to create different shape triangles. Have children draw their shapes on paper that resembles a geoboard. 4
* Encourage children to identify different shapes (not just circle, square, and triangle but others as well) and three-dimensional figures as they draw, look at books, work with geometric puzzles, build structures in the block center, or take a neighborhood walk.5
* Give children many opportunities to handle objects, such as blocks, boxes or containers, shape sorters, and puzzles.6
* Let them climb in and out of boxes or large block structures; on or around outdoor equipment; and under, over, around, through, into, on top of, and out of different things to experience themselves in space.7
* Ask children to measure big objects by taking steps. Vary the steps by asking children to take “baby step”, “giant steps”, “tip-toe steps”. 8
* Create a rhythmic pattern such as clap-clap-snap, clap-clap-snap 9
* Increase awareness of patterns around the classroom and throughout the day. For instance, teachers—

~ Help children find patterns in designs and pictures, as well as in movement and in recurring events such as the daily classroom schedule, the days of the week, or the seasons of the year;

~ engage children in creating and noticing patterns as they string beads; place shapes or blocks into arrays; and arrange other materials. Over time children can reproduce and create more complex patterns; and

~ talk to children about patterns created or noticed in constructing with unit blocks, legos, and other construction materials.10Provide opportunities for mobile infants and toddlers to explore spatial relations (set up spaces/materials for them to climb in [boxes], on [structures], or under [tables]).

* Use language to describe position relationships amongst materials using words such as "next to," "on," "under," "in," "out." ("You're sitting next to Amanda." or "Can you put your cup on the table?" "Oops, the ball rolled under the table." "You put the blocks in the basket!" or "Let's get your bottle out of the refrigerator").
* Identify objects by their properties ("The ball is round." "The box top is flat." "The tile floor is smooth but the carpet is bumpy.").

1 National Council for Teachers of Mathematics www.illuminations.nctm.org (Bar Graph Investigations)

2 Ann S. Epstein, *The Intentional Teacher: Choosing the Best Strategies for Young Children’s Learning* (Washington: NAEYC, 2007) 51.

3 Ann S. Epstein, 53.

4 National Council for Teachers of Mathematics www.illuminations.nctm.org *Investigating shapes (Triangles)*

5 U.S. Department of Health and Human Services, Administration on Children, Youth and Families, Head Start Bureau. *The Head Start Leader’s Guide to Positive Child Outcomes: Strategies to Support Positive Child Outcomes*. (Washington, D.C September 2003), 65.

6 *The Head Start Leader’s Guide*, 65.

7 *The Head Start Leader’s Guide*, 65.

8 National Council for Teachers of Mathematics www.illuminations.nctm.org (How many steps)

9 Diane Trister Dodge, Laura Colker & Cate Heroman. *Creative Curriculum for Preschooler*. Washington, DC: Teaching Strategies, 2002. 426.

10 *The Head Start Leader’s Guide*, 66. McHenry, Jolie D. and Kathy J. Buerk. "Infants and Toddlers Meet the Natural World." *Young Children: Journal of the National Association for the Education of Young Children* (January 2008): 40 - 41.
Rillero, Peter."Doing Science with Your Children." *KidSource Online*. <http://www.kidsource.com/kidsource/content2/Doing.Science.with.child.html> (accessed January 10, 2008).

Wittmer, Donna and Sandra Petersen. Infant and Toddler Development and Responsive Program Planning: A Relationship-Based Approach. New Jersey: Pearson Education, Inc., 2006.