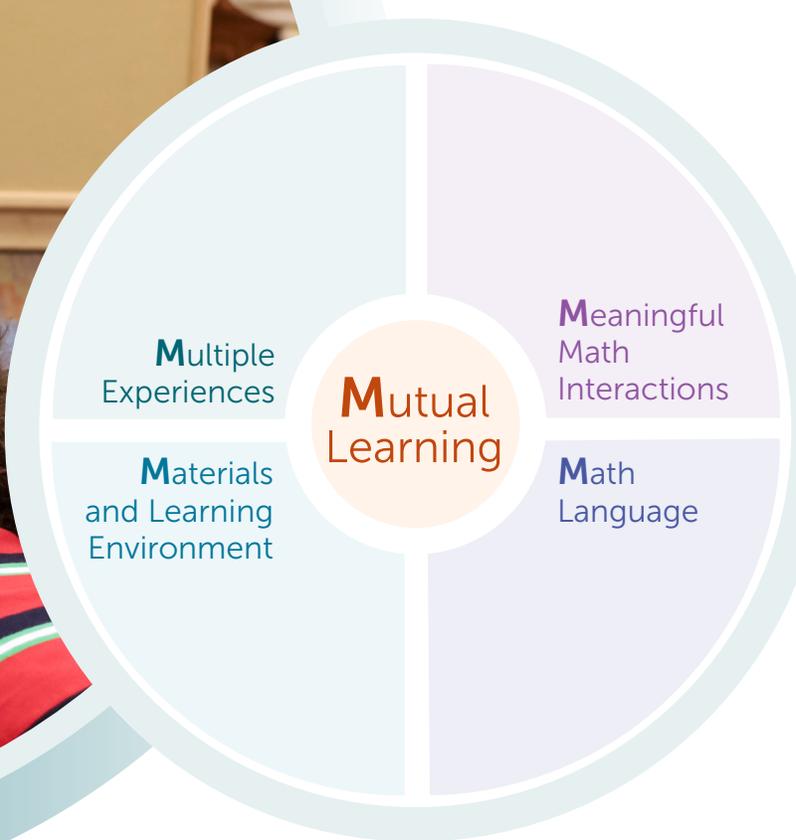


Supporting Toddlers' Early Math Using M⁵ Practices

Math Through Ramps and Balls: A Video Guide





The California Statewide Early Math Initiative is funded by the California Department of Education, Early Learning and Care Division and the California State Board of Education. 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:

- **Mutual learning**
- **Meaningful math interactions**
- **Math language**
- **Materials and learning environment**
- **Multiple experiences**

We refer to these five core early math teaching practices as M⁵ Early Math Practices, or M⁵ practices.

The video guide includes a video that illustrates the M⁵ 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.



What's in the Video Guide

Learn About M⁵

This section provides an overview of the M⁵ Early Math Practices. It describes specific teaching strategies for implementing each M⁵ Early Math Practice.

Watch M⁵ 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 M⁵ practices are illustrated in the clip.

Unpack M⁵

This section provides some examples of how each M⁵ practice is illustrated in the video clip. It also identifies the math concepts the teacher supported by using the practices.

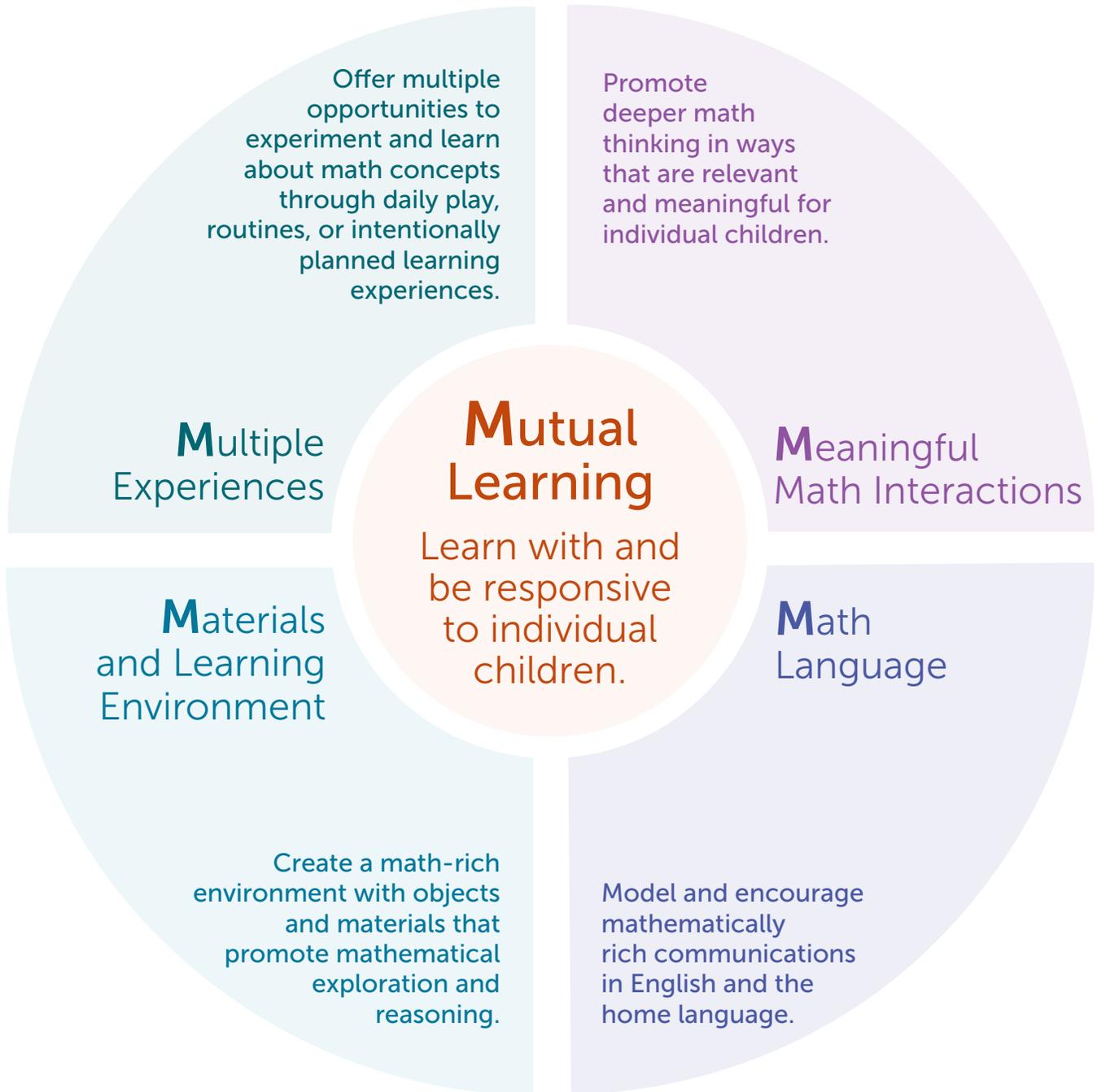
Enhance Your Practice

This section provides focused, open-ended questions, inviting participants to reflect on how they support early math learning and plan ways to apply M⁵ practices in their settings.





Learn About M⁵



Learn about each of the M⁵ 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 M⁵ in Action

Toddlers Explore Math Through Ramps and Balls

In this video, Ale and teacher Heather experiment with ramps and balls. Through meaningful interactions, Heather supports Ale's early math learning in the areas of number sense, problem solving, and spatial relationships.



Materials and Learning Environment

- What did you notice about the materials and learning environment?
- In what ways did the materials promote math learning?

Multiple Experiences

- In what ways did Heather support Ale's exploration and math learning as they played?

Mutual Learning

- What did Heather learn about Ale as he played with the ramps and balls?
- In what ways was Heather responsive to Ale's interests, learning, and development?

Meaningful Math Interactions

- What open-ended questions and prompts did Heather use to encourage Ale's thinking?
- What scaffolds did Heather provide to support Ale in making sense of mathematical concepts, such as number sense, spatial relationships, and problem solving?

Math Language

- What are some ways Heather helped Ale build his math vocabulary?
- In what ways did Heather invite Ale to show his understanding of math vocabulary, such as *big* and *bigger*?

Math Concepts and Skills Highlighted in This Video

- **Spatial relationships:** Toddlers continue to explore how objects move through space. With time and experience, they are able to predict how objects fit together without having to try out all solutions. Toddlers also are learning to understand words describing location (e.g., on, under).
- **Size:** Toddlers are learning about relative size and how different objects fit in space. They may explore nesting different sized objects within one another and learn that some objects fit together and others do not. They also are learning to understand words describing size (e.g., big, small).
- **Problem solving:** Toddlers are learning to solve problems (e.g., finding where the circle goes in the shape sorter) without having to physically try out all options (e.g., putting the circle in the square and triangle holes). They also ask for help from peers or adults when needed.

For more information about how toddlers develop these concepts, visit the [California Infant/Toddler Learning & Development Foundations](#).

Unpack M⁵

Materials and Learning Environment

- What did you notice about the materials and learning environment?
- In what ways did the materials promote math learning?

To promote exploration and learning, the environment included a variety of open-ended materials such as ramps, blocks, rings, tubes, and balls of different sizes. Playing with these materials offered children opportunities to experiment with how different-sized balls move down a ramp and fit through other objects. For example, when Ale was learning how the balls (big or small) roll down the ramp, he noticed how only the small ball could

fit into the tube at the end of the ramp, not the bigger (white) ball. When Heather suggested using a bigger ring, an object with a larger diameter, Ale noticed how both the small and big balls could fit in the ring.

By introducing objects of varying size, Heather created a meaningful opportunity for Ale to experiment and learn about the size of objects and how different objects fit together. The open-ended materials in the environment promoted exploration and, combined with Heather's facilitation, supported Ale's understanding of the concepts of size, height, and spatial relationships.



Multiple Experiences

- In what ways did Heather support Ale’s exploration and math learning as they played?

Everyday play and interactions provide multiple ways to promote math learning throughout the day and in a variety of settings. This video illustrated how Heather used children’s indoor play time as an opportunity to invite children to experiment and reason about how objects move and fit together in space. Heather intentionally set up the environment in ways that promoted experimentation with ramps and balls. She also stayed with Ale to facilitate the learning experience by asking questions, suggesting different materials (e.g., a different-sized ball, a ring), and joined Ale in experimenting with the balls.



Mutual Learning

- What did Heather learn about Ale as he played with the ramps and balls?
- In what ways was Heather responsive to Ale’s interests, learning, and development?

Heather responded to Ale’s interest and facilitated his exploration with the balls and ramp. She helped Ale set up the ramp and followed his lead in making the ramp higher, using two blocks instead of one. After Ale rolled the small ball down the ramp multiple times, Heather facilitated further exploration by proposing that they try a bigger ball and a bigger ring at the end of the tunnel.

“Because it’s too big.”

Heather observed Ale closely and scaffolded his learning based on his emerging skills and concepts. For example, he said, “It can’t go in cause, cause look it.” Then he rolled the ball down the ramp to demonstrate that it could not go through the tube. Heather then used language to describe what Ale noticed: “Because it’s too big.” Ale responded, “Yeah.” She continued to support Ale’s language development by asking open-ended questions, responding to Ale’s communication (verbal and nonverbal), and extending back-and-forth exchanges.

Meaningful Math Interactions

- **What open-ended questions and prompts did Heather use to encourage Ale's thinking?**
- **What scaffolds did Heather provide to support Ale in making sense of mathematical concepts, such as number sense, spatial relationships, and problem solving?**

Heather used a variety of strategies to support Ale's exploration of math ideas, encourage thinking, and scaffold conceptual understanding. She asked a number of open-ended questions to help support his understanding of concepts such as size and height. For example, in the beginning of the video, Heather put one block under the ramps and asked, "What happens if we just use one?" When Ale said, "Nothing, make it higher," Heather elaborated on what he said: "What happens when we make it higher?"

"Why can't it fit?"

Heather also scaffolded Ale's problem solving and modeled the use of spatial vocabulary: "Do you think the big ball will work?" This question encouraged Ale to roll the big ball down the ramp. When it didn't go into the ring, Heather asked, "What happened?" Ale replied, "No can't fit." Heather continued by asking, "Why can't it fit?" These questions scaffolded Ale's problem-solving skills by asking him to think about the elements of the problem (the big ball does not fit into the smaller ring).

Through her next question, Heather helped Ale think about a possible solution to the problem by asking, "What if we use a *bigger* one?" Although Ale did not fully answer all of Heather's open-ended questions, these questions nurtured his exploration of concepts like size and modeled the use of comparative language (e.g., big and bigger).

Math Language

- **What are some ways Heather helped Ale build his math vocabulary?**
- **In what ways did Heather invite Ale to show his understanding of math vocabulary, such as *big* and *bigger*?**

As Heather and Ale explored the ramps, Heather used a variety of math vocabulary describing size (e.g., small, big, bigger) and location in space (e.g., in, higher). Heather helped build Ale's vocabulary when she asked him why the white ball couldn't fit into the hole. He started his answer, "It's too ..." but he did not complete the sentence. Heather extended Ale's communication and said, "because it's too big!" After introducing the word *big*, she referred to a bigger ring by proposing, "What if we use a bigger one?"

By repeatedly using the words *big* and *bigger* throughout this interaction, Heather supported Ale's developing understanding of relative size. For example, Heather said, "We needed a bigger hole so that the big ball would fit." Heather extended Ale's understanding and use of language by providing him with words and phrases to use.



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 M⁵ Early Math Practices.

- What is one M⁵ practice for supporting early math that you observed in the video that you already use with toddlers in your care? Provide an example of how you implement it.
- What practice in the video do you want to try or work on improving to support toddlers' early math learning?
 - How might you create an environment that nurtures toddlers' development of math concepts?
 - What are some ways you might offer opportunities for toddlers to explore math ideas and concepts during daily routines and play?
 - What are some ways you might learn about individual children's math experiences in the home?
 - How might you interact with toddlers to help them explore math concepts and skills in their environment?
 - In what meaningful ways might you model math language?
 - How might you invite children to represent their understanding in multiple ways (e.g., providing concrete objects)?
- 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 promote meaningful interactions for children who are nonverbal?
- What modifications might you make to engage in meaningful math interactions with children who are at risk for developmental delays or disabilities? Why?
- What, if any, questions do you have about using M⁵ Early Math Practices with toddlers?