Agenda

- Introductions: Who’s in the Room?
- Mathematical Mindsets—why are they important?
- What does developmentally appropriate math look like in the early childhood classroom?
- What can we do to promote this in our work?
Which book title best describes your experience as a learner of mathematics?
How do we want children to experience being a learner of mathematics?
Math messages

"I HAD MY DOCTOR DO A D.N.A. BLOOD ANALYSIS. AS I SUSPECTED, I'M MISSING THE MATH GENE."
Math mindset
Teachers feelings about math influence children’s learning

• The level of anxiety held by women elementary teachers was found to predict the achievement of the girls in their classes, but not the boys.

• In addition, girls were more likely to hold the commonly held stereotype that “boys are good at math, and girls are good at reading” if they were in a classroom with a teacher who had more anxiety around math.

Preschool teachers’ math anxiety relates to math learning

• Classrooms where teachers who had higher levels of math anxiety, girls made smaller gains in math, relative to girls in classrooms where teachers had lower levels of math anxiety.¹

• Girls may be more likely to notice and be influenced by their female teachers’ math attitudes because of their identification with their teacher as a role model of the same gender²

¹Young et al., 2017; ²Bussey and Bandura 1984
Early math . . . Matters!

• Early mathematics understanding prior to school entry significantly predicts later school achievement *over and above* reading skills and even attention skills\(^1\).

• This finding held for both boys and girls and for children from high and low SES backgrounds.

\(^1\)Duncan et al., 2007
Mathematics knowledge and later school success

Kindergarteners’ math skills in pattern recognition, measurement, and advanced number sense were most predictive of 8th-grade outcomes.

Claessens & Engel (2013)
Children from low-income backgrounds start school at a disadvantage

• They are less likely to experience high-quality, meaningful opportunities to engage with mathematical concepts at home and in preschool settings than their middle-class middle-class peers.¹

• On average, children from low-income backgrounds enter school and achieve at a much lower level than their higher-income peers, and this pattern persists throughout the course of school.²

¹Case, Griffin, & Kelly, 1999; Duncan et al., 2007; ²Alexander & Entwisle, 1988; Geary, 1994, 2007
Early math skills are critical to school success

• Success in math is linked to high school graduation, college enrollment and completion, and workforce preparation.¹

• Crucially, math knowledge at school entry was the single most powerful predictor determining whether a student would graduate from high school and attend college.²

• The most effective strategy to reduce the opportunity gap is to devote more resources and effort in preschool, and specifically mathematics.³

¹Achieve, 2008; Adelman, 1999, 2006; Gaertner, et al., 2014; ²Duncan & Magnuson, 2011; ³Reardon, 2013
Children are Born Mathematicians!

- Well before kindergarten, children naturally engage in mathematical ways of thinking in the areas of number, geometry, measurement, algebraic thinking, and data analysis. ¹

- National Research Council’s study ² concluded that young children have the capacity and interest to learn meaningful mathematics, but children need “adult support to build and extend their early knowledge and learn to focus on and elaborate the mathematical aspects of everyday situations—to mathematize” (p.334).

But how do we promote children’s math knowledge in developmentally appropriate ways?

Hint: It’s not flashcards.
Math Games
Why games for preschool teachers?
Numbers, Numbers, 1, 2, 3. How many do you see?
Numbers, Numbers, 1, 2, 3. How many do you see?
Can you show 5 fingers in a different way?
Can you show 5 fingers in a different way?
Can you show 5 fingers in a different way?
Can you show 5 fingers in a different way?
If we want children to do better in math…
Encourage them to use their fingers!

• When children use their fingers to think about a number, they develop a representation of that number in their brains.

• Brain science suggests that using your fingers for math is essential for developing strong mathematical concepts.
Let’s Play a Game: Quick Images

We’ll do 3 cards then we’ll talk about what you saw:

1. Flash a card for 1 second.

2. As quickly as you can, show with your fingers the number of dots you see.

_These cards are harder than we’d suggest you use with preschool children—at least at first!_
Quick Images
How many did you see?
Show with your fingers.
Quick Images
How many did you see?
Show with your fingers.
Quick Images
How many did you see?
Show with your fingers.
Which arrangement of dots was the hardest? Which was the easiest?
Subitizing and Chunking
Seeing how many quickly:
Nurturing mathematical mindsets:
Fostering mastery motivation
What is mastery motivation?

• Two children are playing a math game. Both get stuck. But while one gives up, the other tries different approaches until she gets an answer.

• In early childhood, this is known as *mastery motivation*:
  ✓ Is a child’s independent persistence to accomplish moderately challenging tasks
  ✓ Can be different between children
  ✓ Is malleable or changeable—teachers can influence it!
Why is mastery motivation important?

• Mastery motivation is related to school readiness skills
• Children with higher mastery motivation have been found to have higher math outcomes and academic achievement
• Greater social competence and learning-related behaviors
• Higher engagement in learning activities
Can we help children improve their mastery motivation?

• Yes! It is influenced by social interaction.
• Children have greater mastery motivation when
  ✓ Are exposed to challenging materials
  ✓ Receive positive feedback
  ✓ Are allowed autonomy
  ✓ Receive “one-step ahead” scaffolded support during challenging activities
  ✓ Receive praise for effort or persistence, not for how smart they are
Watch the video: https://youtu.be/4tWDbNVWIKQ

Judi Taylor, Alds Street Child Development Center, Nashua, NH
What does this look like in the classroom?

Teachers...
- Provide many different types of challenging activities
- Give children positive feedback
- Give children freedom to make their own choices and
- Don’t interfere with their problem-solving process
- Provide “gentle guidance”
Watch the video: https://youtu.be/oGzSgYLcASM

Grace Tollick, Greater Lawrence Community Action Council Head Start
Reaction to video: Table discussion

What is your reaction to this video?

What ideas can we take away from Judi and Grace’s experience to bring to our own contexts?
How can we support teachers?
How can we support teachers?

• Strong instructional materials
• Lots of support from administration and colleagues
• Ongoing professional development
• Foster a learning culture for children and teachers
• Addressing teachers mathematics anxiety
Watch the video: https://youtu.be/j6gB4sYHNGY

Tara Fitzgibbons, Greater Lawrence Community Action Council Head Start Program
Reflection and table discussion

Think back on the session, what is one idea that resonated with you?

What is one thing that you will do when you get back to your context?
On chart paper please note…

1) One Great Idea that I Learned...

2) One Thing I Will Do...

3) One Way that We Could Have Made the Session More Effective…
References


THANK YOU

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