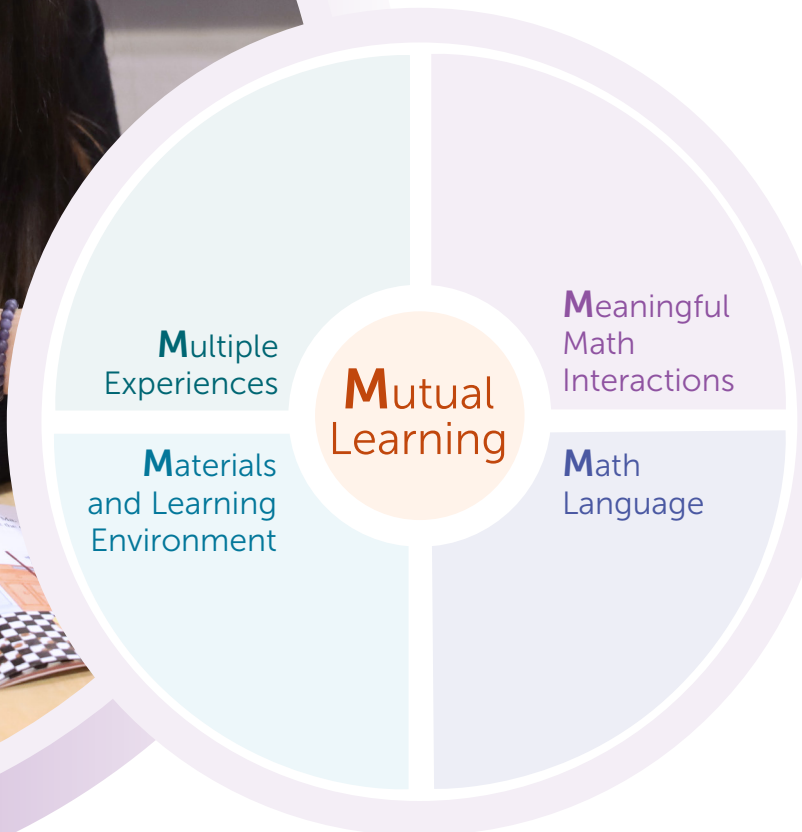
Supporting Preschool Children's Early Math Using M^5 Practices

Exploring Math Through Literature: A Video Guide



WestEd
Center for Child & Family Studies

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This video guide was developed by WestEd, as part of the California Early Math Initiative, led by the Fresno County Superintendent of Schools. Video examples were filmed at the Lighthouse for Children Child Development Center, the demonstration site for the initiative.

Introduction

Videos offer ways to illustrate effective practices for supporting young children's math development. Well-chosen videos paired with intentional discussion offer a powerful tool for observing and unpacking what practices look like in early care and education settings. This video guide is designed to support professional development providers, including coaches, in facilitating discussion and reflection with infant educators. Time for individual staff to reflect on their own practices after watching video examples contributes to professional growth and may inspire changes in practice.

The video guide features key practices to support early math learning:

- **M**utual learning
- **M**eaningful math interactions
- **M**ath language
- **M**aterials and learning environment
- **M**ultiple experiences

We refer to these five core early math teaching practices as M^5 Early Math Practices, or M^5 practices.

The video guide includes a video that illustrates the M^5 practices for supporting early math development. This video offers only a few examples of the many ways the practices might be used with a particular age group. It shows actual practices in a classroom and was not staged. Viewers may not agree with everything the teacher did. Thus, viewers are encouraged to use the video as an opportunity to see the practices in action and reflect on what they might do differently.

There are many ways to promote early math learning. This video guide focuses on how teachers can use children's literature to engage children in meaningful math learning experiences.

Using Read-Alouds as an Entry Point for Math

Children's literature provides powerful ways to explore mathematical ideas such as size, number, operations, patterns, and spatial positions. During read-alouds of storybooks with math concepts, teachers can pose questions and invite children to make predictions, count, or solve problems. Teachers can use children's literature to:

- **Support exploration and understanding of mathematical skills and concepts.** Children's literature provides meaningful contexts for learning about math concepts. For example, storybooks such as *Goldilocks and the Three Bears* or *Actual Size* can promote understanding of measurement concepts such as comparing and ordering size.
- **Introduce and reinforce math vocabulary.** Read-alouds provide teachers opportunities to use math vocabulary when talking about the story with children. Pointing to illustrations in the book or using concrete objects to act out the story can enhance children's understanding of mathematical language.
- **Offer opportunities to engage in mathematical thinking and reasoning.** Interactive read-alouds allow teachers and children to talk about mathematical ideas and encourage children to be mathematical problem solvers (e.g., "There are three kids, now three more arrived. How many do we have all together?").
- **Support dual language learners.** Reading literature to children in their home languages sends a message that the home language is valued. Read-alouds in the home language offer dual language learners opportunities to build on what they know in their home languages and make connections when the teacher reads the same book in English. Reading literature to children in their home language can therefore support math vocabulary growth in their home languages and English and enhance children's understanding of math concepts.

For examples of ways adults can use children's literature to engage children in mathematical thinking, see the collection of literature reviews on the Early Math Project website. The website provides a list of children's books with mathematical themes. For each of the books, a literature review offers guidance on how the book can be used to support mathematical understanding and hands-on activities related to the book.

What's in the Video Guide

Learn About M[5]

This section provides an overview of the M[5] Early Math Practices. It describes specific teaching strategies for implementing each M[5] Early Math Practice.

Watch M[5] in Action

This section includes the video clip description and embedded video. It provides specific open-ended questions that invite viewers to examine and explain how the M[5] practices are illustrated in the clip.

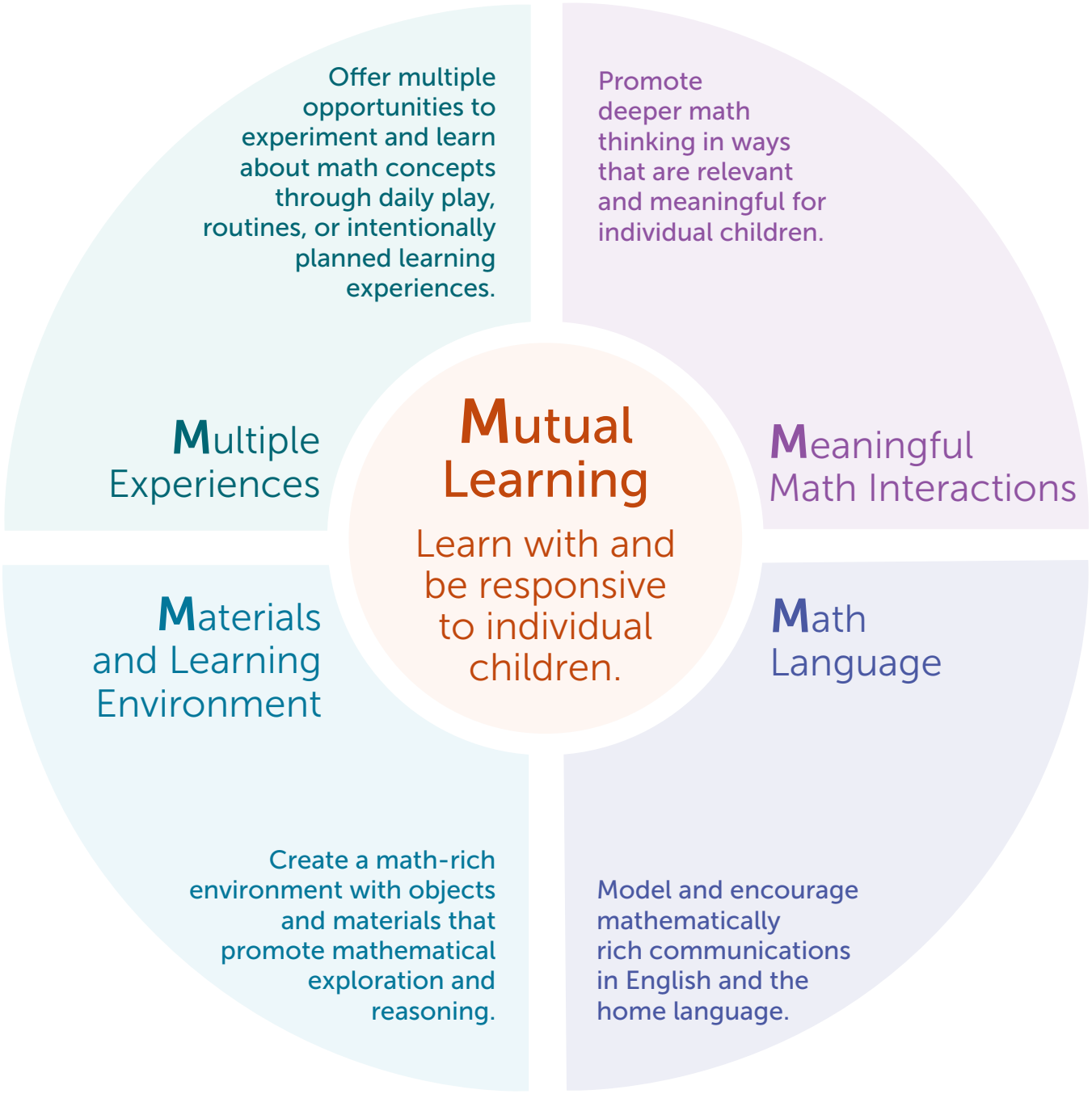
Unpack M[5]

This section provides some examples of how each M[5] practice is illustrated in the video clip. It also identifies the math concepts the teacher supported by using the practices.

Enhance Your Practice

This section provides focused, open-ended questions, inviting participants to reflect on how they support early math learning and plan ways to apply M[5] practices in their settings.

Learn About M[5]



Learn about each of the M[5] practices described in greater detail below.

Mutual Learning

Learn with and be responsive to individual children.

- Observe and listen carefully during interactions to learn about children's development, emerging skills and knowledge, interests, and experiences.
- Use what you learn to build on individual children's strengths, needs, interests, languages, and culture.
- Integrate children's interests, home languages, and culture into the environment and learning experiences in authentic ways to create relevant and meaningful learning experiences.

Multiple Experiences

Offer multiple opportunities to experiment and learn about math concepts through daily play, routines, and intentionally planned learning experiences.

- Introduce mathematical concepts and language through daily interactions and experiences.
- Look for the math in children's play and use teachable moments to build on children's understandings and make math language and concepts explicit.
- Plan a range of developmentally appropriate experiences that promote mathematical thinking and problem solving.

Materials and Learning Environment

Create a math-rich environment with objects and materials that promote mathematical exploration and reasoning.

- Integrate math throughout the learning environment to allow for meaningful math learning during play and daily routines.
- Provide access to open-ended, engaging materials that allow children to explore spatial relationships, attributes, numbers, and shapes.
- Include collections of items that invite children to count, sort, order, and create patterns.

Meaningful Math Interactions

Promote deeper math thinking in ways that are relevant and meaningful for individual children.

- Nurture children's inquiry and exploration of math ideas within the context of everyday routines and play.
- Use open-ended questions and prompts to encourage children's thinking and support conceptual understanding.
- Support children in making sense of mathematical concepts and allow children to demonstrate their understanding nonverbally or verbally.

Math Language

Model and encourage mathematically rich communications in English and the home language.

- Introduce children to mathematical vocabulary in meaningful contexts.
- Invite children to represent their understandings in multiple ways, using concrete objects, words, drawings, and symbols.
- Help children build their math vocabulary in English and in their home language.

Watch M[5] in Action

Exploring Math Through Literature

This video, filmed during a coaching session, features teacher Eva reading *The Doorbell Rang*. Coach John observes as Eva uses the book as a springboard to support children in developing math concepts and skills in the area of number sense.

Materials and Learning Environment

- In what ways did Eva use children's literature to promote early math learning?

Multiple Experiences

- In what ways did Eva integrate math during a small group read-aloud activity?

Mutual Learning

- What did Eva learn about the children from her observations during this activity?
- In what ways was Eva responsive to the children's interests, learning, and development?

Meaningful Math Interactions

- What prompts did Eva use to encourage children's thinking and support conceptual understanding?
- What scaffolds did Eva offer to help children make sense of mathematical concepts such as counting and addition?

Math Language

- In what ways did Eva model the use of math vocabulary and invite the children to show their understanding of math vocabulary?

Math Concepts and Skills Highlighted in This Video

- **Counting:** Preschool children recite the number words for 1–10 in the right order. They learn to count sets of objects using one-to-one correspondence. In addition, they begin to understand the cardinality principle (i.e., the number word of the last object counted represents the total number of objects in the group).
- **Subitizing:** Preschool children quickly determine the number of items in a set, without counting, up to about four items.
- **Addition and subtraction:** Preschool children understand that adding an item or items increases the number of items in a set, while subtracting an item or items decreases the number of items in a set. Preschool children solve simple addition problems (with sums under 10) using counting as a strategy. They often use their fingers or objects to solve these addition or subtraction problems.

For more information about how preschool children develop these concepts, visit the California Preschool Learning Foundations.

Unpack M^5

Materials and Learning Environment

- In what ways did Eva use children's literature to promote early math learning?

Children's books can provide a rich context to support children's understanding and exploration of math ideas. Books can illustrate the use of math in everyday situations, promote problem solving, and reinforce an authentic use of math vocabulary. In this clip, teacher Eva read the book *The Doorbell Rang*. The book is about children sharing 12 cookies with an increasing number of children. The story offers many opportunities to engage in mathematical reasoning, solve addition problems, and use skills such as subitizing and counting.

Multiple Experiences

- **In what ways did Eva integrate math during a small group read-aloud activity?**

Everyday play and interactions provide multiple ways to promote math learning throughout the day, in a variety of settings. Eva used a small group read-aloud activity as an opportunity to invite children to engage in mathematical reasoning and solve simple addition problems. To help the children think about the math concepts presented in the book, Eva asked questions and invited children to engage in counting and problem solving, for example: "So how many is it going to be all together?"

Mutual Learning

- **What did Eva learn about the children from her observations during this activity?**
- **In what ways was Eva responsive to the children's interests, learning, and development?**

While interacting with children during the book reading, Eva observed and learned about their interest in counting and their ability to use counting meaningfully as a strategy to solve an addition problem or verify their answer. For example, when Eva read about two new children (Tom and Hannah) arriving, she asked, "So how many is that going to be all together?" One of the girls replied, "Four." Eva then continued reading the book, but when the boy started counting the children on the page, Eva stopped reading and let him count.

Eva continued to follow the children's interest in counting and to support their counting and addition skills. For example, when the group showed interest in finding out how many children there were all together on the page, Eva allowed each child to count the children on the page. Eva learned about individual children's understanding of addition and their ability to count to 12 using one-to-one correspondence.

In addition, Eva responded to each child's ideas and followed their lead. When Eva had finished reading the page where 6 more children joined, each child had a different idea about how many children there were all together. She highlighted each child's ideas when she said, "Eli says 12, Mika said 14," and encouraged another girl to count to find out the answer.

Meaningful Math Interactions

- What prompts did Eva use to encourage children's thinking and support conceptual understanding?
- What scaffolds did Eva offer to help children make sense of mathematical concepts such as counting and addition?

Eva used a variety of strategies to support children's conceptual understanding of counting and addition. She highlighted math problems embedded in the story, invited children to count, and scaffolded the counting process.

> "Two friends here, and how many are going to join them?"

Eva highlighted the math problems embedded in the story. For example, after reading about two new children (Tom and Hannah) arriving, Eva prompted the children to recall how many new friends had arrived. She said, "Two friends here, and how many are going to join them?" When the children replied, "Two," she followed up by asking for the total amount: "How many is that going to be all together?"

Eva also invited children to count to solve problems. For example, after reading about more children joining, Eva encouraged the children to count to find out how many new children had joined: "How many would join them? Let's count, one, two, three, four, five, six ..." She then encouraged each child to count how many children there were all together across the two pages.

Eva provided scaffolds to support the children's counting process. For example, she encouraged the children to count together and helped begin the counting process by modeling counting the first few numbers and letting the children finish the count list. To support children in developing one-to-one correspondence, she pointed to each object as she counted. In addition, Eva used gestures like circling the entire group to make it clear which objects were to be counted.

More from the Teacher

Watch Eva talk about observing a coach and then how she uses children's literature to support mathematical concepts and skills with a small group of preschoolers.

Math Language

- **In what ways did Eva model the use of math vocabulary and invite the children to show their understanding of math vocabulary?**

As Eva read to the children in the group, she introduced a variety of number words (1–12) and vocabulary related to addition (e.g., plus, equal, join, all together) and division (e.g., "'That's six each,' said Sam and Victoria").

Eva also used gestures, such as holding up two fingers when using the number word *two*, or circling the two groups of children on the page to show that two groups of children were going to be added together. These gestures support children in making connections between the words they hear and the concepts the words represent. This strategy is particularly helpful for children who are dual language learners. They may already know the concept but are still learning the English words to describe what they know.

Eva used prompts to build children's vocabulary and understanding of addition. For example, on the page that shows two new children arriving, Eva asked, "Two friends here, and how many are going to *join* them? … How many is it going to be *all together*?" By using words like *join* and *all together*, Eva prompted the children to think about the meaning of addition.

> "Two little kids and two big kids."

She also provided children opportunities to demonstrate their understanding of math vocabulary. Children replied "four" and counted the kids. One of the children said, "Two little kids and two big kids." Later in the conversation, Eva stated the same addition problem using more formal math language—"two plus two equals four"—helping children gain understanding of math terms such as *plus* and *equals*.

Enhance Your Practice

Think about your own setting. Below are some questions that you might consider as you plan to implement or enhance one or more of the M[5] Early Math Practices.

- What is one M[5] practice for supporting early math that you observed in the video that you already use to support preschoolers' math development and learning? Provide an example of how you implement it.
- What practice in the video do you want to try or work on improving to support preschoolers' early math learning?
  - How might you use children's literature to promote preschoolers' early math development?
  - What are some ways you can ensure that children have multiple opportunities to experiment and learn about math concepts through daily play, routines, and intentionally planned learning experiences, including small group read alouds?
  - What are some ways you might learn about individual children's math experiences in the home?
  - In what meaningful ways might you introduce mathematical vocabulary?
  - How might you invite children to represent their understandings in multiple ways (e.g., concrete objects, drawings)?
- How might you promote meaningful math interactions for children who are dual language learners? What are some ways you could support children's home language development during math experiences?
- How might you adapt your support to engage in meaningful interactions with children who are at risk for or have developmental delays or disabilities? Why?
- What, if any, questions do you have about using M[5] Early Math Practices while reading math-related literature with preschoolers?