Supporting Preschool Children's Early Math Using M<sup>5</sup> Practices

# Making Measurement Meaningful: A Video Guide

**M**ultiple Experiences

**M**aterials and Learning Environment **M**eaningful Math Interactions

> **M**ath Language



**M**utual

Learning



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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:

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

We refer to these five core early math teaching practices as M<sup>5</sup> Early Math Practices, or M<sup>5</sup> practices.

The video guide includes a video that illustrates the M<sup>5</sup> 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 M<sup>5</sup>

This section provides an overview of the M<sup>5</sup> Early Math Practices. It describes specific teaching strategies for implementing each M<sup>5</sup> Early Math Practice.

## **Watch** M<sup>5</sup> 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<sup>5</sup> practices are illustrated in the clip.

## Unpack M<sup>5</sup>

This section provides some examples of how each M<sup>5</sup> 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<sup>5</sup> practices in their settings.





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

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

### **M**ultiple Experiences

**M**aterials and Learning Environment

## **M**utual Learning

Learn with and be responsive to individual children.

### Meaningful Math Interactions

**M**ath Language

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

Model and encourage mathematically rich communications in English and the home language. Learn about each of the M<sup>5</sup> practices described in greater detail below.



### **M**utual 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.









#### Making Measurement Meaningful

This video, divided into two parts, illustrates the ways teacher Maritza supports a preschooler's understanding of measurement concepts, mathematical reasoning, and problem solving. In Part 1, using unit cubes, Maritza and the child focus on comparing height. In Part 2, they use unit cubes to measure and compare lengths of their hands.



#### Materials and Learning Environment

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

#### **M**ultiple Experiences

 In what ways did Maritza support the child's exploration and math learning as they played?

#### **M**utual Learning

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

#### Meaningful Math Interactions

- What open-ended questions and prompts did Maritza use to support the child's understanding of measurement concepts?
- What scaffolds did Maritza offer to help the child compare height or measure length?

#### Math Language

- What are some ways Maritza helped the child learn math vocabulary such as words to describe the relative height or length of objects?
- In what ways did Maritza invite the child to show her understanding of math vocabulary?

#### Math Concepts and Skills Highlighted in This Video

- Comparing: Preschool children compare two objects by length or other attributes (e.g., weight, capacity). For example, they determine which of two objects is longer by putting them side by side and using words such as *longer* or *taller*, as in "This one is *longer*."
- **Ordering:** Preschool children learn to order three or more objects by size. For example, they arrange three or four objects from smallest to biggest.
- Measuring: Preschool children first show an interest in measuring the length of objects using nonstandard units. With adults' guidance, they use same-sized units (e.g., blocks) laid end to end, along the object they measure, and count the number of units.
- Reasoning and problem solving: Preschoolers begin to identify and use simple mathematical strategies to solve a problem in their environment. For example, they count to find out who has more or use same-unit blocks to measure length.

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

## Unpack M<sup>5</sup>

#### Materials and Learning Environment

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

Maritza intentionally set up a mathematically rich environment. During choice time, children selected from a variety of materials that promote math learning (e.g., blocks, collections of objects). At one of the tables, Maritza set out unit cubes. The cubes are open ended and can be used in different ways. For example, children might create a line of connected cubes and count the number of cubes, create patterns with differentcolored cubes, or build towers of different heights.

In this clip, one child was using the unit cubes to create towers of different heights and to measure the length of her hand. Maritza allowed children to use the materials creatively. She used the child's play as an opportunity to introduce concepts of relative height and measurement and important mathematical vocabulary associated with these concepts (e.g., short, shorter, shortest).



#### **M**ultiple Experiences

 In what ways did Maritza support the child's exploration and math learning as they played?

Everyday play and interactions provide multiple ways to promote math learning throughout the day, in a variety of settings. Maritza used choice time as an opportunity to nurture the child's understanding of measurement and problem solving.

### "Which one was the longest?"

In Part 1, she invited the child to compare structures of different lengths and modeled the use of comparative language: "Which one was the longest?" In Part 2, Maritza invited the child to use the unit blocks to measure and engage in problem solving: "Do you think my hand is six? Do you think it is more or less?"



#### **M**utual Learning

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

Interactions with the child at the unit blocks table allowed Maritza to learn about the child's understanding of measurement concepts and vocabulary.

For example, Maritza noticed that the child was aware of attributes of objects and was able to use words to describe length (e.g., short, tall). However, she also observed that the child was still developing her understanding of comparison vocabulary (e.g., shorter, shortest, tallest)—when Maritza showed the child three towers and asked, "Which one is the tallest?" the child pointed to the shortest tower. Maritza responded by pointing to the towers and explaining, "Shortest is small ... longest means the tallest one."

When the child showed interest in using the towers to represent relative heights of her family members, Maritza used this opportunity to continue to compare height and model the use of comparative language. For example, she asked, "So your daddy is this tall, your mommy is this tall, and you are?" By making connections to the child's family members in an authentic way, she built on the child's strengths (e.g., her knowledge of her family members' relative heights) and helped her work on areas where she needed support (e.g., understanding and using comparative language).

#### Meaningful Math Interactions

- What open-ended questions or prompts did Maritza use to support the child's understanding of measurement concepts?
- What scaffolds did Maritza offer to help the child compare height or measure length?

Maritza used a variety of strategies to support the child's conceptual understanding of measurement concepts and to engage her in mathematical reasoning and problem solving. She asked questions, modeled and scaffolded the use of comparative language, encouraged the child to make predictions and estimations, invited the child to make comparisons, and scaffolded the measurement process.

In Part 1, Maritza asked questions to direct the child's attention to the relative height of the different towers. For example, she asked, "Which one is the tallest?" When Maritza learned that the child was using the towers to represent the relative heights of her family members, she asked questions and repeated the child's answers. This interaction helped Maritza follow the child's reasoning and facilitate the comparison of the towers (her family members) based on height.

For example, the child referred to the tallest tower as her dad, the second tallest tower as her mom, and the shortest tower as her "cousin Alexa's baby." Through this interaction, Maritza learned about the child's understanding of concepts and vocabulary related to relative height. In addition, she learned about the child's family.

Maritza modeled and scaffolded the use of comparative language. For example, she asked, "Is Charlie younger than you? Smaller than you?" When the child responded by saying "He's like short," Maritza elaborated on the child's answer. Modeling the use of comparative language, she said, "So he is shorter than you."



#### More from the Teacher

Watch Maritza talk about meaningful math interactions during choice time.

#### Meaningful Math Interactions (cont.)

In Part 2, Maritza encouraged the child to make predictions, estimations, and comparisons. She challenged the child to use the unit cubes to measure and solve problems: "How long do you think your hand is? ... From here to here, to the tip of this finger." To encourage the child to make predictions and estimations, she asked questions: "Do we need to add more?" and "How many more do you think we need?"

"How long do you think your hand is? ... From here to here, to the tip of this finger."

She engaged the child in counting the unit blocks to find out the length: "Let's count to see how long your hand is. One, two, three ... six." She also invited the child to compare the length of her own hand to the length of the teacher's hand. "Do you think my hand is six? Do you think it is more or less?"

Maritza scaffolded the measuring process by helping the child connect the cubes end to end to measure her hand. For example, she pointed to the beginning and end point of her hand. She also encouraged the child to add only one cube at a time and decide with each addition whether the piece was long enough: "Is that as long as your hand?" She helped the child connect the cubes and supported her counting by pointing to each cube as it was counted.

#### Math Language

- What are some ways Maritza helped the child learn math vocabulary such as words to describe the relative height or length of objects?
- In what ways did Maritza invite the child to show her understanding of math vocabulary?

As the child explored the unit cubes, Maritza introduced a variety of descriptive and comparative vocabulary related to measurement (e.g., long, longest, tall, tallest, shorter, shortest, small). She invited the child to use comparative vocabulary by asking her questions using these words: "Is Charlie ... *shorter* than you?" In the measurement process, they also used words to describe quantity (e.g., five, six, more, less, add).

Maritza also frequently elaborated on the child's responses as a way to introduce relative height vocabulary. For example, when Maritza asked who in the child's family could be comparable to the smallest tower, the child answered, "My cousin Alexa's baby." Maritza elaborated by saying, "Your cousin Alexa's baby could be the *smallest* one."

"Is Charlie ... *shorter* than you?"

# 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<sup>5</sup> Early Math Practices.

- What is one M<sup>5</sup> 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 create an environment that promotes 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?
  - What are some ways you might learn about individual children's math experiences in the home?
  - How might you interact with preschoolers to help them explore mathematical concepts?
  - In what meaningful ways might you introduce mathematical vocabulary?
  - How might you invite children to represent their understandings in multiple ways (e.g., providing 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<sup>5</sup> Early Math Practices with preschoolers?