

Math Is Everywhere: Supporting Math Skills in Infants and Toddlers: Baby Talks Webinar Series

Sarah Lytle: Hello, everyone, and thank you for attending today's webinar, Math is Everywhere: Supporting Math Skills in Infants and Toddlers, as part of the Baby Talks webinar series.

Baby Talks is a series of webinars for teachers, providers, and home visitors working with infants and toddlers, serving Early Head Start, Head Start, and child care programs. These webinars will introduce you to some of the research behind the Head Start Early Learning Outcomes Framework, the ELOF.

My name is Sarah Lytle, and I'll be helping to facilitate today's session, along with my colleague, Beth Zack. We're from the National Center on Early Childhood Development, Teaching, and Learning and are based at the University of Washington's Institute for Learning & Brain Sciences, or I-LABS. I-LABS is a partner organization in the NCECDTL consortium and is one of the leading infant research centers in the country.

Before we begin, I'd like to go over a few housekeeping items, as we'll be using some of the ON24 features during our webinar. At the bottom of the screen, you will see multiple widget applications that you can use. I want to go over the different widgets that are available. I've been talking through each one. We invite you to open the specified widget to see what it looks like on your screen. Remember, you can click on the icon to have it appear or minimized. Throughout the session, we'll be using the blue group chat widget to engage with each other. It's probably not open on your screen.

We invite you to find the blue group chat widget located on the right side of the bar, open it, and introduce yourselves. I see a lot of you have already started doing that, which is great. A copy of today's slide deck—and additional resources—are available in the green resource list, which is the green widget. We encourage you to download any resources or links that you may find useful. If you have any questions during the webcast, you can submit them through the purple Q&A widget. We will try to answer these during the webcast. This is where all technical questions and concerns should be entered.

You can also find additional answers to some common technical issues located in the yellow help widget at the bottom of your screen. You can find the closed-captioning widgets in both English and Spanish. Each of these widgets is resizable and movable for a customized experience. Simply click on the widget, move it by dragging and dropping, and resize using the arrows at the top corners.

For the best viewing experience, we recommend using a wired internet connection, and closing any programs or browser sessions running in the background that could cause issues. Webinars are bandwidth-intensive, so closing any unnecessary browser tabs will help conserve your bandwidth. The webcast is being streamed through your computer. There's no dial-in number. For the best audio quality, please make sure your computer speakers or headset are turned on and the volume is up so you can hear the presenters. Some networks cause slides to advance

more slowly than others, so logging off your VPN is recommended. If your slides are behind, pushing F5 on your keyboard will refresh the page.

An on-demand version of the webcast will be available 24 hours after the webinar and can be accessed using a link that will be sent by email. Please keep in mind that this webinar is also being transcribed, and the transcription will be posted to the ECLKC. Finally, if you have any trouble refreshing, please try refreshing your browser by pressing F5, and be sure to log off your VPN and exit out of any other browsers. So, those are our housekeeping items today. And thank you all for introducing yourselves in the group chat. And thank you for joining us today. And I'm going to turn it over now to our presenter, Beth Zack.

Beth Zack: Hi, everyone. I'm so excited to talk to you today about Supporting Math Skills in Infants and Toddlers. But first, I'd like to start by talking about you and your relationship with math. Did you like math as a child? If you didn't, why do you think that was the case? And how do you feel about math now? There's no need to share out, but just take a moment to think about your own feelings about math. I'm sure many of us have either heard or said ourselves that, "I'm bad at math," or, "I don't like math," at some point in our lives. If you're one of those people who thinks that, "Math is not for me," I'm hoping to change the way you think about math in your daily life. I think once you see all of the things that you do every day that it involves math, it's easier to think about how to incorporate math across a child's day, whether that's in the classroom, on a home visit, or encouraging parents to include in the home. Now, take a moment to think about your day so far. Have you used any math? Please share what math you have used today in the chat box. Again, I'd love for you to share any way you think you've used math today in the group chat box.

Sarah: I see some responses. People counting blocks, paying for lunch, building blocks with children.

Beth: Working on budget.

Sarah: Budget.

[Both laughing]

Beth: Measuring, some for lunch.

Sarah: Yeah, a tip for lunch. Time and attendance. Counting the team.

Beth: Planting, bills.

Sarah: As you can see, the group chat is just flying by.

Beth: So clearly, everyone has used math in some way today. And there's lots of great examples here, from stuff that they've done with children to stuff that they've done on their own. Infants and toddlers are learning about math just as often as they play, they eat, they have their diaper changed, and join you in activities and routines. Math is everywhere, whether you're an adult, preschooler, toddler, or infant.

So, at the end of this webinar today, you should be able to identify ways infants' and toddlers' play in routines build informal foundations for math, to describe how math is integral to learning in all domains of the ELOF, and design activities and strategies for scaffolding and

supporting early math skills in what children already do every day. So, here's what we're doing today. We'll discuss why it's important to foster math skills, beginning in infancy. I'll describe math skills and concepts children learn as infants and toddlers and how they support school readiness across the ELOF domains. We'll share activities and strategies for scaffolding and supporting children as they build math skills.

I'll provide an overview of four key effective practices for supporting early math learning, and we'll end with some closing thoughts and some resources and support. So, what do we mean when we say "math?" And what does math look like for infants and toddlers? Math is number and operations—counting, sorting, measuring, using patterns, understanding geometry—it's making comparisons, and spatial sense. It's also one of the subjects that make up the acronym STEAM.

STEAM stands for "science, technology, engineering, arts, and math." But STEAM is more than a subject or a collection of facts. It's really a way of thinking that involves observing, questioning, testing ideas, and creating. I mentioned STEAM because I want to emphasize math connection to all of the STEAM subtopics. Not only can you do math when you do science, technology, engineering, and art, but to do science, technology, and engineering, you need to do math. Taking you through these images, for example. Math can be found in each one. Science is using inquiry skills—such as observing, asking questions, exploring, making predictions—to understand how the world works. And gardening, as shown in this picture, uses all those things. Scientists use math to talk about what they observe and predict. And you can include other math skills, too. This is all involved in childhood good practice one-to-one correspondence skills, like touching or pointing to each carrot as they count them. Or the adult could ask the little boy to compare the size of the carrot. Technology.

Technology doesn't exist without math concepts, like number, geometry, and spatial relationships. Technology is any man-made tool. Imagine this little girl might be using the binoculars to go on a shape hunt around the classroom, using them to spot circles, squares, and triangles. And you could create your own binoculars out of toilet paper rolls or paper towel rolls to add engineering and art, too. Engineering is building and creating, which requires an understanding of geometry and function. As you'll see later in the webinar, block play is also full of opportunities for building math skills, like shape, size, spatial concepts, such as on and off, and pattern. In our photo, the infants are investigating shape and size as they explore these new objects.

They're also beginning to explore patterns as they shake their maracas. We'll explore these math concepts further throughout the webinar, but I hope this gives you a glimpse into how integrated math is across subjects and learning domains. Math truly is everywhere. Think back to the examples everyone shared in a chat box at the start and all the different ways you've already used math today, from doing your budget to working with blocks to maybe parking your car when maybe you went on a home visit.

So, when you park your car, you use spatial concepts, you think about distance and position. Math concepts and math language are part of so much of what you do, often without you even realizing it. The same is true for your interactions with infants and toddlers. The opportunities for infants and toddlers to discover math concepts are endless, from exploring all the different

shapes and sizes to making music to carrying out their bedtime routine. Infants and toddlers are building foundations for math as they play and go about their day, at home, in the classroom, or out and about. Infants and toddlers naturally explore concepts—like measurement, pattern, shape, and size—all on their own. But it is the teachers, parents, and other adults who make children's play mathematical through the language and reflection they provide.

Math language helps children see the math in action and makes the concepts more concrete as they explore. For example, in this image, a home visitor is using spatial language and comparing size when she says, "You put the smaller ball inside the bigger ball." This not only builds a child's math skills but hearing new words supports their language development, as well. What are some ways that you are already using math concepts for the infants and toddlers you support? Please take a moment and share your thoughts in the chat box. Again, the question is, what are some ways that you are already exploring math concepts with the infants and toddlers you support?

Sarah: Alright, some answers are starting to come in. People are saying lots of spatial play and exploration, counting the steps as we go upstairs, identifying shapes of toys, nesting trucks, different-size balls.

Beth: Yeah.

Sarah: Spatial play.

Beth: Counting toes when changing the diaper. Love that one.

Sarah: Mm-hmm.

Beth: Towers, finger play. So, lots of great examples. Please continue to share. Shape identification and problem-solving. Thank you everyone, for sharing these.

Sarah: Pouring water, too—always a good one.

Beth: Fantastic. So, as we begin to explore the math concepts that infants and toddlers are learning in more detail, I'd like for you to be thinking about other ways you could intentionally use math with the children in your care or ways you can encourage parents to use math for children at home. We talked about earlier, you are another teacher. A parent you work with may not feel comfortable with math. You might not think you're good at math or maybe that infants and toddlers can't do math. And some parents may worry that they don't have the skills to include math at home. So, the ultimate goal is to create environments that support early math learning in all children so that they are ready for school.

For infants and toddlers, math-related play can be as simple as playing with blocks or in water, racing cars, and clapping to music—things that you all have mentioned. To some people, these things may not seem like math, but they really are. These are foundational skills that are essential to children's school readiness and later learning. Children need to have these early experiences with math in order to engage in more complex math when they are older. These early math skills prepare children to become logical thinkers who can connect ideas, ask questions, and analyze information to better understand the world around them. Infants and toddlers need time and space to play in open-ended ways, with lots of different types of material, to boost these emergent math skills. And research shows, this is a really big part of

what children naturally do during play. Importantly, researchers have found that early math skills are the best predictor of later success in school.

Children's math skills in pre-school predict how they will score in third-grade reading and math. On the other hand, children's early literacy skills in preschool only predicts their third-grade reading scores. So, why might math be the best predictor of later math and literacy skills? One thought is that it's because math is integrated across the learning domain.

So, the next section will look at math skills that are part of the Early Learning Outcomes Framework, or ELOF. So, I want to spend some time going through the developmental domain outlined in the ELOF. Math skills begin to develop early, as you'll see as we work our way through the developmental progression. The domains are broad areas of early learning and development, from birth to 5 years, that are essential for school readiness and long-term success. The five central domains for infants and toddlers are: perceptual, motor, and physical development; social and emotional development; language and communication; cognition; and approaches to learning. We'll talk about the math skills, behaviors, and concepts infants and toddlers demonstrate as they progress towards specific developmental goals. We'll primarily focus on the infant/toddler domain, and in particular, cognition. But I wanted to mention, there's an additional suite of domains that focus on preschool-age children.

Cognition is broken into two subdomains for preschoolers: mathematics development and scientific reasoning. Some early math concepts, like measurements and patterns, are only included as subdomains for preschoolers, but there are related skills and concepts that you can support in infants and toddlers, as well. Please keep in mind that all children will show these behaviors and skills at their own pace. These are meant to give you a general idea of when to expect behaviors. You can find the ELOF and supporting material on the Early Childhood Learning and Knowledge Center, or ECLKC website. I've included these links at the end of the presentation under Resources and Support. You can also access these resources now using the resource pod of this webinar platform.

The full presentation is available to download. so you will have access to these links after the webinar. I will also share some specific examples of activities that can be used to support school-readiness goals across the domain of the ELOF for infants and toddlers. As I do so, we'd like you to continue to think about how you already support children's math development in the activities and routines you do throughout the day. At the end of this section, we'll have some time to share and learn from one another. So, as I mentioned, we're going to primarily focus on the infant/toddler domain of cognition. It includes a subdomain, emergent mathematical thinking. However, math is integrated across all the central learning domains. So, I'll describe examples for each of those, as well.

As we go through each goal, keep in mind that children's cognitive development is supported in the context of their culture and that a child's family, teachers, peers, and community all play an important role in supporting children's developing math skills. So, let's dive right in and talk about the goals for infants' and toddlers' emergent mathematical thinking and what the progression looks like as we develop these skills. The first goal for emergent mathematical thinking is child develops a sense of number and quantity. The first age group in the progression

is birth to 9 months. During this time, babies attend to quantity and play with objects, such as reaching or looking for more than one object.

And when an infant picks up one object, then uses her hands to pick up a second object, she's actually learning about number. During the first year, children are also sensitive to number, and able to see the difference between small and large groups of objects. But how do we know infants are paying attention to quantity and beginning to learn math concepts at such a young age? Let's take a look at one seminal research study, out of many that have been conducted, that helps us better understand what infants understand about addition and subtraction. In this study, 5-month-old babies sat on their caregiver's lap, in front of a little stage, as you can see in the picture here.

They watched a sort of magic show as a researcher, who was out of the infant's sight, reached her hand through a hole in the side of the stage and placed an object on it. Next, infants watched as a screen came up to cover the object. While the screen was up, the researcher reached her hand in again and placed another object on the screen. The infants then watched the hands leave the stage empty without the object. Infants then either saw a possible or impossible outcome. For the possible outcome, when the screen dropped, there were two objects on the stage. But for the impossible outcome, there was only one object on the stage. The researcher measured infants' looking time to the possible and impossible outcomes. They found that 5 month olds look longer at the impossible outcome.

And we know, from a large body of research, that infants look longer when they see something unexpected, like the impossible outcome. So, this suggests that infants were expecting there to be two objects on the stage, so they looked longer when there was only one object. Some infants saw the same procedure, only objects were removed from the stage, rather than added, to see what they understand about subtraction. The results were the same. Infants looked longer at the impossible outcome. This study shows that infants as young as 5 months old have a basic understanding of math. So now, let's move on to the next age group in progression, 8 to 18 months. In this age range, you can expect to see infants use basic words or signs to refer to a change in the amount of objects, such as asking for more or signing "all done" when their plate is empty. Some children learn their first number words by 18 months.

They usually learn the word "two" first, and they can recognize very small numbers without counting. Between 16 and 36 months, toddlers use language to refer to quantity, such as using signs or number words to identify small amounts. Or they might talk about quantity, such as big, little, too much, or a lot.

And by 36 months, many children will be able to count small numbers, to at least two or three. What does it mean to count? Parents and teachers have many ideas about what it means. But it's more than the ability to simply say numbers in order. It's also showing one-to-one correspondence, which is counting each object in a group of objects, by identifying each object as you say the number word. By 36 months, children can look at a small group of items and identify more or less, without needing to count, and they can use their fingers to show how old they are. Now let's look at an example of a teacher encouraging toddlers' early understanding of number during free play.

[Video clip begins]

Teacher: You want to cut this in half and see how many pieces we have? You want to use a knife? You want me to show you? You going to take that apart?

[Speaking indistinctly]

Here, you want to cut it with a knife? You want to try this knife and cut it in half? Move over there and see ...

[Speaking indistinctly]

Alright, did you cut it in half? This one. And we'll cut it in half. We have one piece. And we cut it, and now it's two. Say, "One, two."

Girl: Say, "One."

Teacher: One, two pieces. You want to cut another one? Look at this shape. It's a pear. You want to cut it? Try it. Say, "It's one big pear," and now let's cut it in half. Now you have ... Whoa! How many pieces do we have now? One, two. Do you want to put them back together? Are you going to get a strawberry? OK, this one is big. And this is smaller. [Video Ends]

Beth: So, I've been talking for a while. So, I'd love to hear from you again. What math skills and concepts was the teacher supporting in this video? Please share your thoughts in the chat box.

Sarah: Somebody says, "Two halves make a whole."

Beth: That's early geometry.

Sarah: And shapes, counting, number building, classifying, quantifying, size comparison.

Beth: I saw one-to-one correspondence in there, as well.

Sarah: Mm-hmm. Fractions. Lots of fractions.

Beth: Mm-hmm.

Sarah: Big and small. Part-and-whole relationships.

Beth: Yes. Fantastic. I think, number recognition. I think you guys have got them all. Thank you for sharing. So, this is just one example of a teacher supporting a child's early math skills through her language and actions. You can check out more video examples for each of the ages in the developmental progression under Learning Trajectories on the ECLKC, as well as the learningtrajectories.org free web-based tool. The Learning Trajectories tool includes additional resources about how children, from birth through third grade, think and learn about math. It's also filled with resources on how to create environments and activities to support early math learning.

These links are also under Resources and Support. So, infants and toddlers aren't exactly multiplying or dividing yet, but they are building foundational mathematical skills. One of the important prerequisites is spatial awareness—just understanding objects and the shape, size, position, direction, and movement of objects. Spatial awareness is a natural part of your day. You use it when you use a map to locate a restaurant or pick the appropriate-size container to pour something into, or parallel-park your car.

Children use spatial awareness throughout the day, too. Let's take a closer look at the goal "Child uses spatial awareness to understand objects in their movement in space." In the emergent mathematical thinking subdomain, from birth to 9 months, infants are already building spatial skills as they explore or examine objects and watch them as they move. By 1 year of age, infants are able to track both distance and direction of objects. You can help infants and toddlers develop a sense of their body and space through the materials you use and games you play. Songs like, "Open, Shut Them," and "Pat-a-Cake" encourage spatial awareness. In this image, you see a young toddler crawling through a tunnel. This is a perfect opportunity to introduce spatial language. You could say, "You are inside the tunnel," or, "You crawled through the tunnel."

Another great time to include spatial language is during free play or daily routines. You might say, "You put the carrots on your plate," or, "The broom is behind the door." Use "not" talk to highlight spatial relationships throughout the day. Between 8 and 18 months, you'll notice infants and toddlers begin to explore how things fit together or with other things, and how objects move through space, such as rolling a ball or a car down a ramp. In the photo on the left, the toddler is exploring the spatial relationships of "in" and "out" as she nests cups. In the photo from a home visit, on the right, this toddler is learning about shape, size, and how the shaped blocks need to be in the correct orientation to fit into the sorter. Next, we'll watch a video of a teacher explaining how she created an environment using open-ended material to support toddlers' developing spatial skills. [Video begins]

Teacher No. 2: We decided to go with more of a loose-parts philosophy, as far as toys are concerned. Each classroom is geared to what the children are engaged in. And I watched the children for a while, and then I just decided to incorporate what their interests were into the rest of the classroom. Did you see this? I put out a Keurig carousel that would normally hold the Keurig cups as more of an inserting tool. Last week, we were all about inserting, so now it's "in and out." Now that they have the ability to remove the object, it's not just inserting, so we've moved to that next step. I did the Keurig carousel in a variety of different size curlers.

Boy: Look at this.

Teacher No. 2: What are you going to do with the curlers? I want them to problem-solve. I want them to figure out, "This doesn't fit? Well, what can fit?" Yesterday, in fact, I took a picture with my iPad, because we do document everything for our Journeys of Discovery, and they had put—one child had put a paint-stir stick in their Keurig carousel while another one was putting the curler, while another one was putting one of those plastic tubes. And they were all working together with all different objects. It was my validation that, "Yes, they are into this. This is engaging. I need to continue this." Using your fingers to put that in. In. I put out a wooden—I don't know what it was. It just has holes in it. I don't know what it's for. I think it may be for markers, but I'm using it as an inserting tool. And the curler, some of them fit in the wooden holder. Some of them fit in the Keurig carousel. So, any object in that room can be inserted into something from a different area. So that way, they know they can carry it over here. "I can insert it into the transparent jugs on the light table." Everything can be inserted and taken out.

Boy: [Speaking indistinctly]

Teacher No. 2: Yes. I put it in there. And I have a red tube.

[Video ends]

Beth: Learning math, she does a beautiful job of letting children explore the objects on their own, while also intentionally using math language, like when she said, "Are you using your fingers to put that in?" as the little boy puts the curler inside the cup-holder carousel. It might have been hard to hear on the video, because of the voice over, but while the children play with the wooden inserting tool, the teacher tries a curler that doesn't fit and says, "Too big," which introduces the math concept of size and also comparisons as they try different-size objects in the holes.

Giving children time and space to play in these open-ended ways with varied material supports their emerging math skills, such as spatial awareness. Having an engaging but not overwhelming environment with interesting and open-ended materials available to young children is really important for supporting their school-readiness skills. When working with children with a disability or suspected delay, provide extra physical or verbal support as they explore with their bodies. S

upport can mean holding materials steady, moving your bodies or objects closer together, or providing verbal spatial cues, such as, "Move the clothespin down lower to find the peg hole." So, from 16 to 36 months, children can predict how things will move through space or fit objects based on size, such as putting smaller objects in a small box and larger objects in a large box. By the time they are 3, children can do sophisticated puzzles with interlocking pieces that vary in color and shape. They have some understanding of size and weight when picking up or moving objects.

One type of play not specifically mentioned in the ELOF, though it's so important for building math skills, like spatial awareness, is playing with blocks. Infants' early play with blocks involves exploring the shape and size with their hands and mouth. They are learning about the properties of shapes, like, "This cube has straight lines and corners, but a circle-shaped block is round with smooth edges." As their motor skills develop, they will experiment with banging blocks together or sliding them on the floor.

Around 1 year of age, children begin to stack blocks, just one on top of the other to begin with, then line them up to create roads or tracks. For younger children or children with disabilities or suspected delays, you could put Velcro on the blocks to help them successfully stack them. By 2 to 3 years, toddlers are creating more complex structures, such as taller towers or the walls of a house. This is a perfect opportunity to use math talks to discuss spatial relationships. You might say, "You put the green block on top of the purple block." Block play engages children in other math skills too, such as counting—like, say just, "I have one, two, three blocks"—or exploring patterns as children use color or shape to line up or stack blocks.

So, they might make comparisons, such as saying, "Your tower is small, but my tower is big." Puzzles are another great way for children to build an understanding of shapes and spatial relationships. Children need to turn, flip, and rotate pieces to find the right fit when they engage in puzzle play. And research studies show that we can see benefit from early spatial play years later. In one study, researchers observed children's puzzle play in children's homes when

they're between 2 and 4 years of age. Then, when children were 4 and a 1/2 years old, the researchers visited them again to play a spatial game. For the game, children saw images of shapes split in two, like in the photo on the top right. They had to choose which shape the two pieces would make when put together, as shown in the photo on the bottom right. Children who played with puzzles more often when they were younger were more likely to perform better at this game.

And other researchers have found the same relationship between early puzzle play and later spatial skills. So, encourage play with puzzles. As these findings suggest, it may support children's future math skills. It also shows that spatial skills can be improved with practice, which really bodes well for all of us.

So, the last goal of emergent mathematical thinking is related to matching and sorting. It states, "Child uses matching and sorting of objects or people to understand similar and different characteristics. When children pair two objects, based on their color, shape, or size, they are matching. Sorting occurs when children separate multiple objects into groups according to their similarity. Children learn to identify new objects and learn their names based on shape more than any other characteristic. When children match and sort objects, they are learning about the relationships between things and characteristics of objects or people.

Children also learn how to apply rules to successive objects. For example, when sorting laundry at home, the rule might be that dark colors go in this pile, and light colors go in a different pile. From birth to 9 months, children learn about similarities and differences between objects by mouthing or shaking a toy. In this photo, the teacher offers this baby a ball as he explores its bumpy texture with his mouth. From 8 to 18 months, children start matching shapes with similar characteristics, with the help of an adult, but they also start to spontaneously match objects while playing. This might be putting shapes in a shape-sorting box, matching pieces to their shape on a puzzle board, or even putting a toy bottle with a baby doll, as shown in the image from a home visit on the bottom left. This toddler is not only learning about matching but she's also engaging in pretend play, which supports your social-emotional development. And she's practicing her fine motor skills, which supports her physical development.

It's important to adapt materials and experiences to meet the developmental level and needs of each child. In the second photo the child is provided—the teacher provided a puzzle with large pieces and tall handles that are easier for this child to grasp, so she can also engage in puzzle play. Between 16 and 36 months, children begin to sort objects into groups based on a single characteristic, such as separating different color squares and circles into separate tiles based on shape. Then, they might do it again based on color or size. By the time they are 3, most children will identify characteristics of people and how they are like them such as, "My dad has curly hair just like me."

Through matching and sorting, children are learning skills that will prepare them for understanding more complex rules and systems, which are an essential part of math in school. Like most math concepts and skills, the best way to learn about matching and sorting is when they're a part of children's everyday world. So, we'd love to know, what are some ways you can or already do encourage sorting and matching using everyday objects, either in the classroom or at home? Please share your ideas in the chat box. Again, what are some ways you can or

already do encourage sorting and matching using everyday objects, either in the classroom or at home?

Sarah: A couple of people have already identified sorting socks as one way to do that, matching shoes and mittens, thinking about different colors or shapes of objects. Ooh, egg cartons are great for sorting. I love it.

Beth: Shoes, socks, silverware.

Sarah: Somebody says, unloading the dishwasher. Similar to the silverware answer. Oh, Kimberly said, "In the classroom, we sort animals by color and the same characteristics." I like that.

Beth: Nice. Just types of toys, like cars in one container, books in another. A lot of great ideas.

Sarah: Keeping cupcake tins, sort of like the egg-carton idea.

Beth: Oh.

Sarah: Oh, in the classroom, kids themselves can sort by height.

Beth: Yep, I saw that one, too.

Sarah: Unique. I like that.

Beth: Fantastic, everyone. Thank you so much for sharing. Lots of great ideas, hopefully, for other people to take away, as well. So next, we'll watch a video example, from a home visit, of a great matching activity that you can do anywhere. In this video, a home visitor takes a square from a shape puzzle and encourages a little girl to find other objects shaped like a square in their home. The video is in Spanish, but you don't need to understand Spanish to see what a great activity this is to do at home, in the classroom, or when you're out and about.

[Video begins]

Visitor: [Speaking Spanish]

Mother: Sí?

Visitor: Sí?

Mother: [Speaking Spanish]

Visitor: [Speaking Spanish]

Mother: [Speaking Spanish]

Visitor: [Speaking Spanish]

Mother: [Speaking Spanish]

Visitor: [Speaking Spanish]

Mother: [Speaking Spanish]

Visitor: [Speaking Spanish]

Mother: [Speaking Spanish]

Visitor: [Speaking Spanish]
Mother: [Speaking Spanish]
Visitor: [Speaking Spanish]
Mother: [Speaking Spanish]
Visitor: [Speaking Spanish]
Mother: [Speaking Spanish]
Visitor: [Speaking Spanish]
Mother: [Speaking Spanish]
Visitor: [Speaking Spanish]
Mother: [Chuckles]
Visitor: [Speaking Spanish]
Mother: [Speaking Spanish]
Visitor: [Speaking Spanish]
Mother: [Speaking Spanish]
Visitor: [Speaking Spanish]
Mother: [Speaking Spanish]
Visitor: [Speaking Spanish]
Mother: [Speaking Spanish]
Visitor: [Speaking Spanish]
[Video ends]

Beth: So, planning a shape scavenger hunt is a great way to help toddlers learn the names and properties of shapes, which are important for school readiness. Let's look at some more math skills that are important for children to learn before kindergarten. As I mentioned earlier, measurement is actually found in a preschool subdomain, cognition, in the ELOF. Measurement includes determining attributes such as size, length, volume, weight, time, and distance. I included Goal 8 on the slide "Child measures objects by their various attributes, using standard and nonstandard measurements.

Uses differences in attributes to make comparisons." As an example, imagine an adult asked each of these preschoolers in the photos, "How big is it?" Both of these children are measuring dolls. The little girl chose traditional measuring tape, but the little boy chose building blocks. He might have wondered, "How many blocks will it take to reach the height of the doll?" Even though measurement is found in the preschool domain of cognition, it's important to talk about measurement as it relates to infants and toddlers, too. Adults can help children explore measurement concepts from the time they are infants. So, how exactly are infants and toddlers measuring?

This toddler isn't using measuring tape in the same way as the preschoolers on the previous slide. But she's still learning by exploring how it works and maybe even noticing the numbers on the tape. Filling and emptying containers of water, sand, or dirt teach infants and toddlers

about weight and volume. You can give young children different-size cups or balls or soft toys to learn about size. A child might think, "Hmm, this ball fits in my mouth, but this one doesn't. I wonder why." As toddlers nest and stack cups, they learn about size and how things fit together. A predictable schedule and routine helps children learn about the concept of time. "After I take a bath, I get milk, while Mom or Dad read me stories." Teachers, home visitors, and parents play an important role in teaching their children about measurement through the language they use. And teachers don't need to plan lessons to teach measurement concepts such as weight.

You can simply add math talk to children's play. While toddlers are exploring outside, you might say, "That leaf you're holding is light, but this rock is heavy." And home visitors should encourage parents to do the same at home. For children who are dual-language learners, introduce important concepts in English and their home language. I wanted to highlight one other math concept found in the preschool cognition domain of the ELOF. It's goal ... Preschool math seven, "Children understand simple patterns," found under the subdomain Operations and Algebraic Thinking.

This photo shows a preschooler completing a pattern she made with blocks, alternating black-and-white polka-dot blocks with ones with green stripes. Her teacher is showing her possible options to continue the A-B-A-B pattern. Using and understanding patterns is a foundational skill for infants and toddlers, too. So, let's look at some examples. Patterns aren't only visual, like stripes or on blocks or on a shirt. They can also represent regular, predictable happenings, like the changing of the seasons or even that nap time always happens after lunch. Being able to recognize patterns helps us to better understand and organize our life experiences. Daily routines are especially important for teaching infants and toddlers about patterns.

In these photos, this little girl is learning that we always wash our hands before we eat a snack or lunch. Providing visual cues at each step in a hand-washing sequence can be helpful to all children, but especially children with a disability or suspected delay. By using visual cues, children can follow along as we complete each step in the sequence. Teachers and home visitors can provide printouts of the visual cues for parents, and encourage them to use them at home, too. Visual cues are helpful for children who are dual-language learners, as well. You could provide the key vocabulary for each step in their home language so they can see the words in action.

Consistent routines are especially helpful for children who are dual-language learners learn what to expect throughout the day. These images are available for download on the ECLKC. And I provided the link to the classroom visuals and support in the Resource List. The arts, particularly music, can also help infants and toddlers use and understand patterns. You can gently bounce an infant in your arms to music or have toddlers stomp their feet to a steady beat. Music, with its regular rhythms and beats, is a wonderful medium to use to help children build this skill. In fact, one study found that infants who participated in 12 musical play sessions were better at detecting changes in not only musical patterns but also language patterns, compared to children who participated in non-musical play sessions.

During these musical play sessions, children listened and moved to music with a regular, predictable beat. Music has rhythm, and so does language. Helping infants understand the

rhythm of music by listening and moving together may help infants build skills in recognizing patterns. Learning about patterns is not only important for developing math skills, but also for language development, problem-solving, and more. Learning doesn't happen in isolation. All of the areas of development in the ELOF are integrated, and children learn many concepts and skills at the same time.

Let's take a quick look at how math skills are connected to the other central domains of the ELOF for infants and toddlers. We'll look at one example for each one. For approaches to learning from the subdomain Initiative and Curiosity, let's look at the goal, "Child demonstrates emerging initiative in interactions, experiences, and explorations." From 16 to 36 months, toddlers begin to get ready for the next activity without being directed to. This is also an important part of learning pattern during daily routines. In Social and Emotional, the subdomain Sense of Identity and Belonging, Goal 12 states, "Child shows confidence in own abilities through relationships with others."

When infants and toddlers feel emotionally and physically safe, they are more confident to explore their world and practice math skills, from trying different puzzle pieces to climbing the steps to going down a slide. For Language and Literacy, from the subdomain Vocabulary, the child understands an increasing number of words, using communication with others. As we've already talked about today, you and the families you work with have an important role in teaching math skills, by including math talks throughout a child's day. This supports not only their knowledge of math concepts but also their language development.

And from Perceptual, Motor, and Physical development, from the subdomain Gross Motor, the child uses sensory information and body awareness to understand how their body relates to the environment. As children build growth in fine motor skills, they're also developing spatial awareness, such as, "I fit through this hole in the tunnel, but not in a door for a dollhouse." So, before we move on to the final section, I'd like to invite you to apply what you've learned so far: the idea that math is all around. Take this picture, for instance. Imagine an infant or toddlers is playing in this space. How can you use what's in this room to support math learning? And what specific skills would that activity support? For example, you might say that a teacher can use spatial language to introduce the concepts of inside/outside. "We're inside the classroom right now, but we'll go outside by those trees," pointing out the window, "after snacks." So, take a moment and share some ideas in the chat box. Again, I'd love to know, how can you use what's in this room to support math learning? And what specific skills would that activity support?

Sarah: So, Andrea says that they can learn order by using a visual daily schedule and doing pictures or following pictures to figure out activities. Bianca says, or suggests, counting the stack rings. I see other people talking about the ladder and the slide, going up and down the slide.

Beth: Mm-hmm.

Sarah: Maybe looking for patterns in the artwork that's hanging on the wall. I like that one.

Beth: More stacking. Yeah, patterns on the square mat. Lots of great ideas here. So, I'm just going to add some labels all over, just as some examples. I'm sure there's even many more of this. Some have already pointed out, like, for example, looking for patterns in the artwork. So

really, the point here is that you can find math everywhere. And a home visitor can do this activity with families at home to help them think of ways to add more math into their child's day. So, for the rest of our time together, I wanted to talk about some effective practices for helping infants and toddlers build math skills to support school readiness. These four elements are a great place to start in guiding your thinking. Creating supportive, responsive learning environments, using language that is intentional and meaningful, encouraging family engagement, and incorporating math into everyday experiences. We'll take a look at each one of these elements individually, though you'll notice there is overlap between them. Learning happens in the context of relationships. Nurturing responsive and consistent care helps create safe and supportive environments, where children feel secured and valued. In these settings, children feel comfortable to engage fully in learning experiences. Responsive interactions are essential to all children's learning.

Responsive learning environments are important for all children, but they can be especially important in helping children who are dual-language learners or children with disabilities or suspected delays thrive. One way to do this is to provide children with a disability or suspected delay more time and opportunities to practice math skills during activities. It can also mean adapting materials to make them bigger, brighter, easier to grasp, and so on, to meet their needs. To support dual-language learners, provide visual cues around the classroom for math concepts and activities, when possible, including key terms in the language of the classroom and their home language, like in this example of a daily schedule. So, I've read many examples of how to use language to build infants' and toddlers' math skills, but it's really such an important part of understanding math.

But I just want to elaborate a little bit more. When you add math language to children's everyday activities and routines, it helps build their math knowledge and vocabulary. And it turns out, the more math language children hear daily, the greater the growth of their math knowledge. Adults can increase the amount of math talk by bringing up math concepts during activities children are already doing. And the activities don't need to be math-specific. For example, in this image from a home visit, the mother is practicing adding spatial words while walking outside to get mail with her toddler.

One of the most important things you can do, as a teacher, home visitor, or parent is to be intentional about the math language you use and include throughout the day. And this applies not only to the words you provide verbally but also the language you include around your classroom. Being intentional also means considering a child's home language, their culture, and developmental level when you're talking about math concepts. Family engagement is an essential component of teaching children math skills, so they are ready for school. Research shows that children are more likely to have higher math scores when their parents include math activities at home.

The best way to do this is to encourage families to incorporate math in what they do every day. Some families may be resistant. As we talked about, they might not feel comfortable with math themselves, or they don't have the skills or think that their infants and toddlers can't do math. Or realize that there's so many ways they can actually encourage the development of math skills in just what they're doing throughout the day. So, how do we get families more involved?

If you're a teacher or home visitor, you have an important role in showing parents how to make the home a learning environment. To teach math skills, you need nothing more than to consider the routines and activities they already do and the materials they already have in and around their home. For families of children who are dual-language learners, encourage them to use their home language so they feel confident having more language-rich, meaningful conversations.

Teachers and home visitors can talk with families to find out ways they already see and support math happening in their home. Help them discover objects and toys in their house that their infants and toddlers can safely use for math-related play. I'll talk about these materials more in an upcoming slide. And of course, encourage families to think about opportunities for math in their daily routines. As we discussed, routines themselves help teach children about patterns. You may have heard the term "mathematize." It means to bring out the math in everyday activities and routines children are already a part of. It's so important for children to see math being used in their everyday world, whether that's in their home, at the grocery store, riding the bus, or in a classroom. In your work with infants and toddlers, you likely already include math in ways you don't even realize.

Have you ever sung a song with a repeating pattern or read a book that uses numbers, like, "Five little monkeys jumping on the bed?" Or maybe you asked a toddler to put forks in one basket and spoons in another. This is sorting. On a home visit, you might have encouraged a father to have his child help measure ingredients in the kitchen. There are countless opportunities to count, measure, sort, compare, problem-solved, and find patterns to support early math learning. Next, we'll look at a few examples of ways to support mastering mealtime, time outside, and book reading.

So, at mealtime, you can describe the shape and size of your child's food or tableware. Take these images of the tortilla, for example. If the tortilla was a circle, you can say, "See, the edges are round. We cut the tortilla, and now each piece is shaped like a triangle, which has three sides." You could talk about number. "We had one tortilla, but we cut it, and now we have eight pieces." The middle photo, you can talk about the shape of your plate and compare the size. "Your bowl is smaller than my plate." You can talk about matching or patterns. You could ask what shape the apple is, or invite a toddler to help scoop ingredients in the kitchen. Here are some ideas of how to add math to your time outdoors. While outside, use spatial language like, "The tree is near, but the slide is far." Or on a home visit, encourage a mother to use spatial language while pushing her son in a swing, talking about, "Pushing you up high, and now you're down low and back at high again."

Or go on a shape hunt, like we talked about, discovering squares and circles and triangles all around you. For younger children, you could point out different shapes and talk about their properties. Discover measurement by filling cups or buckets with sand, dirt, or leaves, or compare different weights and heights of materials you find outdoors. And books provide a great springboard for discussion and activities related to not only math but all the same subjects. You can include math concepts while looking at any children's book. Talk about the size or shape of objects. Compare and contrast, count, match, talk about numbers, look for spatial relationships, and so on. So, we've been talking about finding math in everyday

experiences, and one of the best ways to do this is using materials and objects that are already in your home or classroom. Open a kitchen drawer to find some cups, take clothes out of the dryer, or grab an empty tissue box to begin exploring math concepts.

So, what are some ways you can use these everyday objects? You could create your own water table with a bucket or Tupperware, some water, and cups of different sizes, to explore measurement. As we talked about, when doing laundry, find each sock and its match. You could poke holes in the bottom of the tissue box and give your child different-size objects—like pipe cleaners, straws, or crayons—to explore the spatial concept of "in and out" and size. Be sure to include materials that are developmentally appropriate for the age of your child so they aren't dangerous or a choking hazard. Or rather than picking materials for an activity, have the activity be about finding materials, like in the video example you watched earlier of the little girl searching for objects, shapes like squares, in her living room.

Thank you so much for joining us today. We've really covered a lot. I'd like to end by sharing the quote from a "News You Can Use" article on ECLKC. It says, "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." We hope you keep this in mind as you take the ideas and knowledge we shared today to support early math learning in infants and toddlers. As you think about ways to support the development of math skills in infants and toddlers, keep these four key components in mind.

Responsive: Is the environment safe and nurturing so that children feel comfortable playing and exploring math concepts.

Language: Do you incorporate math language in a way that is intentional throughout the day?

Family engagement: Have you encouraged families to make their home a learning environment that supports math learning? **And every day experiences:** Are you and the families you work with incorporating math concepts into the things you do every day?

Sarah: Thank you so much, everyone, for listening. We hope this information will be valuable to you as you find ways to incorporate math, or encourage parents to include math, in the things you're already doing every day, from playtime to mealtime to bedtime. If you have thoughts you'd like to share about how this relates to your work, or questions about any of the content that we covered today, we'll open it up in our last couple of minutes for some comments and questions, and you can go ahead and type those into the Group Chat.