112 early educators from 14 states in the U.S. and Canada

Early Math Summer Institute

Meaning-making in **E**arly **M**athematics **E**ducation

Congratulations

The Graduates of the First MEME Summer Institute

July 10, 2015

Why Am I Here?

Why Are We Here?

Americans Struggle to Achieve Mathematics

Americans Struggle in Math

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Americans Struggle in Math

Achievement Gap

U.S. students are falling behind in mathematics internationally (OECD, 2012)

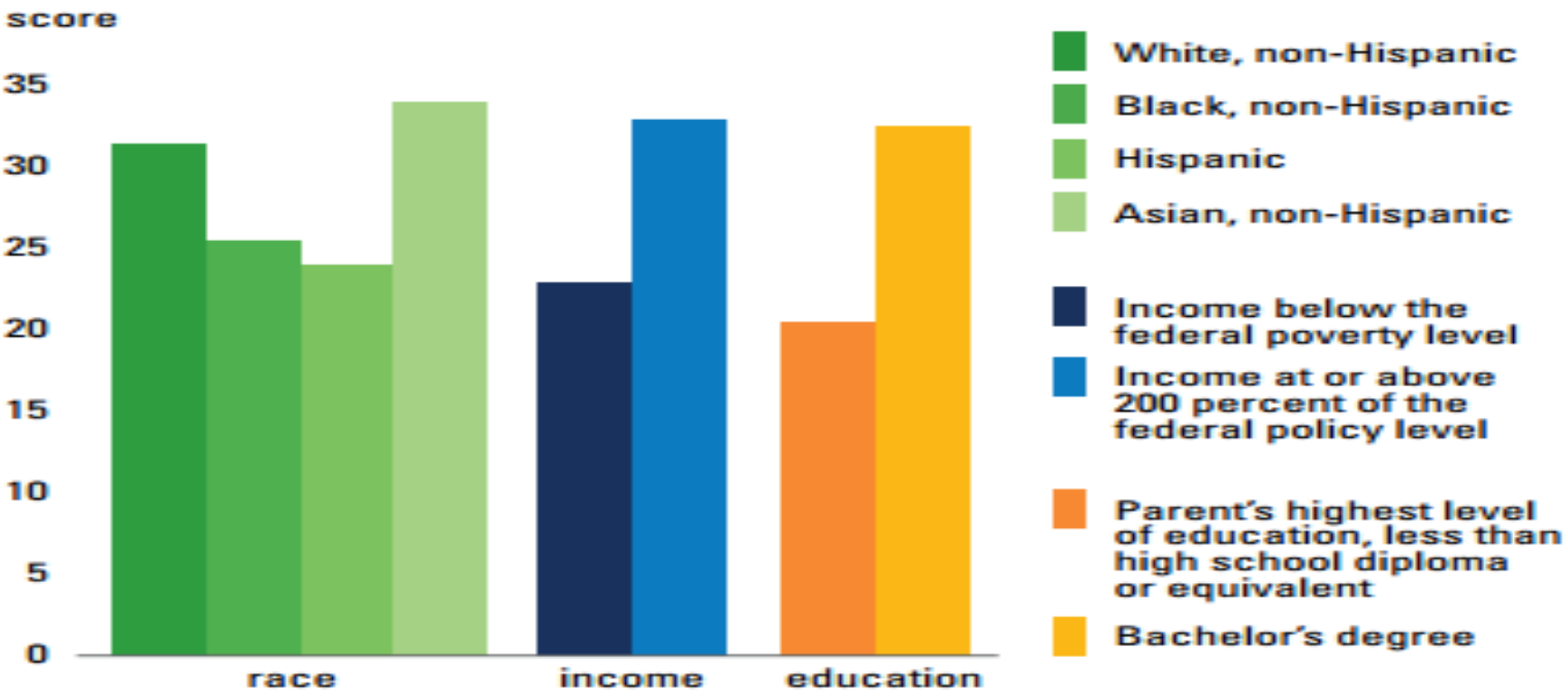
65 countries participated in the Programme for International Student Assessment (PISA)

Rank	Country	Score
1	Shanghai-China	613
2	Singapore	573
3	Hong Kong-China	561
4	Chinese Taipei	560
5	Korea	554
6	Macao-China	538
7	Japan	536
12	Finland	519
13	Canada	518
16	Germany	514
23	New Zealand	500
26	United Kingdom	494
36	United States	481
37	Lithuania	479

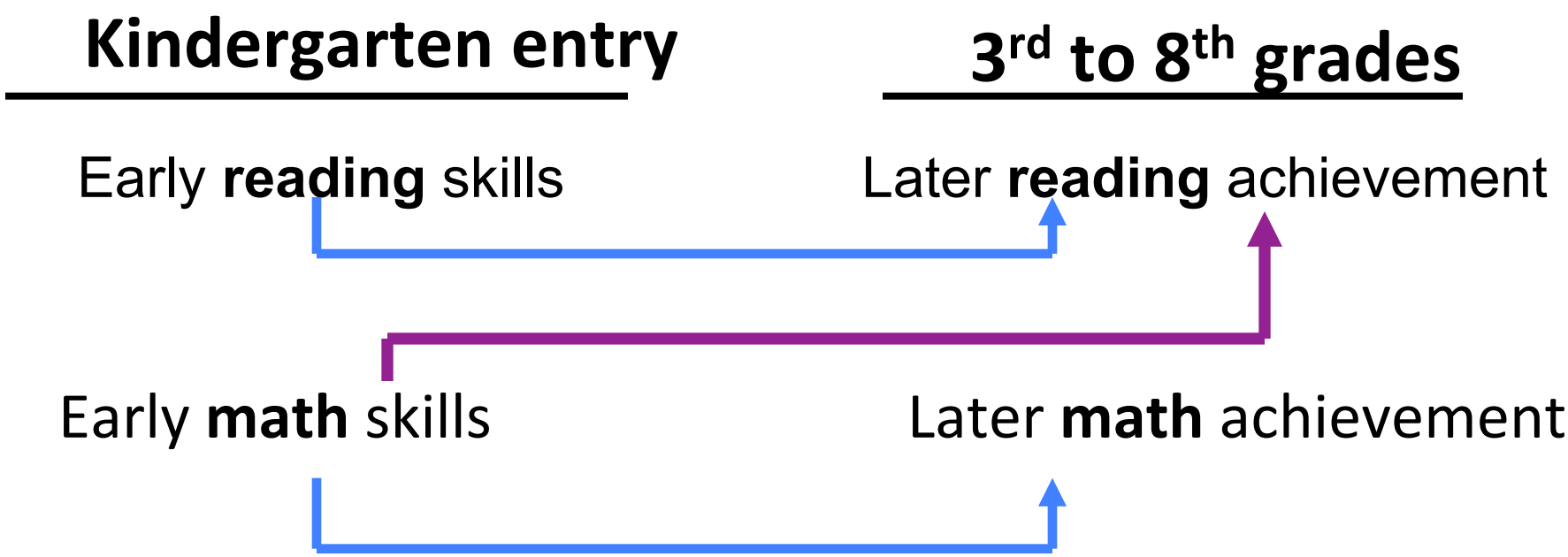
OECD Average

Achievement Gap

Figure 1: Mathematics scores for children entering kindergarten for the first time in 2010



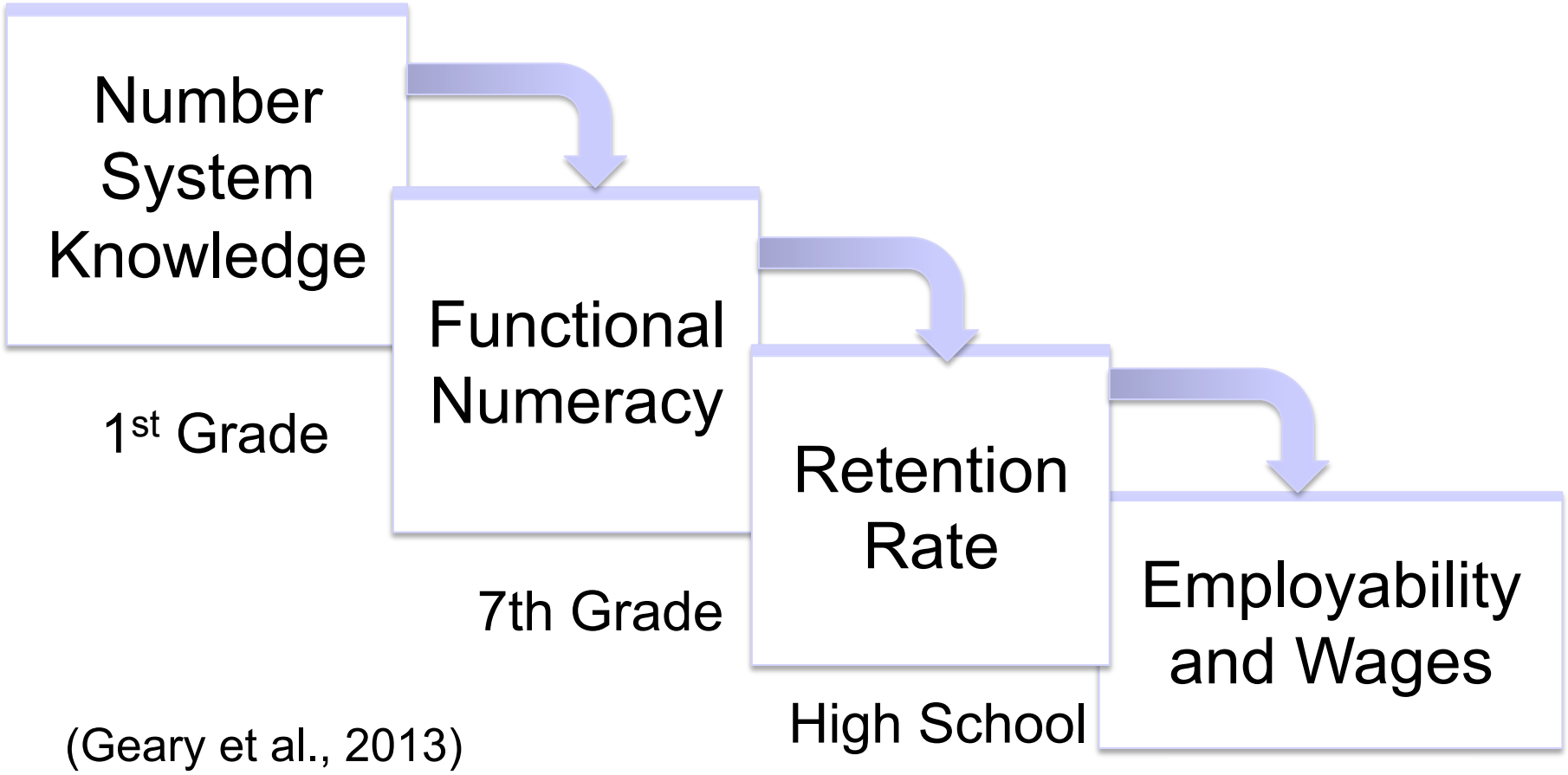
Early Math Matters



Duncan et al. 2007

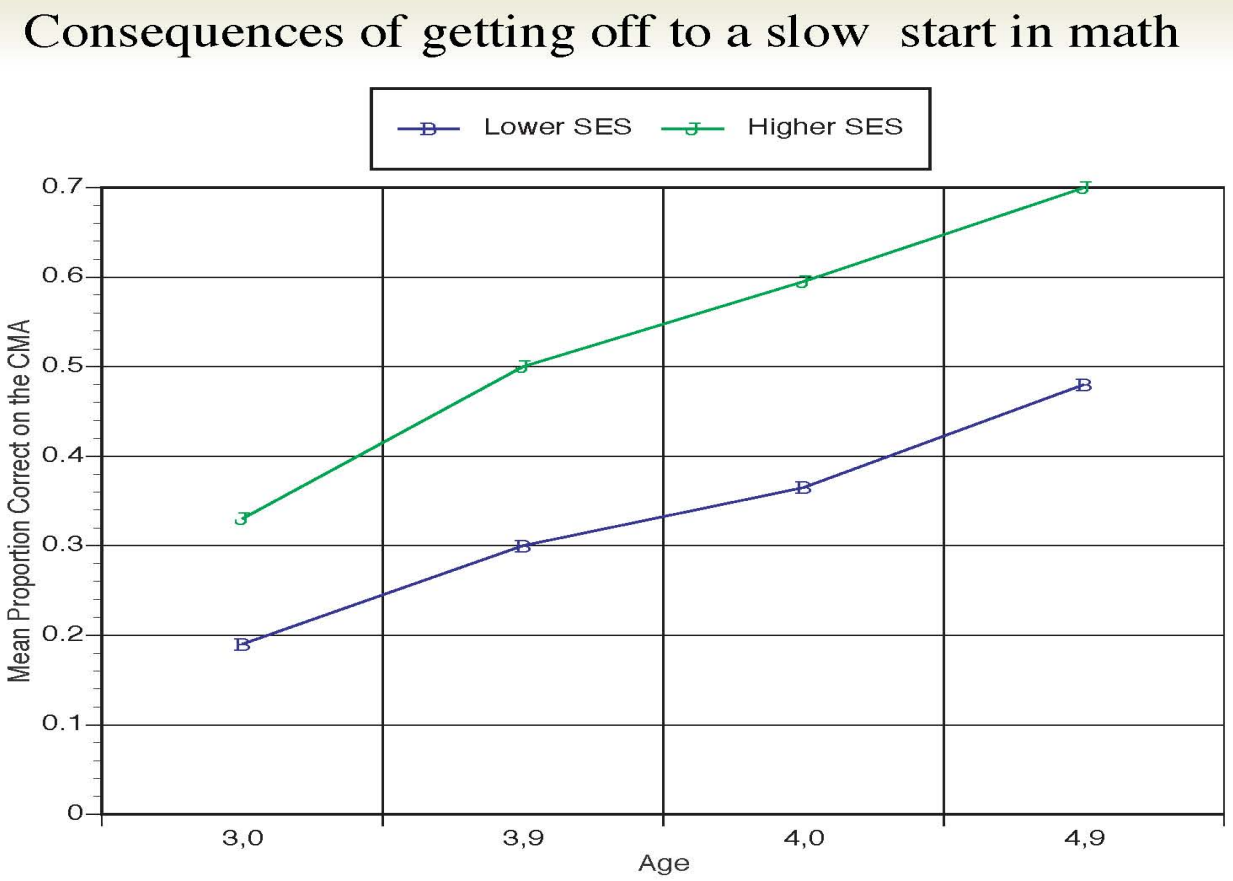
Mathematics has stronger predictive power than reading for later achievement

Early Math Matters



(Geary et al., 2013)

Early Math Matters



Courtesy of Starkey & Klein NSF Grant

Early Math Instruction Matters

Reading	Mathematics
• Reading requires little explicit instruction after a certain point. Learning to read and reading to learn.	• A new and unfamiliar topic (e.g., fraction) usually cannot be fully grasped without some assistance from a text or a teacher.

(NRC, 2001)

Early Math Instruction Matters

Reading	Mathematics
• Reading uses a core set of representations (e.g., 26 English letters).	• Math has many types and levels of representations (e.g., + - =≤ $\sqrt{z} = \sqrt{r}\exp(i\phi/2)$ $\sqrt{4} = 2$

Early Math Instruction Matters

Reading	Mathematics
• Children have more exposure to literature outside of school. • Children read books for pleasure outside of school.	• Children have little exposure to formal math concepts and symbols outside of school. • Very few children read math texts for pleasure outside of school.

Early Math Instruction Matters

- School-based instruction may play a larger role in most children's mathematical learning than it does in their reading experience.
- The consequences of quality mathematics instruction may have even greater effects on children's proficiency than is the case with reading.

(NRC, 2001, p. 19)

A Survey of Preschool Teachers

- A preschooler points to a ☐ and asks Tina if it's a rectangle. How should Tina respond?

Sample Questionable Response
• No, it is a square
• No, rectangle has opposite sides
• No, this is a square, shaped like a box
• All the sides are the same in a square
• I show them a window or a door as examples of rectangle

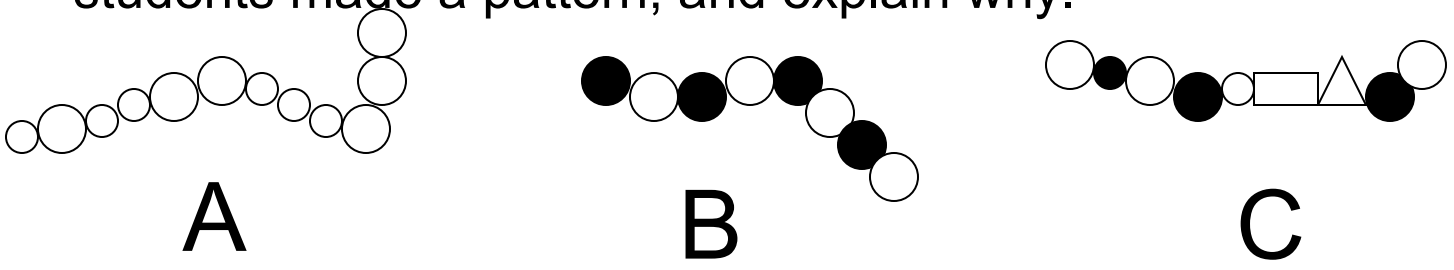
A Survey of Preschool Teachers

- Tina wants to help her students understand that there is a pattern to how the numbers beyond 10 are written —the base 10-system. Please describe an activity that you think is best suited to Tina's goal.

Sample Questionable Response
• Concrete moveable numbers, matching pictures
• Look at the numbers
• Count number of student in the classroom and write it on the board
• Count with rhythm of music
• Teach them this when they get to 1st grade

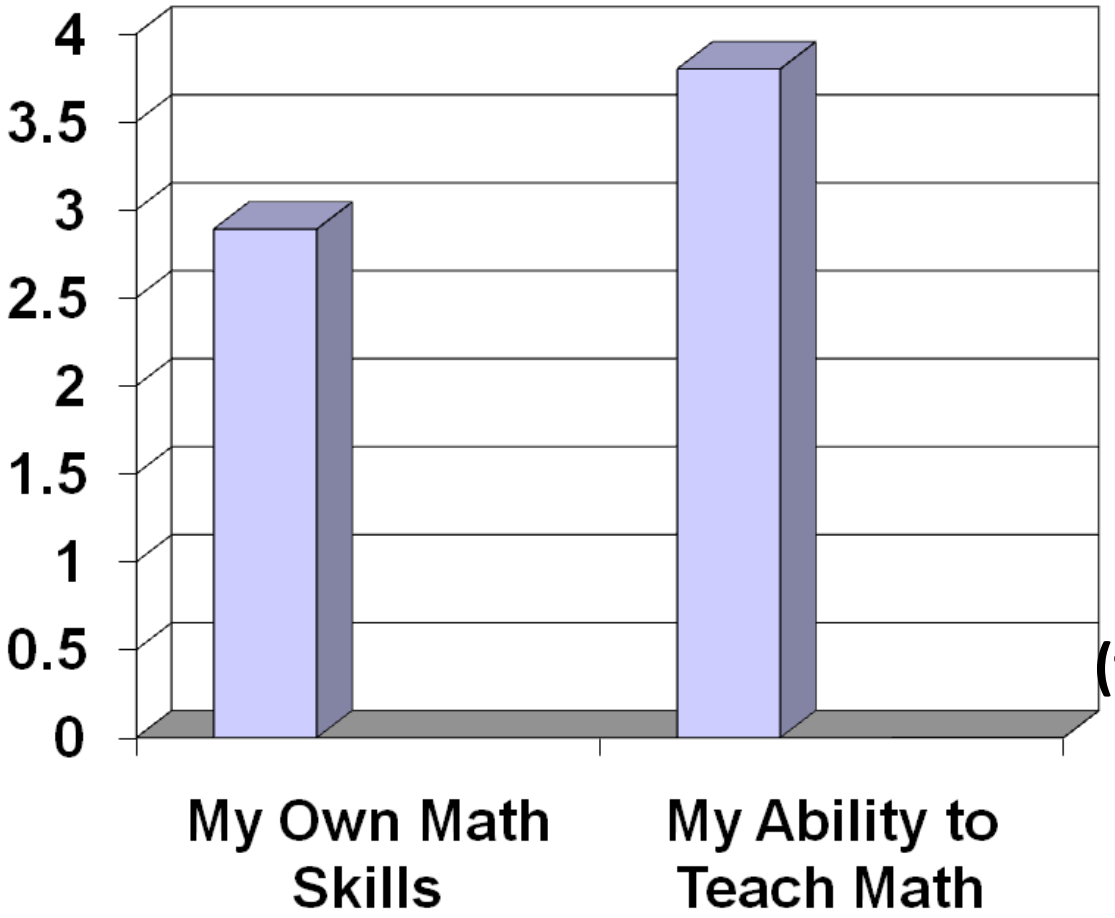
A Survey of Preschool Teachers

- Tina was doing an art activity with her students where they were stringing beads together to create a bracelet. She noticed that some of her students decided to make patterns while others did not. Please tell us whether you think each of the following students made a pattern, and explain why.



Sample Questionable Response to Student A's Bracelet
• No
• Did not make a pattern
• I cannot find any repetition
• This student has the concept 2 and 3

A Survey of Preschool Teachers



(t (302) = -25.06, *p* < .001)

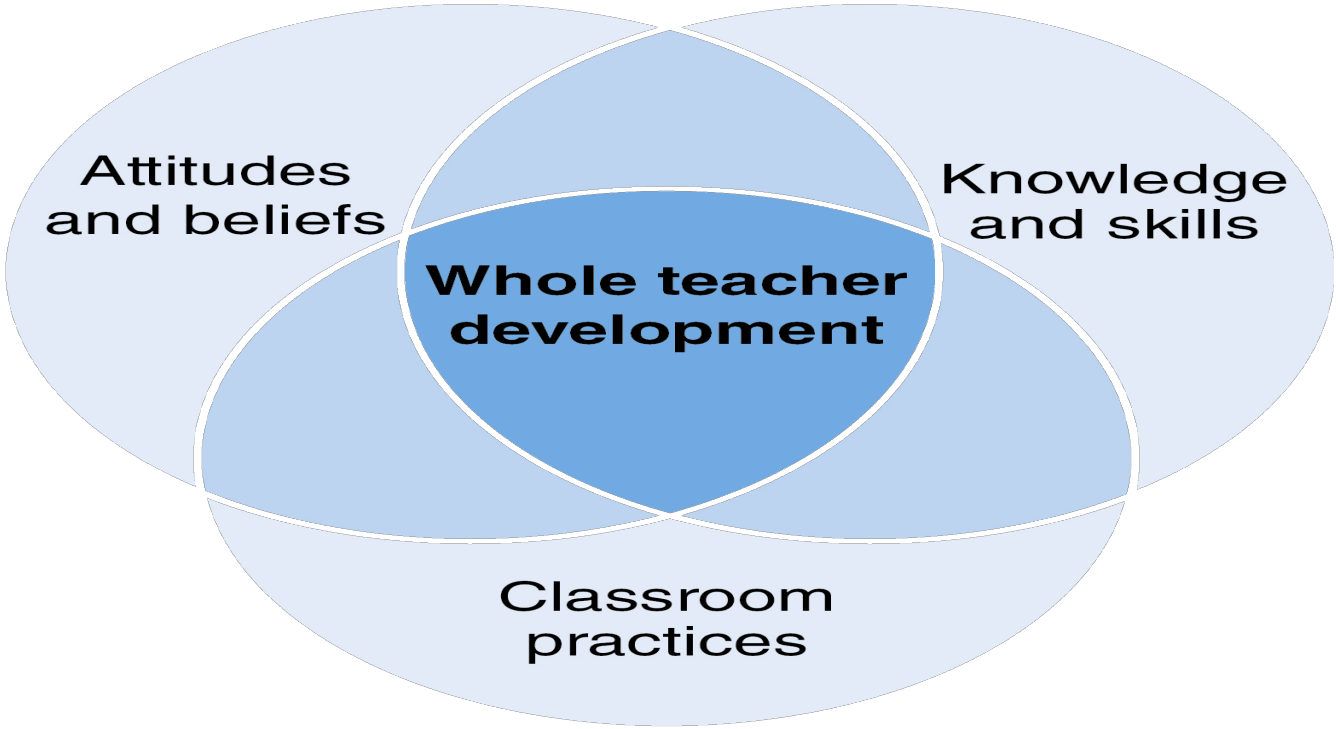
You can't teach something that you don't know

The single most important determinant of what children learn is what teachers know.

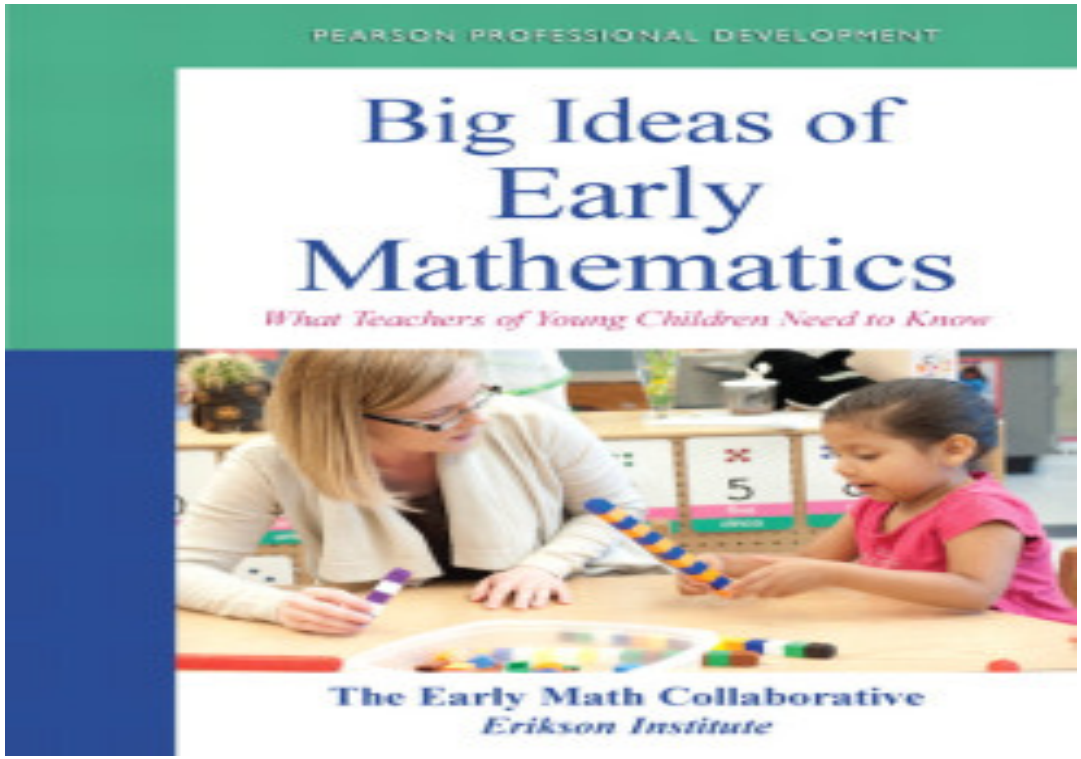
Why Are We Here?

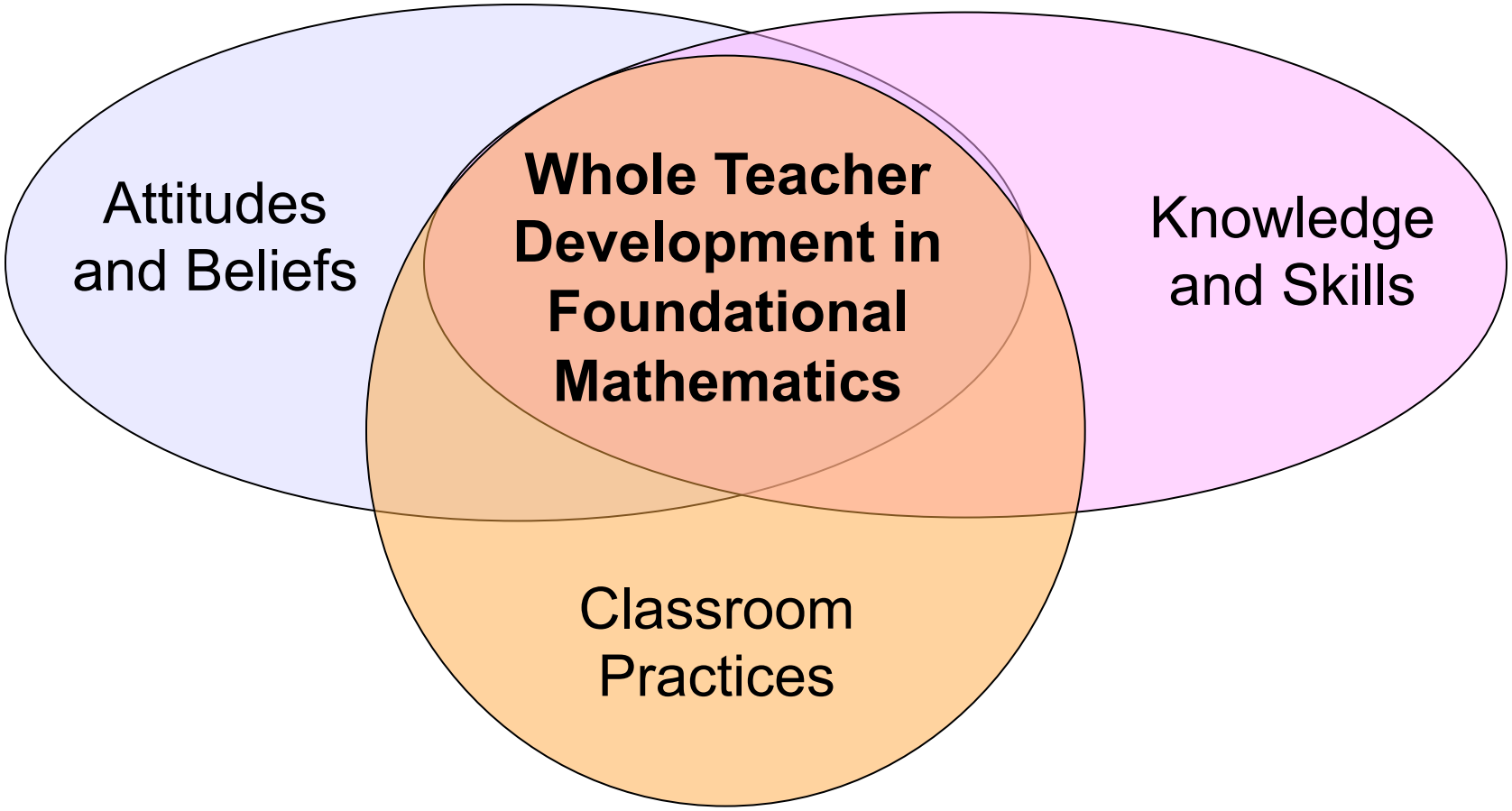
- Working together to improve our understanding of foundational mathematics
- Through productive struggles alone as well as with colleagues and instructors

Our Approach to Teacher Development



Our Approach to Foundational Math



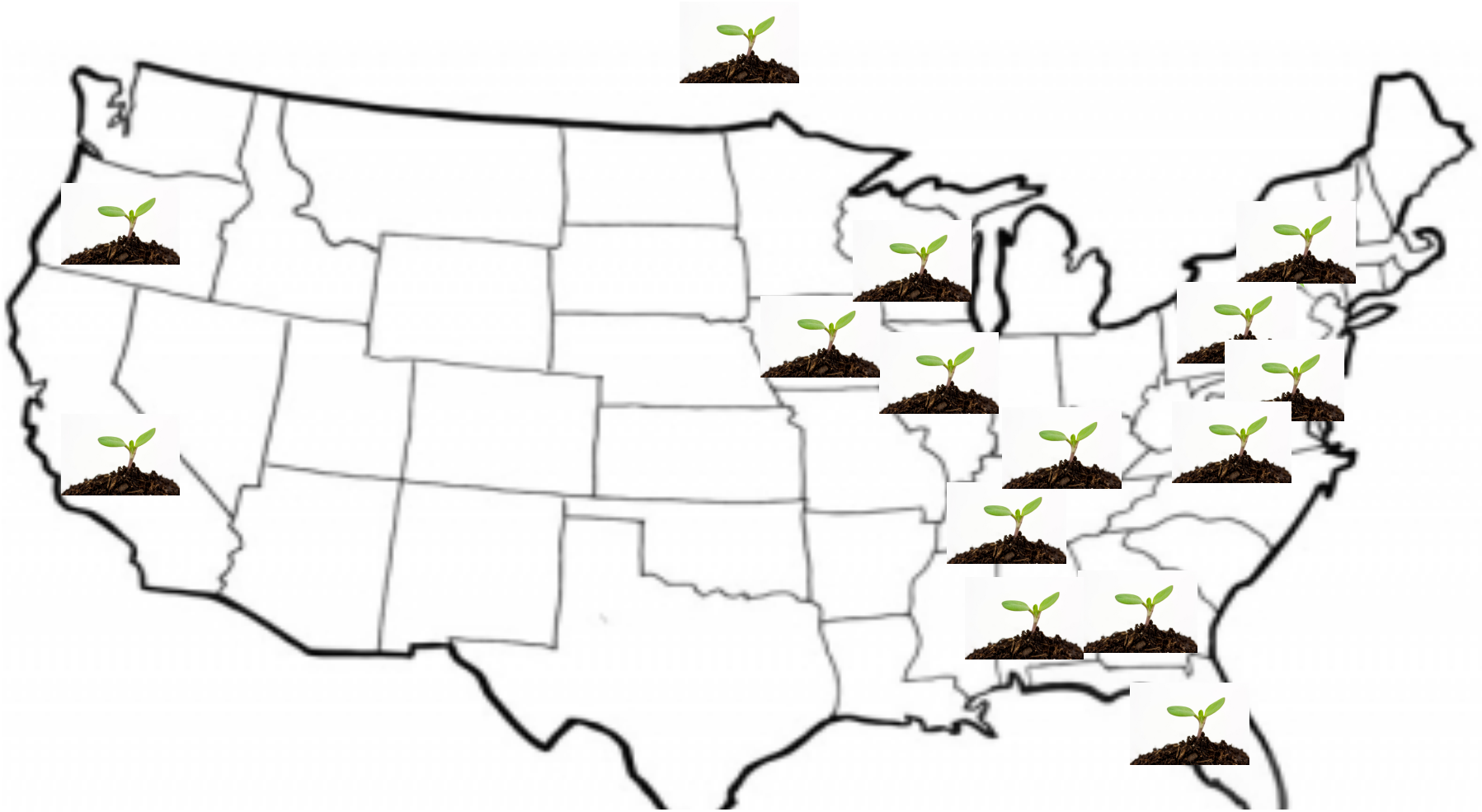

Attitudes and Beliefs
Whole Teacher Development in Foundational Mathematics
Knowledge and Skills
Classroom Practices

Early Math Collaborative

Focus on Teacher Development

Launched in 2007

Pre-K & K Teachers



Thank you from Erikson's Early Math Collaborative Team