Mathematics

How Do Preschool Children Develop Mathematical Thinking?

Children begin to discover mathematical concepts such as more and less, measurement, and counting through their daily routines and during play. “The National Council of Teachers of Mathematics (NCTM) and the National Association for the Education of Young Children (NAEYC) affirm that high-quality, challenging, and accessible mathematics education for 3- to 6-year-old children is a vital foundation for future mathematics learning” (NAEYC & NCTM, 2002). As young children explore materials and their environments with support from adults, their curiosity and knowledge about mathematical concepts becomes more advanced. Early care and education providers encourage this development by offering hands-on opportunities for play, exploration, and problem-solving. This provides the foundation for the development of more advanced skills such as logical reasoning and abstract thought.

Mathematics

Number Sense: counting sequences; one-to-one-correspondence; cardinality; grouping quantities; and number recognition

Number Relationships and Operations: ways of representing numbers; number relationships; and operations

Measurement: comparing objects and quantities; sorting and classifying; and recognizing patterns

Geometry: recognizing shapes and their attributes, position of

Books to Promote Mathematical Thinking

Number Sense & Counting

10 Black Dots by Donald Crews
Bear Counts by Karma Wilson
Chicka Chicka 123 by Bill Martin Jr.
Freight Train by Donald Crews
It’s a Numberful World by Eddie Woo
More, Fewer, Less by Tana Hoban
Feast for 10 by Catherine Fallwell

Geometry & Measurement

Actual Size by Steve Jenkins
Balancing Act by Ellen Stoll Walsh
City Shapes by Diana Murray
Inch by Inch by Leo Leoni
Mouse Shapes by Ellen Stoll Walsh
Round is a Tortilla: A Book of Shapes by Roseanne Greenfield Thong
Shape by Henry Arthur Pluckrose
Up, Down and Around by Katherine Ayers

Patterns & Algebraic Thinking

Animal Patterns by Nathan Olson
City Patterns and Farm Patterns by Nathan Olson
I See a Pattern Here by Bruce Goldstone
I Went Walking by Sue Williams
Lots and Lots of Zebra Stripes by Stephen Swinburne
Monster Knows Patterns by Lori Capote
Move! by Steve Jenkins
Pattern Bugs by Trudy Harris
Pitter Pattern by Joyce Hesselberth
Rooster’s Off to See the World by Eric Carle
The Napping House by Audrey and Don Wood

Examples of Integrated Learning

How children may exhibit these skills	How early care and education providers can encourage these skills
Line-up vehicles in construction area during free play, touching each one while counting them.	▪ Read aloud picture books that feature "math-talk" and provide opportunities for meaningful discussion. ▪ Model counting out loud and one-to-one correspondence during routines and play, and ask children to count. ▪ Provide a variety of interesting materials for grouping collections, sorting, and counting in all areas of the classroom. For example, seashells, buttons, blocks, vehicles, etc.
Collect natural materials on the playground for science exploration in the sensory bin.	▪ Collect, compare, and describe objects. Notice differences in shape, patterns, size, etc. ▪ Invite children to explore, organize, build, stack and take apart materials during play time. ▪ Use descriptive math language and vocabulary when interacting with children. *Example:* "You collected rocks of different sizes. Which one is the biggest? How can we sort them?"
Imitate writing numbers and drawing shapes on clipboard in the dramatic play area.	▪ Point to and talk about numbers and shapes in books, on puzzles, on blocks, in the classroom and community. Notice the shapes of different numbers and objects. ▪ Invite children to participate in a number and shape hunt in the classroom and at home and report their findings. ▪ Encourage children to practice writing numbers and drawing shapes in a variety of ways during free play, such as with paint, dry erase boards, paper and clipboard, or post-it notes. Discuss shapes and their attributes.

Tools and Resources

Erikson Institute: Early Math Collaborative

NAEYC: Math

NCTM: Mathematics in Early Childhood Learning

TODOS: Mathematics for All *Excellence and Equity in Mathematics*