



Transcript for the video:

The Relationship of Teacher-Child Interactions in Preschool Play to Young Children's Mathematical Ability

Dr. Elsa Núñez, President: I'm Elsa Núñez, President of Eastern Connecticut State University. At Eastern we encourage our students, whenever possible, to work with faculty on applied research, so I'm pleased to share with you new research findings about factors that contribute to children's mathematical abilities. This information, gathered by faculty and student researchers in Eastern's Center for Early Childhood Education, has powerful implications for teachers who work with young children. I hope you find it useful.

The Relationship of Teacher-Child Interactions in Preschool Play to Young Children's Mathematical Ability (0:48)

Dr. Sudha Swaminathan, Co-Principal Investigator: The purpose of the math play study was to investigate teacher-child interactions during play settings. But specifically we wanted to look at the math interactions, so we wanted to study what kinds of teacher interactions led to stronger mathematical engagement for preschool children.

Dr. Jeffrey Trawick-Smith, Co-Principal Investigator: We were curious about whether teachers' interactions with children, to kind of support play, would actually have an impact on their learning of number, or their mathematical thinking.

Methodology (1:25)

Narrator: Six Eastern Connecticut State University students assisted with carrying out the study.

Jenny Wolff, Undergraduate Research Assistant: We did an assessment, the TEMA assessment, with children in the beginning of the school year to get a baseline about their mathematical ability. And then we re-assessed them at the end of the year to see how they progressed in those mathematical abilities. We then also looked at, through some video, how the interactions with their teachers helped those mathematical progressions.

Dr. Swaminathan: We recorded the children during play, and especially when the teacher would come near them and talk to them.

Dr. Trawick-Smith: We didn't ask teachers to do anything special. They didn't try out any kind of intervention or method of teaching. We took videos of that very natural interaction during free play time in classrooms.

Claire Fryer, Undergraduate Research Assistant: We edited those clips to only the teacher-child interactions, and then we coded those based on certain standards that we had, like how long they were, if they were good interactions or not, and things like that.

Dr. Trawick-Smith: We looked at whether there were relationships between the ways that teachers kind of supported play, or interacted with children in play, and mathematical thinking.

Dr. Swaminathan: The second part was we looked at the math behind the play interactions. Was it related to number sense; was it related to problem solving? We looked at measurement opportunities; we looked at communication—math talk communication. And our results were pretty striking and fairly interesting.

Dr. Trawick-Smith: We began to discover that there were several ways that teachers support math while they're just kind of interacting with them, as they play.

Teacher: Alright, now I have another question. How do we find out the answer to that? How do we find out if we're actually right?

Study Finding #1: Interactions Around Number Sense (3:25)

Narrator: There were three major findings in the study. The first was related to teacher-child interactions around number sense.

Dr. Swaminathan: The first math-related results showed that the more you talk about numbers to children, the more they learn numbers.

Teacher: How many blocks do we have here? Can we count them? Can you help me count them?

Child: Look at this one!

Teacher: That's so tall! Let's count how tall it is. One, two, three...

Jenny Wolff: Number sense for mathematical interactions is a basic understanding of numerals and quantities.

Child: Five, six, eight.

Teacher: Seven.

Child: Seven.

Teacher: Eight.

Child: Eight.

Jenny Wolff: There were a lot of interactions with number sense around board games. The teacher was able to observe the mathematical ability by seeing how many spaces that child moved and how that child understood the correlation between number and quantity.

Child: Watch this time! One, two, three, four, five, six.

Teacher: Very good.

Dr. Swaminathan: Research has shown that number sense is very critical in preschool, so it wasn't surprising that we found that these children learned so much of number sense.

Study Finding #2: Communication About Mathematics (4:41)

Narrator: The second finding was related to communication between teachers and children about mathematics.

Dr. Swaminathan: The more interesting part of our study was that we found communication was significantly important for these children.

Jenny Wolff: Communication around mathematics is basically the child explaining their understanding of a concept.

Teacher: What are the differences between the red one, the blue one, and the yellow?

Child: They're bigger and they're squares.

Jenny Wolff: It may be a child explaining how they came to understand that two objects are not the same size, maybe they compare it using standard measurement tools; maybe they put it next to each other. But it's the child's ability to explain their processes, and that can be aided by questions from the adult.

Teacher: How do we find out if it fits?

Child 1: We have to try it.

Child 2: We have to measure it.

Teacher: Alright, so why don't we do that. Do you have a ruler?

Dr. Swaminathan: So the teachers and the children who talk about math, so they actually talked about their counting; they talked about their mathematical problem solving; they talked about measurement.

Teacher: It's up to eleven? And how many was the light box? How many inches?

Child: Ten.

Teacher: Ten. So which one's bigger?

Dr. Swaminathan: These children talked about math, and when they did, it wasn't just to say what answer they got, which is the most typical expectation in classrooms. They talked about their processes, how they went about solving things. Or they talked about why something did

not work. So those who engaged in math talk had greater mathematical gains at the end of the school year.

Dr. Trawick-Smith: This suggests that effort to get children to think numerically, and also to talk about what they're doing as they're thinking about number or other areas of math, that those things will actually have a positive impact on their math learning.

Dr. Swaminathan: And this has not actually been proven by earlier research, and it's only been talked about theoretically in the math circle, but it was interesting for us to see a significant result in our study.

Study Finding #3: "Good-Fit" Interactions During Play (7:02)

Narrator: The third major finding was about the importance of good-fit interactions during all types of play.

Dr. Trawick-Smith: When teachers support children's play, and they support it in a way that really is aligned with what children are currently doing, we call this a good-fit play reaction.

Teacher: It has three flowers; where else do you see that? There you go.

Dr. Trawick-Smith: A teacher studies what a child is currently doing in play, and then provides just the right amount of support to help them think more deeply or become more symbolic in their play. And what we found are those good-fit play interactions were associated with increases in mathematical thinking. This is the most exciting finding, at least to me as a play researcher. Teachers' interactions support play itself, and then subsequent gains in children's play ability will support cognitive development, intellectual development—and that includes mathematical thinking.

Dr. Swaminathan: Research in cognitive science talks about how when you articulate your problems, then you are actually seeking out a solution, and your mind starts to put the verbal parts into a solution pattern. So this was interesting to see that connection in the preschool area.

Dr. Trawick-Smith: The study suggests that teachers have a role to play in this process—that they, through their interactions, can really support higher levels of mathematical thinking. And the best way that they're able to do this is through interactions that support play itself, that really help children to play in more complex or symbolic ways.

Jenny Wolff: The most interesting thing was the amount of mathematical knowledge that the children actually had and the ability for these teachers to bring that out through their questions and their scaffolding.

Teacher: Do you know what this number is? There's a four and a one.

Child: Forty.

Teacher: Forty-one!

Jenny Wolff: I think that there's times when we really underestimate the abilities of preschoolers and children in general, and to see these children understanding that you can measure these objects and compare objects at age 3, 4, and 5 was amazing to me.

Claire Fryer: The whole experience of the study in general was an experience most teachers don't usually get. And I think that all of that will influence how I will become a teacher and how I treat my children in the classroom, and things that I can incorporate.

Dr. Trawick-Smith: Our finding supports the theory that language is really important in learning, and that play is useful. And it goes beyond just supporting social and emotional development; that play also contributes to intellectual development and even academic learning.