What is early math?
Why does it matter?

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Opening Plenary Session, Children as Mathematicians PD Institute
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What is mathematics?

Turn & Talk to the person next to you about your answer to this question.
How could we sort this collection?

Turn & Talk to the person next to you about this question.
We could sort by using a yes/no question...

How could we re-sort this collection?
We could sort by considering the function of the objects ...

How could we re-sort this collection?
We could sort by looking at the shape of the objects ...

How could we re-sort this collection?
We could sort by looking at the color of the objects ... 

Are there other ways to sort this collection?
Watch a preschooler doing math
What is mathematics?

Turn & Talk to the person next to you about this question again.  

*Did the activity we did & the video we watched give you any new ideas about mathematics?*
**What is mathematics?**

Mathematics is a logical way of thinking that allows for increasing precision.

- We use mathematics to make sense of the world.
- We use mathematics to solve problems.
Erikson Institute  
Early Math Collaborative

• Celebrated 10 years in 2017
• Started out working with preschool and kindergarten teachers
• Have expanded our work up through 5th grade
• Have expanded our work down to 0-3 yrs

Mission Statement: Transforming the understanding, teaching, and learning of foundational mathematics from the ground up
Celebrated 50 years in 2016
Knowledge in the service of children.

“It depends ..”
Focus on Whole Teacher Knowledge, Attitudes & Practice

“It would be hard to trust gardening advice from someone whose own garden was an overgrown weed patch. I suspect it’s also hard for children to believe that learning [math] is exciting and worthwhile unless the adults in their lives actually value and enjoy learning [math] themselves.”

-Nancy Rosenow, Nature Explore
PRECURSOR -- what comes before & prepares for or signals something

Red sky at night, sailors' delight. **Red** sky at **morning**, sailors take warning.

When leaves turn red and fall, we know winter is coming.

In mathematics, a PRECURSOR concept is a concept that **underlies or prepares the ground** for a big idea.
Precursor Mathematical Concepts prepare the ground for the foundational BIG IDEAS of math.
What are Big Ideas of Early Mathematics?

Key mathematical concepts that

• lay the foundation for life-long mathematical learning and thinking

• can be explored at any early age and developed for years to come

• help teachers focus and clarify their goals for children’s learning
What makes an idea “big”?

• Mathematically central & coherent
• Consistent with children’s thinking
• Generative of future learning
Precursor Mathematical Concepts & Big Ideas are tools for adults to understand foundational math & to notice & plan for children’s learning.
Why Precursor Mathematical Concepts & Big Ideas?

• Precursor Mathematical Concepts & Big Ideas deepen teachers’ knowledge of foundational mathematics
• Expanded knowledge helps teachers feel better prepared and more confident
• Knowledge impacts practice
Why Precursor Mathematical Concepts & Big Ideas?

• Exist outside of specific activities, curricula and standards
• Easy to remember—not a laundry list of skills
• Help teachers “mathematize” play
• Put the focus where it belongs—thinking and understanding
Enjoy your break-out sessions!
What is early math? Why does it matter?

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What are your biggest “take-ways” from the break-out sessions you participated in?

Turn & Talk to your neighbor about this.
Core Values of the Collaborative

Math learning is for everyone.

Math learning is crucial in early childhood.

Math learning follows developmental progressions.

Math learning depends on effective teaching.
Why Might We Need to Note that Math learning is for everyone?
I’m just not a “math person.”
Math learning is for everyone.

- Math is creative and empowering
- Math learning is the result of effort
- We can all achieve a level of math success
- MATH CAN BE A GATEWAY INSTEAD OF A GATEKEEPER
Why do we need to point out that Math learning is crucial in early childhood?
Reading = Girl

Math = Boy

(Beilock, et al., 2010)
Kindergarten entry

Early reading skills

Early math skills

3rd to 8th grades

Later reading achievement

Later math achievement

(Duncan, et al., 2007)
Math learning is crucial in early childhood.

- Early math is foundational, addressing key concepts.
- The early years are the time to develop a positive math identity.
- GOOD EARLY MATH LEARNING MAY BE A BRIDGE TO LATER ACHIEVEMENT.
Why do we need to point out that Math learning follows developmental progressions?
“Math is mostly about memorizing more and more stuff.”

\[ \frac{1}{2} \text{base} \times \text{height} \]

\[ \pi r^2 \]

\[ 7 \times 8 = 56 \]
“For centuries, many students have learned mathematical knowledge... without much understanding... Today it is vital that young people understand the mathematics they are learning.”

(National Research Council, 2001)

“A (math) learning trajectory consists of levels of thinking, each more sophisticated than the last, that lead to achieving the mathematical goal.”

(Clements & Sarama, 2009)
Fosnot & Dolk’s “Landscape of Learning” (2001)
Math learning follows developmental progressions.

• Learners must actively construct their math knowledge.

• DIFFERENT LEARNERS MAY TAKE DIFFERENT PATHWAYS TO REACH THE SAME UNDERSTANDING OR SKILL
Why do we need to point out that Math learning depends on effective teaching?
• Pre-service teachers who “love children but hate math” are often advised to teach younger students.

• That “math person” thing again: suggests teaching does not matter.
Amount of teacher “math talk” in preschool predicts math achievement

(Klibanoff, Levine, Vasilyeva, Hedges, & Huttenlocher, 2006)
Math learning depends on effective teaching.

- Math is a complex, socially-developed set of ideas that must be taught to be learned
- EFFECTIVE TEACHING VALUES THE EXISTING IDEAS LEARNERS HAVE ABOUT CONCEPTS AND MAKES CONNECTIONS TO NEW OR DIFFERENT IDEAS
Core Values of the Collaborative

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Math learning is crucial in early childhood.
Math learning follows developmental progressions.
Math learning depends on effective teaching.
Thanks for spending the day thinking with us!