

Making Math Meaningful for Young Children

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Children are natural mathematicians.

They push and pull toys, stack blocks, and fill and empty cups of water in the bathtub. All of these activities allow young children to experience math concepts as they experiment with spatial awareness, measurement, and problem solving (ETFO 2010; NAEYC 2010). Young children easily learn as they describe, explain, and consider the ideas from their immediate environment. *Am I as tall as Yancey? How can I find out? I know! We can both stand next to each other in front of the mirror.*

Early math is not about the rote learning of discrete facts like how much $5 + 7$ equals. Rather, it's about children actively making sense of the world around them. Unlike drills or worksheets with one correct answer, open-ended, playful exploration encourages children to solve problems in real situations. Because the situations are

meaningful, children can gain a deeper understanding of number, quantity, size, patterning, and data management (Grossman 2012). For example, it is easier to understand what *six* means when applied to a real-life task such as finding six beads to string on a necklace or placing one cracker on each of six plates.

Creating a math-rich classroom

Research suggests that preschool classrooms can be the ideal environment for learning about math (ETFO 2010). Children sort materials into corresponding bins at cleanup time, explore patterns and shapes while creating at the art table, tell time while using the visual schedule to predict which activities come next, and measure when they squeeze their bodies through the climber on the playground (ETFO 2010).

Preschool classrooms also celebrate curiosity and risk-taking as children engage in inquiry-based exploration at various learning centers and outdoors. Interesting items in the environment encourage children to find answers

to their questions and solve problems across all curricular domains. Children measure as they clap out the beats to music. They repeat rhythmic patterns as they dance. They describe, sort, and count objects in the discovering science center and look for patterns while on a nature walk. They count the rungs while climbing up the ladder to the loft. Many familiar children's songs, stories, and poems contain mathematical messages that help familiarize children with counting, measuring, and patterning. For example, children can count along with "One, two, buckle my shoe" and "Ten little monkeys jumping on the bed."

In addition to offering blocks, buttons, and other loose materials to touch and explore, teachers can ask open-ended questions that promote problem solving and probe and challenge children's mathematical thinking and reasoning (Ontario Ministry of Education 2010). Such questions are not meant to elicit correct answers but rather to engage children in open-ended conversations that promote high-level thinking, such as *What do you notice about these*

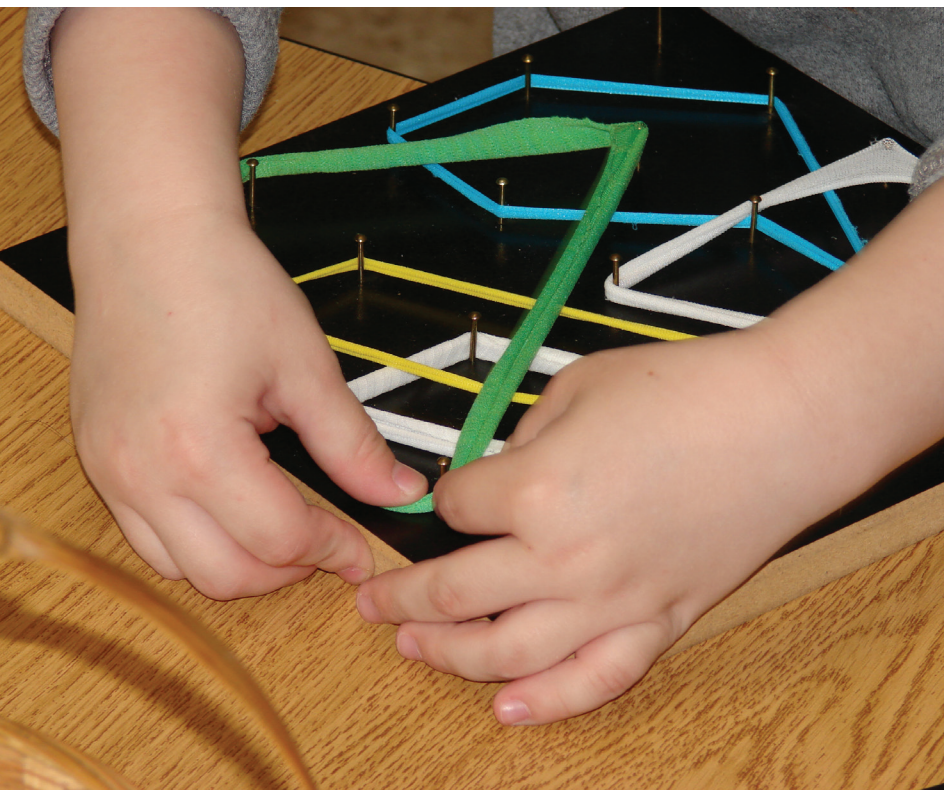
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objects? How might we sort the toys? One of the foundations of play-based learning is that the teacher is active in the play, asking questions and adding knowledge and insight. The teacher learns together with children throughout the inquiry process.

Every preschool classroom needs to be rich with materials that encourage math exploration and learning. A well-stocked math and manipulatives center includes found objects such as shells, stones, bread tags, and sticks, as well as purchased materials. The center can include photos of completed geoboard creations or of children sorting coins in the dramatic play center. There might be narratives of children's learning, such as transcripts of children's comments and conversations, and artwork featuring pattern or shape exploration. Teachers can post documentation of math learning as a way of encouraging children to reflect on past experiences and motivate them to plan and revise future ones. These visuals can inspire even deeper, more connected learning. They help children maintain their focus on a particular topic, refine and expand their ideas, communicate their learning to others, and reflect on their experiences before making new plans.



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Encourage children to play mathematically

Young children need to see themselves as capable mathematicians. Child-guided and child-focused explorations and teacher-guided math activities help children practice and consolidate their learning. This helps them feel confident about what they know and can do. Although many preschoolers learn some math concepts on their own, it's important for teachers to include math in authentic experiences, resulting in a deeper understanding by children (ETFO 2010).

In addition to creating a rich math and manipulatives learning center, teachers can encourage children to use math tools and strategies in all areas of the classroom. Children might use a set of plastic links to measure their buildings in the block center, use play money to pay for a train ticket in the dramatic play center, and use rulers to measure the growth of spring bulbs in the discovering science center. Take a set of scales outdoors so children can figure out who found the heaviest rock. Using math tools for real-life tasks frees both teachers and

children to act spontaneously, resulting in richer interactions and a calmer learning environment (Wien 2004).

In addition to the freedom to use materials in authentic ways, children also need freedom of time and space to deeply engage in math. The preschool schedule should include plenty of time for uninterrupted play so children have the time they need to work on sustained tasks of interest. This allows children to explore materials thoroughly, often resulting in more complex and evolved experiences over time. If a child spends all of his time at one learning center, he is not missing out on learning opportunities elsewhere. Instead, his deep connection to the center is often indicative of rich learning. Teachers can model the use of other materials at the center, such as using writing materials to draw plans for a structure to be built, or pose challenges that encourage the child to think beyond her play, such as *How tall can you build this tower before it falls?*

To support learning, it is important to encourage children to communicate their explorations and findings. Teachers can establish a routine through which children share their experiences

SUPPORTING DUAL LANGUAGE LEARNERS

Children who are DLLs can learn math concepts and skills without being fluent in their second language. Much of the meaning is found in the right materials. If families send to the classroom familiar items from home, the children will know the name and function of the items in their home language. They can use this prior knowledge as a foundation to help them learn math. For example, young children may not understand how to sort plastic shapes, but they already know it is important to sort the baby's socks and daddy's socks in separate piles—a math activity that has real-life meaning in any language.



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at group time. For example, a child might explain how he built a structure with blocks, do a dance with repeating steps, or share a photo of a complex pattern made with colorful buttons. While circulating through the room, a teacher might notice high-quality work and suggest that a child share it with her peers during group time. The child making the presentation grows in confidence and the onlookers may want to try the experience themselves.

Conclusion

Most children enter preschool knowing a lot about math. In a safe and supportive classroom they will feel comfortable taking risks and engaging in self-directed problem solving. Weaving math into all areas of the curriculum will heighten children's play experiences and allow all learners to experience success. Children will soon see themselves as capable mathematicians who apply their skills in a number of ways. Their growing math skills, confidence, and interests will serve them well in school and life. **TYC**



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