

## Research on the Go Podcast: Supportive Environments for Building Math Skills with Infants and Toddlers

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Beth Zack: Hello, and welcome to "Research on the Go," a podcast where we explore some of the latest research in the field of child development, its implications, and practical applications. My name is Beth Zack, and I am joined today by Dawson Nichols.

Dawson Nichols: That's me. Hello. We are from the National Center on Early Childhood Development, Teaching and Learning, and we are based at the Institute for Learning and Brain Sciences at the University of Washington in Seattle.

Beth: In this podcast, we want to not only talk about the research itself but also to provide a space where we can talk a little more deeply about ways to incorporate it into your work supporting grantees.

Dawson: Right, so today we are going to be talking about how you can support math skills with infants and toddlers.

Beth: Wait a minute, wait a minute. Aren't infants and toddlers too young to learn anything about math?

Dawson: No, no, no. [Both laugh] This is something that we hear a lot, yes. But math, look, is everywhere. It is in the world around us, and infants and toddlers are building math skills as they play and go through their daily routine from the very earliest.

Beth: Oh, wow, I never thought of it that way. When I think of math, I think of numbers and counting.

Dawson: Yes, yes, and math is that, but it is also sorting things. It's using patterns and shapes, understanding the geometry of things, making comparisons between things, spatial sense, measurements. It's when they're drawing, when they're sorting things, when they're doing scavenger hunts for shapes around the room, which is a great activity. "Hey, can you find a circle in this room?" [Laughter]

Beth: Oh, so sort of like a mix of I Spy and a shape hunt.

Dawson: Right, right, right.

Beth: That's pretty cool. I'm going to have to try that with my daughter.

Dawson: Toddlers love it. Home visitors can use the game with caregivers to support matching skills. Families can play it anywhere.

Beth: That's such a cool idea. So, maybe out on a walk or in the grocery store, maybe even a long car trip to break up the time. "So, can you find a square outside?"

Dawson: Yes, exactly.

Beth: Something like that? Cool. These activities are great, but I'm sort of wondering. They seem like they're geared maybe more toward older toddlers and even preschoolers. So, what does math look like when we're talking about these younger babies? So, infants or maybe even younger toddlers, those that they're not walking or talking yet.

Dawson: Right, so before a toddler, an infant can sort shapes into a sorter or climb the bars on the playground even later, they have to learn the basic skills through very simple activities. So, if you think about it, before zooming around the playground, you're a toddler, and you're toddling around the playroom, and that is how you start to learn those distances and relationships, measure spaces that way.

Beth: My toddler's totally doing that right now but with climbing. She's trying to figure out where to put her hands and her feet and how far she needs to move her foot up to reach the next climbing peg, so that fits right into what you're talking about.

Dawson: Right, and that is a more complex version of what they do as infants, when they're just crawling around and figuring out how their bodies move but also those shorter distances and those simpler geometries and shapes, feeling the shapes of objects with their fingers and even early with their mouths, right? That's what they're doing. They're learning about math that way.

Beth: You're telling me feeling the shape of an object is actually teaching infants and toddlers about math?

Dawson: Absolutely, yes. Again, understanding shapes is part of math. And feeling things from the very earliest is how they do it, learning about quantity and size, how things are the same as other things or different from other things. That comparison is a mathematical comparison.

Beth: I'm sure I'm with a lot of other people listening here where I never thought of it that way.

Dawson: Yeah, well, and over time, they build on those foundational skills so that now they understand the shapes of things and they can start to build blocks into stacks. They can stack things. They can make patterns. That's how we build these higher skills.

Beth: Yeah, build those towers that they love to knock down over and over again or maybe even buildings.

Dawson: [Laughter] Yeah. And remember, even knocking them down is part of the learning process. It's how they understand how these things relate to one another. The point is that infants and toddlers, they use math as the most foundational part of their learning because it is part of the world, and these foundations is something that we want to share with grantees so they understand the learning that's happening at this very early stage.

Beth: And so, all this math learning, it comes naturally during their play, right? Is that what you're saying?

Dawson: Well, it definitely does, again, because it's in the world. [Both laugh]

Dawson: We live in a mathematical world, but guiding the play can be really helpful. There was a study. Researchers gave parent-child pairs photographs that depicted the steps for building something, like a garage, with blocks. They tested whether children playing with blocks benefited from having someone use these spatial words like, "The blue block goes on the red block. The big block goes under the little block," things like that, while building to guide their play.

Beth: And?

Dawson: It really helped. [Laughter]

Beth: That's awesome. And so, what it sounds like is we can just engage with children in stuff they already like to do without having to plan these new activities.

Dawson: Absolutely, yes. A lot of what teachers and caregivers already do supports math learning. A lot of what children are already doing in just their play is mathematical learning. We just need to call it out for them.

Beth: Oh, that's so true, but I guess just because we naturally support math learning, that doesn't mean we shouldn't be intentional and help create these supportive environments to build their math skills. Is that right?

Dawson: That's a great point. So, a responsive environment has three essential things about it. First, of course, it's safe and comfortable. Second, it has varied open-ended materials to play with. And then, third, and most importantly, of course, it has caregivers in it. [Laughter] Caregivers who are responsive, and they're using rich, mathematical language and scaffolding the activities and guiding the play.

Beth: Alright, well, I want to hear more about all those things, but let's start with the "it's safe and comfortable." So, I feel like I understand that. You want it to be safe but also warm and inviting, and there needs to be enough space for children to really engage in the activity.

Dawson: Right, space, and when infants and toddlers feel safe, they're much more likely to explore. But in addition to giving them enough space to explore, let's remember that space also means time. They need to have the time to explore, to do things and do them again, repeat them. And when we say that the materials are varied, we mean that children have options with the materials. There's more than one thing to do with them.

Beth: Oh, so you could even ... I guess that means you could use different materials to reinforce the same concepts, right? Like, if a child was learning about, say, stacking, they could use maybe blocks one day and – I don't know – cups or something the next?

Dawson: That's a great point. So, varying materials from day to day can be really helpful, but you can also use the same materials in different ways from one day to the next so the child has different kinds of interactions. So, for instance, if you have cups, you can use the cups for stacking and building up things one day, and then the next day, use them for pouring and measuring – same materials, used different ways. The children are learning different math concepts. It's a wonderful way to vary things up.

Beth: That just made me think of: You could also turn those cups over and turn them into drums, which makes me think of music. We don't often think of music and math, but music is great for math. There's patterns and the rhythm, and then there's moving and clapping and stomping. Even if you use the same music over and over.

Dawson: Which is something you should do, by the way. It's great. Children love to have familiar things and to repeat things over and over. Repeating reinforces underlying concepts. Let children repeat things.

Beth: Right. I know it can be hard for us as adults to do the same thing over and over with them, but it's so great for them.

Dawson: Yeah, and when you're familiar with something, you can concentrate on different aspects of that thing during different times, and oftentimes, that's what children are doing. So, that familiarity, that level of comfort is really, really important to their learning. They learn something new every time they encounter a familiar activity or concept, even though it seems from the outside, sometimes, like they're just repeating things.

Beth: Oh, right, so maybe the music's the same, so you're hearing that same song over and over, but you can switch up the activity, like you said. So, maybe clapping to the music and the rhythm one day becomes stomping and dancing around to it the next.

Dawson: Yes, get them up and moving. Yeah, yeah, that's a great example. [Laughter] So, I do want to save some time to talk about the most important part of this responsive environment, and that is, of course, the caregiver. A child thrives most when the caregiver in their environment is attentive and engaged, responding to the child's interests, sharing these mathematical words with them. It's so important.

Beth: Oh, it's so true. There's so much to be said for that responsive caregiver. How can a caregiver be attentive and engaged around math concepts? What are some ideas of things they can do?

Dawson: Right, so, again, first and foremost, recognizing that math is there in the world, and so using the language of math with the children, talking about space and distance, numbers,

shapes, relationships. "That ball is right next to you. That truck rolled far. Look at the big, round wheels. There are four wheels." [Laughter] Research shows that infants who hear number words, they understand numerical aspects of the world even if they can't use those number words themselves. They're still building this foundational knowledge, and through repeated hearing of these words, that's how they build up that knowledge to understand numbers.

Beth: It's so amazing what even young infants are able to do.

Dawson: It is. And using that language is what helps them, so asking children questions is another great strategy. "How many trees do you see on this page?"

Beth: Oh, my gosh. We haven't even talked about books yet. So, what are some tips grantees can use to introduce math concepts?

Dawson: When you read, talk about the shapes, find patterns in the text or in the pictures, count objects on the pages, introduce these math words and concepts. Books don't have to be about math. Any book that you're reading can be used to support math concepts. It's just all in how you use it, the language that you use.

Beth: That's right. I've noticed that my daughter now adds spatial words like "on" and "under" to other things after hearing them a lot when I use them during books.

Dawson: Nice, yes, exactly.

Beth: Perfect.

Dawson: Great. [Laughter]

Beth: So, how else can adults scaffold children's math learning in other areas beyond books and the other things we talked about?

Dawson: Right, well, I guess one last thing that I would love to mention is that adults can model math by playing alongside infants and toddlers, demonstrating for them focus and interest and attention on the mathematical ideas. Children are learning from us through our example all of the time, so showing perseverance, playing with things is a wonderful way for sharing them with children and encouraging the children to explore in these mathematical ways.

Beth: All right, so they're learning not only from our language but just by watching what we're doing.

Dawson: Yes, yes. Oh, and we can also mention here that it's a great way to make connections between English and other languages that a child might be learning. "This block is long. Este bloque es largo." You can just introduce the language there as you're playing with these mathematical concepts.

Beth: Oh, that's a perfect way to do it. What a great idea. So, I guess you would say a great practice is for a caregiver to really just call out the math as children encounter it in their everyday world.

Dawson: Exactly. It is in the everyday world. Our job is really just to call it out.

Beth: Oh, so math isn't this scary thing. It's the stuff that we do and children do every day, and it's just like helping them see that it's just part of their regular world and what they already like to play with and do.

Dawson: Exactly.

Beth: That's so cool.

Dawson: Yes. I couldn't have said it better.

Beth: Well, I think this is a great place to wrap up as we're sadly almost out of time. I just wanted to see if you had any closing thoughts.

Dawson: I guess just ... When you're working with programs, help grantees see that math is everywhere in the world. Show them how to recognize it for themselves and then how to share it with children just using the words. It goes a long way toward helping children build early math skills.

Beth: Oh, and give infants and toddlers opportunities with those varied materials we talked about. Then give them space and time to explore.

Dawson: And encourage program staff to enjoy the experience with them. I always think that the more fun you are having with the children in your care, it's a great indicator that things are going well and that you're doing the right things, especially if you're using math terms as you're doing it. So, enjoy the experience.

Beth: We hope you enjoyed this podcast on creating supportive environments to build math skills with infants and toddlers. For more information, visit ECLKC and search for "math." Thanks for listening.

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