



This guide gives suggestions for presenting the Math Matters: Recommendations and Research PowerPoint presentation. Use this for a quick overview of the “big ideas” in young children’s math learning and key teaching practices to support children’s early **Mathematics Knowledge & Skills**. Show the presentation to teachers or adapt it for other uses.



## SLIDE 1: MATH MATTERS: RECOMMENDATIONS AND RESEARCH

### CHILDREN ARE NATURAL MATHEMATICIANS!

Infants can discriminate between set sizes (NRC, 2009).

Toddlers can use spatial cues and landmarks to find objects (Hermer and Spelke, 1996).

Preschoolers can use rulers and non-standard tools to measure and compare objects (NRC, 2009).

## SLIDE 2–4: CHILDREN ARE NATURAL MATHEMATICIANS!

### What to know

Infants from one day to several months old know the difference between a set of two objects and a set of three.

### What to say

Math learning begins in infancy and continues for the rest of our lives!

### What to do

Read through these three slides.

### References

Hermer, L., & Spelke, E. (1996). Modularity and development: The case of spatial reorientation. *Cognition*, 6, 195–232. Retrieved from <http://www.wjh.harvard.edu/~lds/pdfs/hermer1996.pdf>

National Research Council (2009). *Mathematics learning in early childhood: Paths toward excellence and equity*. Committee on Early Childhood Mathematics. C. T. Cross, T. A. Woods, & H. Schweingruber (Eds.), Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academies Press. Retrieved from [http://www.nap.edu/catalog.php?record\\_id=12519](http://www.nap.edu/catalog.php?record_id=12519)

MATH CONCEPTS AND SKILLS

**Big ideas of mathematics**

- Number and Operations
- Geometry
- Measurement

MATH CONCEPTS AND SKILLS

**HSCDEL—Mathematics Knowledge & Skills Domain**

- Number Concepts & Quantities
- Number Relationships & Operations
- Geometry & Spatial Sense
- Patterns
- Measurement & Comparison

## SLIDE 5 & 6: MATH CONCEPTS AND SKILLS

### What to know

The “big ideas of mathematics” are “overarching clusters and concepts and skills that are mathematically central and coherent, consistent with children’s thinking, and generative of future learning” (Clements and Sarama, 2009).

### What to say

According to the National Council of Teachers of Mathematics (NCTM), there are three “big ideas of mathematics,” which are Number and Operations, Geometry, and Measurement, with Algebra and Data Analysis and Probability playing supporting roles. These “big ideas” are similar to the Mathematics Knowledge & Skills domain elements in the Head Start Child Development and Early Learning Framework (HSCDEL), which are Number Concepts & Quantities, Number Relationships & Operations, Geometry & Spatial Sense, Patterns, and Measurement & Comparison.

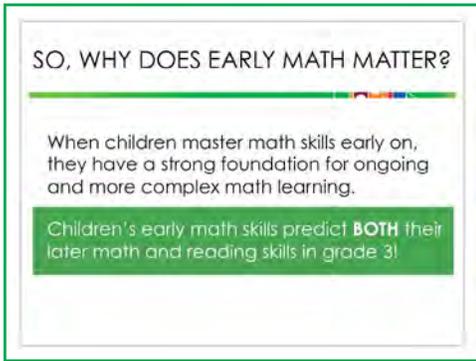
### What to do

Read through these slides.

### References

Clements, D. H., & Sarama, J. (2009). *Learning and teaching early math. The learning trajectories approach*. New York: Routledge.  
National Council of Teachers of Mathematics. Math Standards and Expectations. Retrieved from <http://www.nctm.org/standards/content.aspx?id=4294967312>





## SLIDE 7: SO, WHY DOES EARLY MATH MATTER?

### What to know

Mastering foundational mathematics skills early on contributes to children's ongoing process of understanding deeper and more complex mathematics (Baroody, 2004).

Also, Duncan and colleagues (2007) found that when children enter kindergarten:

- Their mathematics skills mattered the most for predicting later math achievement up to grade 3.
- Their entering math skills were predictive of both math and reading skills up to grade 3.
- Their beginning reading skills predicted later reading, but they did not predict later math skills.

### What to say

We might think of early math skills as a "two-for-one" investment since early math has an impact on outcomes across multiple domains of learning. This is not to diminish the importance of learning in other critical areas, such as literacy and social-emotional skills, but to recognize the need to bring mathematics into balance with them.

### What to do

Read through the slide and the above comments. Then ask teachers/participants what they think of these research findings.

### References

Baroody, A. (2004). The developmental bases for early childhood number and operations standards. In D. H. Clements, J. Sarama, & A-M. DeBiase (Eds.), *Engaging young children in mathematics: Standards for early childhood mathematics education* (pp. 173–220). Mahwah, NJ: Lawrence Erlbaum.

Duncan, G. J., Claessens, A., Huston, A.C., Pagani, L. S., Engel, M., Sexton, H., ... Japel, J. (2007). School readiness and later achievement. *Developmental Psychology*, 43 (6), 1428-1446.





## SLIDE 8: BUT THERE ARE CHALLENGES TO EARLY MATH LEARNING

### **What to know**

This is a transition slide.

### **What to say**

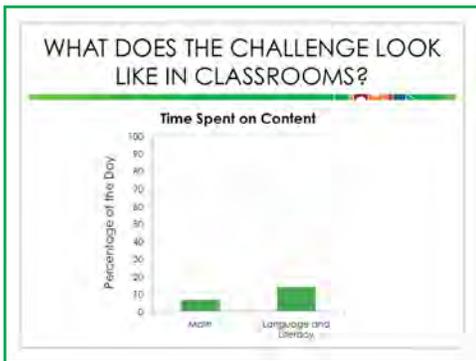
Even though we know that early mathematics is really important, there are also some challenges to math learning. We can see the path, but there's something in the way! What could it be?

### **What to do**

Ask participants to share some challenges they might have experienced.

Some possible answers include: too little time, too many curriculum areas, or not enough math knowledge.





## SLIDE 9: WHAT DOES THE CHALLENGE LOOK LIKE IN CLASSROOMS?

### What to know

This research comes from two studies examining pre-kindergarten programs.

### What to say

Findings from the National Center for Early Development and Learning's Multi-State Study (2005) showed that the average amount of time focused on math content was 8%, compared to language and literacy at 14%.

Another study by Early and colleagues (2010) that examined how children spent time in preschool found that children spent about 8% of their day in mathematics, 17% of the day in literacy activities, and about 44% of the day in no specific learning activity.

Results from these studies also showed that math learning tended to focus on discrete skills or factual knowledge rather than conversation, problem-solving, or interactive learning.

Taken together, we're getting the picture that not nearly enough math is happening. So, what does this mean for young children's math learning?

### References

Early, D., Barbarin, O., Bryant, B., Burchinal, M., Chang, F., Clifford, R., et al. (2005). *Pre-kindergarten in eleven states: NCEDE's Multi-State Study of Pre-Kindergarten & study of State-Wide Early Education Programs (SWEEP)*. Retrieved from [http://www.fpg.unc.edu/sites/fpg.unc.edu/files/resources/reports-and-policy-briefs/NCEDE\\_PreK-in-Eleven-States\\_Working-Paper\\_2005.pdf](http://www.fpg.unc.edu/sites/fpg.unc.edu/files/resources/reports-and-policy-briefs/NCEDE_PreK-in-Eleven-States_Working-Paper_2005.pdf)

Early, D. M. , Iruka, I. U., Ritchie, S., Barbarin, O. A. , Winn, D. C., Crawford, D. M., et al. (2010). How do pre-kindergartners spend their time? Gender, ethnicity, and income as predictors of experiences in pre-kindergarten classrooms. *Early Childhood Research Quarterly*, 25, 177-193. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0885200609000726>





## SLIDE 10: A FUZZY PICTURE

### What to say

One challenge is that math is often not a big FOCUS of early learning activities. Here is a picture that gives us some information, but none of it in clear focus. We get a general idea about what this child is doing, and what he might be learning at this moment, but we are unable to see specific details about his experience. From the research, we know that this is how mathematics, and other content-specific domains, are often thought about in classrooms. They are general and somewhat fuzzy or unspecific.



## SLIDE 11: A MORE FOCUSED APPROACH

### What to say

We want to move practice to a **more focused approach** where intentional and specific teaching helps children build content-specific skills, a change that has been called for by the Advisory Committee on Head Start Research and Evaluation: Final Report (2012). The advisory committee made two recommendations relevant to our discussion today.

- The first is to increase “supportive and stimulating interactions that provide a foundation **for content-specific curricula** and implement content-specific, evidence-based curricula.”
- The second recommendation is that those content areas that previously received less attention (and as a result, lower child outcomes), now become a greater priority.

Among those content areas are:

- **Mathematics**
- Science
- Vocabulary

### References

Advisory Committee on Head Start Research and Evaluation: Final Report (August, 2012). Washington, DC: U.S. Department of Health and Human Services. Retrieved from [http://www.acf.hhs.gov/sites/default/files/opre/eval\\_final.pdf](http://www.acf.hhs.gov/sites/default/files/opre/eval_final.pdf)





## SLIDE 12: SUPPORTING EARLY MATH

### What to know

The next four slides introduce teachers to specific practices they can do to support early math learners.

### What to say

But the good news is, we can make a difference! We are going to see some simple ways to increase math learning. But first, what are you already doing?

### What to do

Ask participants how they are now supporting math learning. You may want to write their ideas down on a poster paper.

### SUPPORTING YOUNG MATHEMATICIANS: MATHEMATIZE!

Talk with children about what they are doing using mathematical words, phrases, and questions.



How long is your shadow?  
Can you make it longer?  
Can you make it shorter?  
Let's take five steps back and see what happens to our shadows.

## SLIDE 13: SUPPORTING YOUNG MATHEMATICIANS: MATHEMATIZE!

### What to say

Mathematize means bringing out the math in what children are doing. Adults can mathematize children's experiences by using mathematical language in everyday conversations, making comments, asking and answering questions, and posing problems.

### What to do

Ask participants to provide examples of mathematical concepts and words for this activity. For example, number concepts: counting five steps; geometry: spatial concepts (moving hand up or down, stepping backward); measurement and comparison: size of shadow (longer, shorter).



SUPPORTING YOUNG MATHEMATICIANS:  
PROVIDE MATERIALS!



Provide children with materials that support mathematical exploration and play with children when they use these materials.

## SLIDE 14: SUPPORTING YOUNG MATHEMATICIANS: PROVIDE MATERIALS!

### What to say

Carefully select materials that support mathematical learning goals. Materials need to be interesting and meaningful to children and enhance their engagement in learning.

### What to do

Ask participants to discuss what kinds of mathematical concepts children can explore using the materials in the photos. For example, using buttons, children can count, add and subtract, compare quantities, sort, classify, and create patterns. Using shapes and pegboards, younger children can explore, recognize and match shapes, and learn simple spatial concepts, such as *up*, *down*, *in*, and *out*. Older preschoolers can combine and separate shapes, describe attributes, compare sizes, and learn more complex spatial concepts, such as *next to*, *in front of*, and *between*.

SUPPORTING YOUNG MATHEMATICIANS:  
PROVIDE CHALLENGE!



Take note of children's math learning and think of new activities and materials that will challenge them.

## SLIDE 15: SUPPORTING YOUNG MATHEMATICIANS: PROVIDE CHALLENGE!

### What to say

Children learn best when they are engaged in active learning where they can explore, manipulate, extend, and expand on their knowledge. Adults extend a child's learning by observing what a child already knows and is able to do and providing a slightly more challenging activity.

### What to do

Ask participants to identify what kinds of mathematical concepts the two children in this picture are working on (measuring, looking at objects increasing in size under the microscope). Then ask for ideas about ways the teacher might extend the children's mathematical learning, such as adding more bugs of different sizes so children can compare, sort, and order by size, and manipulating the microscope to make objects look smaller as well as bigger.



## SUPPORTING YOUNG MATHEMATICIANS: SHARE!

Talk with coworkers, supervisors, and families about how children are learning and what you are doing!



## SLIDE 16: SUPPORTING YOUNG MATHEMATICIANS: SHARE!

### What to say

Tell participants that this information is just a start. Teachers need to continue to deepen their knowledge and skills on an ongoing basis: work with a mentor or peer teacher to share ideas and resources about teaching math, plan lessons, observe each other, and use resources from the Early Childhood Learning and Knowledge Center (ECLKC) website.

### What to do

Have participants share with a partner one math-related activity they did in their classroom.

## SLIDE 17: CLOSING

Provide participants with NCQTL contact information and encourage them to visit our website for additional resources: <http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/teaching/center>



For more information, contact us at: [NCQTL@UW.EDU](mailto:NCQTL@UW.EDU) or 877-731-0764

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