Early Math Learning = Later School Success

A Conversation with Deborah Stipek, PhD

BY JOANNE TANGORRA

Early math instruction should have clear learning goals, but it also needs to be meaningful to young children.

In this *Active Learner* interview, we talk with early education expert Deborah Stipek, PhD, about the importance of early math learning in young children's long-term academic achievement. Dr. Stipek chairs the Heising-Simons Development and Research on Early Math Education Network.

Q: *Early mathematics has increasingly come into the spotlight as the result of new research that connects early math learning to later academic achievement. What are some of the key findings in this area?*

A: The one that has received the most attention is the finding (in several large-scale studies) that math skills at kindergarten entry — that is, the knowledge children develop *before* entering elementary school — predict later reading skills and later academic achievement overall. Consistent difficulty in math during elementary school is associated with higher dropout rates and lower college entrance — more so than consistent difficulties in reading. Although we're not yet sure about the underlying connections, these findings make clear the importance of early math learning to children's future academic success.

Q: *Is there a particular area of mathematics instruction that is most significant in predicting later learning?*

A: Young children need to develop a strong sense of number, which includes being able to count using one-to-one correspondence, being able to determine which of two numbers is larger, understanding that adding to a collection results in a larger number, and so on. They should also develop spatial skills: not just being able to identify shapes, but also being able to articulate the defining characteristics of shapes, and to understand spatial concepts such as *above, below, under.*

Q: *In what ways are the Common Core State Standards shaping expectations for preschool math instruction and learning?*

Sorting, counting, and matching games can be used as forms of "playful" math instruction for young children.

A: Many states are aligning their preschool standards to the Common Core kindergarten standards. Ideally, children have the foundational skills they need when they enter kindergarten to achieve standards. And by aligning the standards and instruction, teachers help children experience a continuum of opportunities to develop their skills. Math standards are important. They give teachers guideposts and a clear sense of the goals. It's hard for teachers to create a plan if they don't know where they want to end up.

Q: *You discuss the need for "playful instruction" in relation to early math learning. Can you explain what you mean by that?*

A: Teachers of young children do *not* have to choose between play and academic instruction. When teachers are intentional — planning activities with learning goals in mind — math adheres to the goals of standards-based academic teaching without appearing overtly as such. In one classroom I visited, the teacher had drawn a 6 x 10 grid on a shower curtain and spread it out on the floor. She invited children to take off their shoes and sort them into piles according to attributes that they themselves had established — for example, sneakers, shoes with Velcro, sandals — and then arrange the shoes into categories on the grid. From there, the teacher asked children what they noticed about the shoes, which led to a discussion about which categories had the most or least shoes, which kind of shoe most children wore to school that day, how many more sneakers there were than sandals, and so on. This is what I call "playful instruction." Although the children may not have realized this was a math lesson, they were indeed learning math.

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Q: *What are some other examples of how teachers can engage young children in math learning "playfully"?*

A: Math instruction for young children should be intentional and have clear learning goals in mind. But it also needs to be meaningful to young children. Some math teaching can be done in the form of games (for example, playing chutes and ladders, or playing war with cards, in which children count the symbols to determine who has more). I have seen children hunt for shapes in their classroom, debating whether a window with slightly curved corners is really a rectangle; or explain to their teacher why they claim that the clock is a circle. Young children also love to count objects: the number of letters in their name, the number of cars in a toy train, the number of children present during circle time, the number of buttons on their shirt, the number of rungs on the ladder to the slide. You can teach math effectively without a

Having children explain how they are making sense of a math problem helps foster a deeper understanding of the concept.

single flashcard or worksheet. Math is everywhere in children's lives. Helping them see that will make math meaningful to them.

Q: *You cite research that shows that playful math has a bonus: social-emotional learning. Would you explain how that works?*

A: That's right. Teacher-planned math activities can also support the development of children's social skills. This is evident, for example, in the shoe categorization activity, during which children had to negotiate and establish agreed-upon categories, follow classroom protocol by raising their hands to answer questions, and participate as part of a group. So children are learning both math and social skills.

Q: *Why is "math talk" so important to the development of children's mathematical understanding?*

A: First, there is good evidence that the amount of math language children hear before school predicts their math skills after they enter school. Getting children to explain their solutions gives teachers some insight into how they are making sense of the math problem and thus what an appropriate follow-up might be. It also fosters deeper understanding of the concept by requiring the ability to articulate the thinking behind solving a math problem.

Q: *What is the role of a structured curriculum in early math education?*

A: A structured curriculum can serve as a guide to teachers for what should be covered and in what order. It also provides some suggestions for specific activities that will help teachers promote math development in their students. But even the best curriculum is no substitute for teacher understanding and skill. So much of good teaching is listening to children's own sense-making and then building on what children understand. Most important are the interactions around math that occur between the teacher and the children.

Q: *Research indicates that early childhood classrooms tend to spend more time on literacy instruction than math instruction. Is there a need to increase time for math instruction in the early childhood classroom? An optimal amount of time each day that teachers should spend on math instruction?*

A: We usually recommend at least 20 minutes a day on teacher-planned math activities that have a clear learning goal. But math can be woven into the entire day: counting off as children line up, counting out two crackers for each child at snack time, or looking for shapes while walking down the corridor.

Q: *How much more needs to be done in order to convince educators, policy makers, and the general public that "early math matters"?*

A: I see a much greater recognition of the importance of math happening just in the last couple of years. Once teachers begin to engage in meaningful, playful math learning activities with children, they are usually won over by seeing how much their children enjoy them and how much they learn. The bigger challenges are teachers' own math anxiety and lack of training and support they receive for teaching math. And for that to be overcome, we need to see greater investment in supporting preschool teachers with the training they need to be most effective in preparing young children for mathematics in preschool and beyond.

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Deborah Stipek *is the former dean of Stanford University's graduate school of education, where she now serves as Judy Koch Professor of Education. She holds a PhD in developmental psychology from Yale. Dr. Stipek's research focuses on children's achievement motivation, early childhood education, elementary education, and school reform. She is a member of the HighScope Board of Directors.*