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Eugene Geist

# Infants and Toddlers Exploring Mathematics



**A good deal of research** is beginning to support the idea of emergent mathematics and that, much as with reading, children begin to learn mathematics from the day they are born. We know that infants and toddlers begin to notice relationships as they interact with their parents or primary caregivers through songs, rocking, and other verbal and nonverbal communication. Later, they build on this foundation by beginning 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.



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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.

What Children Might Do	How the Behavior Relates to Mathematics	What Teachers Can Do
<p>Dump blocks out of a bucket and put all of the blue ones in a pile.</p>	<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 versus 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>Receptive language develops before productive language. Therefore, infants and toddlers can understand what you say to them even if they can't talk to you.</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, record observations, and promote interactions with objects.</p> <p>Use words that describe size, shape, and color: "You made a big pile of blue blocks."</p> <p>Ask questions, such as, "Where is the blue one?" or "Can you put all the balls in the bucket?" Ask children what they are doing and talk about the mathematical connections the child is making.</p>
<p>Beat on a drum, shake a tambourine, or play another musical instrument.</p> 	<p>Infants and toddlers are slowly constructing number sense (e.g., realizing that numbers have meaning), concepts of quantity, and other ideas through their interactions with the environment.</p> <p>These beginning concepts of number will eventually lead to understanding one-to-one correspondence and quantification.</p> <p>Using a "steady beat" activity allows a child to construct the interval nature of number (i.e., that there is the same interval between 1 and 2 and 2 and 3 and that 2 is always and exactly half of 4).</p> <p>A child's first patterning activities are usually through rocking or bouncing along with a song or a chant.</p>	<p>Provide plenty of sound makers (e.g., wrist bells, pots and spoons, rhythm instruments) so children can experiment and experience rhythm and steady 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> <p>Use a steady beat when rocking infants, and perhaps add a chant to it.</p> <p>Incorporate rhythms while rocking or bouncing the child (i.e., hard bounce, soft bounce, hard bounce, soft bounce).</p>
<p>Pretend to drink from a cylindrical block.</p>	<p>Mathematics involves recognizing and thinking about how objects are the same and how they are different. Representational thought is key in understanding math concepts. Any activity that promotes the use of representational thought supports emergent mathematics. For example, to a child, a cylindrical block looks like a cup, so he pretends to drink from it. Making connections eventually leads children to being able to use number to represent a quantity. This begins with <i>more</i> and <i>less</i> relationships and develops into addition and other math functions.</p>	<p>Set up a simple dramatic play area with many props that encourage children to make one item stand in for another.</p>
<p>Fit containers (such as plastic bowls) of different sizes inside each other.</p>	<p>Infants and toddlers learn by using their senses and their motor skills. Their ability to compare and contrast the attributes of objects is the basis for many future math concepts.</p> <p>Order and sequence (in this case based on size) will eventually lead children to an understanding of quantification (e.g., <i>how much</i> and <i>how many</i>) and 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 texture books.</p>

## Infants and Toddlers Exploring Mathematics *(cont'd)*

What Children Might Do	How the Behavior Relates to Mathematics	What Teachers Can Do
Help a teacher slice bananas for snack or return blocks to shelves labeled with shapes.	<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" or "These are <i>square</i> and those are <i>round</i>."</p>
Crawl through a tunnel or in and out of a cardboard box.	<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 relation to one another.</p> <p>Physical activities introduce spatial relationships and set the stage for understanding geometry and numbers.</p> <p>The developmental domains (cognitive, physical, and emotional) are linked and need to be used to support mathematics understanding.</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 pillows. Talk about what children are doing so they can begin to learn the words that describe math 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>
Fill and empty containers at sand and water tables.	<p>Infants and toddlers are still constructing the concept 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 usually not begin to emerge until about age 4. However, this comprehension does not just pop into a child's head—it is constructed slowly, over time, as children play and interact 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 sand, water, and other safe materials and containers of different sizes, shapes, and capacities. Encourage children to fill and empty the containers and notice what happens. Focus a child's thoughts by asking such questions 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>Give infants a ball for each hand to hold to help them understand <i>more</i> and <i>one</i>.</p>
Make patterns using physical objects, such as blocks or beads and string; physical interactions, such as dance and movement; and music activities, such as singing songs and playing instruments.	<p>Patterning activities require children to observe, listen, recognize, and repeat relationships and can introduce beginning number concepts to children who are preverbal. 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); perform a dance that repeats a movement; or repeat a song with a specific rhythmic pattern.</p> <p>Dances and music can help bring cultural diversity to a mathematics lesson. Different cultural dances and music are based on different rhythmic patterns. Dance and music from different cultures can introduce a different patterning structure to children in an accessible way.</p>	<p>Observe and comment on the patterns children make. Engage in patterning with the children. Make or provide a simple pattern, then invite children to make one that looks like it (e.g., make a row of 1 giraffe, 1 tiger, 1 giraffe, and 1 tiger, and provide a container of animals).</p> <p>Use dance and movement to support patterning activities. Many dance steps are based on numerical patterns.</p> <p>Focus on the many children's songs that are based on simple repeating rhythmic patterns. Ask children to look for the rhythm of the song.</p>

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