

News You Can Use: Supporting Early Math Learning for Infants and Toddlers

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Infants and toddlers develop and refine math concepts and skills through everyday routines, experiences, and most important, caring interactions with trusted adults. Teachers, home visitors, family child care providers, and families all have an important role to play. In this News You Can Use, we discuss ways adults can be more intentional in how they support young children's math learning—and school readiness.

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Supporting Early Math Learning for Infants and Toddlers

Ervin holds Marshall, his 6-month-old son, in his arms as he bottle feeds him during a home visit. Ervin shakes his head and says, "Marshall doesn't seem happy about drinking his bottle. He's drinking it slower than usual and he keeps playing with the nipple with his tongue. He was the same way this morning. He usually finishes his bottle pretty quickly!" Shelly, his home visitor, watches for a few moments, then asks, "Has something about his bottle feeding changed?" Ervin responds, "Not really. Feeding time, formula, and bottle are the same. Oh, but when I went to the store last night to buy new nipples, they didn't have the ones I usually get. So I got different ones. I put the new nipple on this morning. You don't really think he's noticing the different nipple, do you?" Shelly smiles and nods her head. She kneels on the floor in front of Marshall and says, "Marshall, I think we know why you're not happy. Your bottle has a new nipple! It's not the same as your old one. It has a different shape and it feels different in your mouth. You noticed something different about your bottle and you're letting us

know you noticed!"

Dani (11 months old) signs "more" after she finishes eating her banana slices. Will, her teacher, laughs and says, "You want more? Okay, I'll give you some more banana slices." He cuts up the rest of the banana, puts the slices in a bowl, and puts the bowl in front of her. She eats all of the banana slices. When the bowl is empty, Will signs and says, "All gone. Dani ate the whole banana. All gone!" He smiles at her and she smiles back.

Kamara (18 months old) sits on the living room floor and plays with an empty wallet and a small wooden block. Carol, the family child care provider, sits near her and watches. Kamara opens the part of the wallet that holds coins and tries several times to fit the block in it. Then she opens the part that holds bills and tries, without success, to fit the block in. Kamara looks over at Carol, who smiles and says, "You are trying to put the block in the wallet, but it doesn't seem to fit. What will you try next?" Kamara gets up and goes over to a low shelf that holds different types and sizes of bags. She selects a large canvas bag with handles and brings it back to where she was sitting. She picks up the block and drops it into the bag. Then she looks at the wallet, picks it up, and drops it in, too. She brings the bag to Carol and gives it to her. Carol claps her hands and exclaims, "Yay, you found something large enough to fit the block and the wallet!"

Rashid (34 months old), Ben (32 months old), and Summer, their teacher, are sitting together on a blanket outside, reading the boys' favorite book, *Jump, Frog, Jump!* Every time Summer reads the line "How did the frog get away?" Rashid and Ben get up and yell, "Jump, frog, jump!" and then jump up and down (like a frog, of course!) for a few moments before sitting back down.

What do these children have in common? Each child, in his or her own way, demonstrates early mathematical thinking!

Infants and toddlers begin to develop math concepts and skills in the first years of life, but they are really natural mathematicians. In fact, new research shows that children may have innate (or inborn) understandings of math concepts that involve quantities. Even without adult support, we see infants and toddlers using math concepts to make sense of their world. For example, young infants like Marshall begin to notice that something is different from what they already know. Becoming aware of how things are the same and different is an early concept for sorting and classifying. Infants like Dani show they understand the concept of more; more is one of the first number concepts that children develop. Toddlers like Kamara, Rashid, and Ben try to fit objects into various sizes of containers (spatial relationships) and predict words that are repeated in stories you read aloud or songs you sing (patterns). Even though young children may already have some basic understandings, teachers, home visitors, family child care providers, and families still have a very important role to play. Infants and toddlers develop and refine math concepts and skills through everyday routines, experiences, and most important, caring interactions with trusted adults! Being aware of early mathematical concepts can help you be more intentional in how you support young children's math learning—and school readiness!

Where Is the Math?

Everywhere! Math, or **mathematics**, is "a way of describing the world—a way of thinking, knowing, and problem-solving." You use math concepts and math language all the time, but may not realize it. For example, separating clothes into warm water and cold water piles for washing (sorting and classifying), keeping score at sports events and explaining how much your team is ahead or behind (numbers and operations), and giving someone directions to get from one place to another (spatial relationships) all involve math. In your work with infants and toddlers, you likely play games, sing songs, and read simple books that use numbers and counting, use comparison words such

as **big** and **little** (measurement), and explain the order of everyday routines and experiences (patterns). All of those experiences support young children's early math learning. Math is all around us; creating an environment that supports early math learning and using the language of math, or "math talk," makes it concrete and visible for infants and toddlers.

Components of Math

One way to recognize and support early math learning for infants and toddlers is to be familiar with what math involves. Here are brief descriptions of five math components and suggestions for incorporating early math concepts into daily routines and experiences.

Numbers and Operations

This component includes developing a sense of number (that numbers have meaning) and understanding concepts of quantity (how much), order (e.g., first, second), ways to represent numbers, one-to-one correspondence, and counting.

- Play games, sing songs, recite nursery rhymes, and read books that use numbers and counting. Gently bounce infants on your lap or knee and invite toddlers to clap or beat on a drum to a steady beat. Steady beats relate to number concepts such as counting and one-to-one correspondence (e.g., one bounce per beat, one clap per beat).
- Count out loud with children! There are so many things you can count both indoors and outdoors.
- Provide a variety of age-appropriate materials that support children's explorations with one-to-one correspondence, e.g., containers with lids, markers with tops. Invite older toddlers to help set the table for meals and snacks. Explain that each place at the table gets one plate, cup, napkin, and utensil.
- Use math talk as you describe what children see and do. For example:
 - "You have two eyes, and so does your bear. Let's count: 1, 2."
 - "I have more crackers than you do. See, I have three and you have two. I'm going to eat one of mine. Now I have the same as you!"
 - "That's the third time I've heard you say 'mama.' You've said 'mama' three times!"

Shapes and Spatial Relationships (Geometry)

This component includes recognizing, naming, comparing, and contrasting objects based on their shape; and understanding the physical relationship (i.e., direction and position) between oneself and objects or between two or more objects in the environment.

- Play simple body games such as "This Little Piggy," "Open, Shut Them," and "Pat-a-Cake." Games like these help infants and toddlers develop a physical sense of where they are in space.
- Provide materials and equipment such as simple puzzles, different-sized boxes, tunnels, and age-appropriate climbing structures. These materials and equipment allow young children to physically explore spatial relationships such as in, out, over, under, inside, and outside.
- Provide toys and blocks with different shapes for infants and toddlers to explore. In addition to learning the names of shapes, this helps them discover characteristics of shapes such as sides, corners, and curves.
- Use math talk as you describe what children see and do. For example:
 - "Look, Jason went under the climber and Aliyah is on top!"
 - "You're sitting next to Carlos."

- "Some of the crackers we have for snack today are square, and some are round."

Measurement

This component includes determining qualities such as size, weight, quantity, volume, and time and using the appropriate tools to do so.

- Provide a predictable daily schedule of routines and experiences. This helps infants and toddlers develop a sense of time (e.g., "what comes before" and "what happens next").
- Provide the same type of toy in different sizes, such as big and smaller blocks and balls, and toys that have graduated sizes, such as nesting cups, measuring cups, and stacking rings.
- Let infants and toddlers play with sand and water (as appropriate for their ages and stages) and various types and sizes of containers. Encourage them to fill, dump, pour, scoop, and weigh. This helps infants and toddlers begin to understand the concept of volume. And don't forget to provide plenty of adult supervision as children play with sand and water!
- Use math talk as you describe what children see and do. For example:
 - "It's not easy to move that stool because it's heavy."
 - "You took a long nap today!"
 - "Let's count how many steps it takes to reach the playground."

Patterns, Relationships, and Change (the Building Blocks of Algebra)

This component includes recognizing patterns (i.e., seeing the relationships between things that make up a pattern) and/or creating repetitions of objects, events, colors, lines, textures, or sounds to make patterns; and understanding that things change over time and that change can be described using math words.

- Provide a predictable daily schedule of routines and experiences. Predictable routines and experiences are also patterns that help infants and toddlers make sense of their world.
- Play "peek-a-boo" and hide toys as a way to facilitate **object permanence** (the concept that objects and people exist even if you can't see them).
- Sing songs and do finger plays with repetitive words and phrases such as "Old MacDonald Had a Farm" and "Los cinco hermanitos." Read books with repetitive language patterns such as *I Went Walking*.
- Point out patterns that occur indoors and outdoors. Make patterns with children using toys such as large beads and laces, small colored wooden blocks, and large colored pegs and pegboards. You can also make patterns with sounds and movements.
- Use math talk as you describe what children see and do. For example:
 - "Marcus has stripes on his shirt—white, blue, white, blue, white blue."
 - "I put the blocks in the bucket, you dump them out. I put the blocks back in the bucket, you dump them out! In, out, in, out, in, out!"
 - "Our plant looks taller today. I think it grew overnight."

Collecting and Organizing Information (Data Collection and Analysis)

This component includes gathering, sorting, classifying, and analyzing information to help make sense

of what is happening in the environment.

- Point out how objects are the same and different. Draw children's attention to characteristics such as color, shape, texture, size, and function (how the object is used).
- Organize the environment to help young children know where toys and materials belong; for instance, put labels with pictures and words on shelves and containers, or put children's photos and names on their cubbies. This helps young children practice sorting and categorizing.
- Provide collections of small toys and other safe objects such as shells and plastic bottle tops that older toddlers can sort and organize in different ways. Pay attention to any safety concerns with toys and objects if toddlers are in mixed-age groups with younger children.
- Use math talk as you describe what children see and do. For example:
 - "You put the big lid on the big pot and the small lid on the small pot."
 - "You always smile when your mom sings to you!"
 - "Let's put the dolls in the basket and the balls in the box."

Engaging Families

As you become more aware of and intentional about supporting early math learning throughout the day, share your knowledge with families and ask them what examples of math they see happening at home. Help them identify the many ways they already use math with their children. Work with them to find safe toys and other objects their infants and toddlers can use for math play (kitchens and dressers are often great places to find these things!) and opportunities during daily routines to use math talk with their children. For example, diapering, meal and bath times, walks around the neighborhood, and shopping trips are ideal times to count, point out shapes and sizes, talk about patterns, and describe how things are the same and different. Encourage families to use their home language. When families speak in their home language, they strengthen their relationship with their children and are more likely to have meaningful conversations using rich, descriptive words.

Conclusion

Math is everywhere! There are lots of opportunities during the day for infants and toddlers to discover math concepts through play and exploration and to hear new math words. How many ways are you already using math in your interactions with the infants and toddlers in your care? How might you build on those experiences to intentionally offer more math in your time with them and their families? The more you engage infants and toddlers in math play and math talk and share your enjoyment of the experience, the better chance they have to develop the early math foundations that are so important for later math learning and learning in general!

*This News You Can Use is adapted from the following article:

Jan Greenberg, "More, All Gone, Empty, Full: Math Talk Every Day in Every Way," in *Young Children* (Washington, DC: National Association for the Education of Young Children, May 2012), 62–64.

Natalie Angier, "Insights From the Youngest Minds," *New York Times*, (2012, April 30), retrieved June 4, 2012, from <http://www.nytimes.com/2012/05/01/science/insights-in-human-knowledge-from-the-minds-of-babies.html?pagewanted=all> ; Johns Hopkins University, "You Can Count On This: Math Ability Is Inborn, New Research Suggests," *ScienceDaily*, (2011, August 8), retrieved June 4, 2012, from <http://www.sciencedaily.com/releases/2011/08/110808152428.htm> .
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Children: What It Is and How to Promote It," Social Policy Report 22:1 (2008), 3–23, https://srcd.org/sites/default/files/documents/22-1_early_childhood_math.pdf.

Jan Greenberg and Toni S. Bickart, *Math Right from the Start: What Parents Can Do in the First Five Years* (Washington, DC: Teaching Strategies, 2008).

Jan Greenberg and Toni S. Bickart, *Math Right from the Start; Launching Into Literacy and Math: Nurturing Mathematical Thinking Skills (birth-3)*, accessed June 4, 2012, from http://oldweb.madison.k12.wi.us/tnl/lilm/early_math/infants&toddlers/math_thinking_skills.html; Virginia's Early Childhood Development Alignment Project, Milestones of Child Development.

Study Guide

SUMMARY:

This News You Can Use (NYCU) describes five components of math and provides suggestions for how to support early math learning for infants and toddlers.

Key Messages:

- Even without adult support, infants and toddlers naturally use math concepts to make sense of their world.
- Adults use math concepts and math language in their own lives all the time, but may not realize it.
- Math for infants and toddlers involves five components: numbers and operations; shapes and spatial relationships (geometry); measurement; patterns, relationships, and change (building blocks of algebra); and collecting and organizing information (data collection and analysis).
- Being aware of early math concepts can help you be intentional in creating environments that support early math learning and in using "math talk" with infants and toddlers.

Think:

- Math is considered part of the cognition and general knowledge domain. What are some ways that early math learning relates to the other domains—social and emotional development, approaches toward learning, language and literacy, and physical development and health?

Reflect:

- Reflect back on your math experiences in school. How might those experiences affect how you support early math learning for infants and toddlers?
- Looking at your own activities, think about the ways you use math concepts and math language in your own daily life.

Discuss:

- Discuss how early math learning might help infants and toddlers get ready for preschool and beyond.
- Share examples from your observations of how the infants and toddlers you work with use math concepts or math talk.

Next Steps:

- Make a list of math talk words and phrases. Post a selection on the walls to help you notice math

talk opportunities. If you go on home visits, bring the list with you to share with families to help them notice opportunities, too.

- Watch the webinar Supporting the Intuitive Understanding of Early Math in Infants and Toddlers, from the 17th Annual Virtual Birth to Three Institute. Listen for one or more new ideas to try or to share with a coworker or family.

Topic: [School Readiness](#)

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