

INFANTS AND TODDLERS Exploring Mathematics

Researchers are in the beginning stages of learning how infants and toddlers build the skills they will one day use for mathematics. We know that infants and toddlers begin to notice relationships as they start to classify, seriate (put objects in order based on number and size), compare, and order objects. Here are some examples of what infants and toddlers might do, how these behaviors are related to mathematics, and what teachers can do to encourage the natural mathematical interests of this age group.

<i>What Children Might Do</i>	<i>How the Behavior Relates to Mathematics</i>	<i>What Teachers Can Do</i>
Dump blocks out of a bucket and put all of the blue ones in a pile.	<p>Infants and toddlers look for exact matches because that is the level of classifying they can handle. They cannot understand that things can be the same and different at the same time (e.g., round and blue vs. square and blue).</p> <p>Classification skills will one day be used for the math content areas of measurement, patterning/algebra, and geometry/spatial.</p>	<p>Provide plenty of blocks and other toys and items of different shapes, colors, and sizes.</p> <p>Play with children, notice what they do, and record observations.</p> <p>Use words that describe attributes such as size, shape, and color: “You made a big pile of blue blocks.”</p>
Beat on a drum, shake a tambourine, or play another musical instrument.	<p>Infants and toddlers are slowly constructing number sense (e.g., realizing that numbers have meaning), concepts of quantity, and other ideas through their interaction with the environment.</p> <p>These beginning concepts of number will eventually lead to understanding one-to-one correspondence and quantification.</p>	<p>Provide plenty of sound makers (e.g., wrist bells, pots and wooden spoons, rhythm instruments) so children can experiment and experience rhythm and beat.</p> <p>Encourage children to play and move along with recorded music.</p> <p>Talk with children and describe what they are doing: “Shake, shake—shake, shake, shake. You made your own music.”</p>
Pretend to drink from a cylindrical block.	<p>Mathematics involves recognizing and thinking about how objects are the same and how they are different. For example, to a child a cylindrical block looks like a cup, so he pretends to drink from it. Making connections will eventually lead to children being able to use number to compare and contrast groups of objects. This will begin with <i>more</i> and <i>less</i> relationships and develop into addition and other mathematical functions.</p>	<p>Set up a simple dramatic play area with many props that encourage children to compare, sort, contrast, manipulate, and explore properties such as size and shape.</p>
Fit containers (such as plastic bowls) of different sizes inside each other.	<p>Infants and toddlers learn through their senses and by using their motor skills. Their ability to compare and contrast the attributes of objects is the basis for many future mathematical concepts.</p> <p>Order and sequence (in this case based on size) are important concepts that will eventually lead children to an understanding of quantification (e.g., how much and how many) and numerical comparisons (e.g., <i>more</i> and <i>less</i>).</p>	<p>Provide a variety of toys that invite children to explore with their senses and motor skills and allow them to compare and contrast objects by size, color, texture, and sound. Some good toys for this purpose include xylophones, stacking rings, shape boxes, and texture balls or books.</p>

<p>Help a teacher slice bananas for snack or return blocks to shelves labeled with shapes.</p>	<p>Adults use mathematics every day to help make sense of the world, solve small problems, and order their universe. Infants and toddlers do the same thing as they engage in everyday activities such as eating snack and cleaning up.</p> <p>As children grow, it is important for them to understand the importance of mathematics in their daily lives so they will feel comfortable with mathematics as adults.</p>	<p>Point out mathematical and relational comparisons during daily activities. For example, serve two kinds of fruit and say, “These apples are hard and crunchy. The bananas are soft and mushy.”</p> <p>Introduce mathematical words to children in matter-of-fact ways: “These blocks are <i>longer</i> than those blocks.” “These are <i>square</i> and those are <i>round</i>.”</p>
<p>Crawl through a tunnel or in and out of a cardboard box.</p>	<p>Infants and toddlers use their whole bodies to explore and learn. Being in different positions lets children pay attention to where things and spaces are in relationship to one another.</p> <p>Physical activities such as these introduce spatial relationships and set the stage for understanding geometry and numbers.</p>	<p>Encourage children to explore how their own bodies fit in space and to see things from different perspectives (e.g., <i>inside</i> and <i>outside</i>, <i>high</i> and <i>low</i>). Provide an expanding tunnel or one made by taping together several cardboard boxes.</p> <p>Let children climb on a stack of soft pillows. Talk about what children are doing so they can begin to learn the words that describe mathematical concepts: “You were <i>in</i> the box, then you climbed <i>out</i>.” “You climbed <i>up</i> on the pillows, then you jumped <i>down</i>.”</p>
<p>Fill and empty containers at sand and water tables.</p>	<p>Infants and toddlers do not understand that simply changing the shape or arrangement of one or more objects does not change the quantity. This understanding is known as <i>conservation</i>, and it will not begin to emerge until about age four. However, this comprehension does not just pop into a child’s head—it is constructed slowly, over time, as children play with objects, containers, and substances such as sand and water.</p> <p>Conservation is important to future mathematical content areas such as classification, seriation, and number.</p>	<p>Offer materials such as sand and water (or other safe materials) and containers of different sizes, shapes, and capacities. Allow children to interact by filling and emptying the containers and noticing what happens. Teachers can focus a child’s thoughts by asking questions such as, “What might happen if you pour that into this jug?” or “Do you think all of the sand will fit in this bucket?”</p>
<p>Make patterns using blocks or beads and string.</p>	<p>Patterning activities require children to observe, recognize, and repeat relationships and can introduce beginning number concepts. To make patterns a child must create specific relationships between the objects. For example, a child might alternate colors (red, blue, red, blue), sizes (large, small, small, large), or numerical patterns (1 block, 2 blocks, 1 block, 2 blocks).</p> <p>Patterning leads to seriation.</p>	<p>Observe and comment on the patterns children make. Engage in patterning with the children. Make or provide a simple pattern, and invite children to make a pattern that looks the same as the model (e.g., make a row of small animals—one giraffe, one tiger, one giraffe, one tiger—and provide a container of animals).</p>

In all of these examples, teachers’ interactions with children are vitally important to children’s understanding of early mathematics. Teachers are most effective in helping infants and toddlers construct knowledge when they assume the role of facilitator. Teachers who are facilitators of learning are active observers of children’s actions and explorations. They offer materials and activities that provide appropriate levels of challenge, help children question their own assumptions, and encourage them to think about and recognize relationships between objects.

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