## Supporting Infants' Early Math Using M$^5$ Practices

# Math Is Everywhere: 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:

- **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$^5$ 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.

# 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.

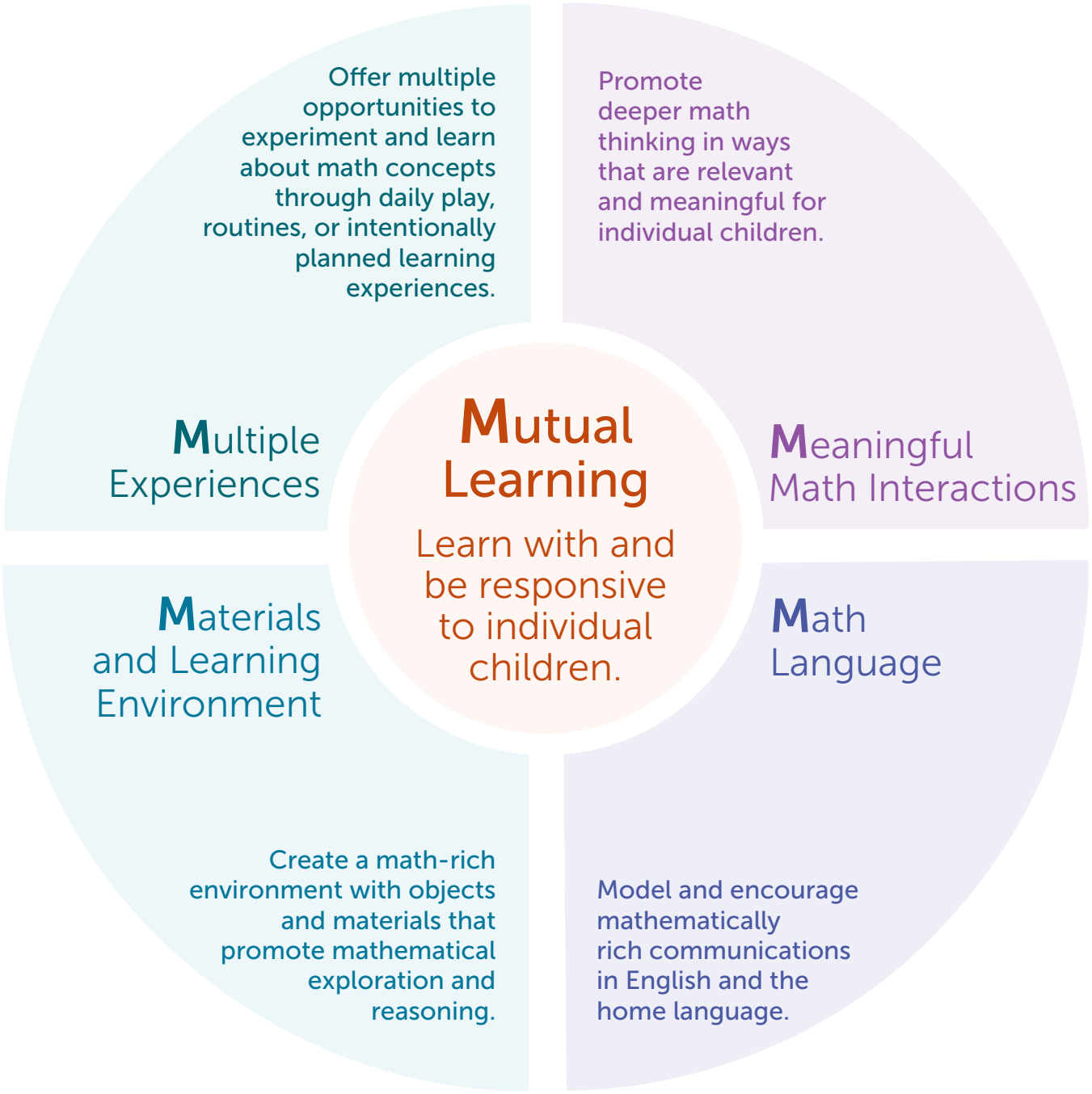
## **Unpack** M[5]

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

## Math Is Everywhere in the Infant Room

In this video, infants explore a variety of open-ended materials. Teacher Christina learns about individual children's interests and supports their early math development by offering math language, materials, meaningful math interactions, and multiple experiences to support children's growing understanding of number 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 Christina support children's exploration and math learning as they played?

### Mutual Learning

- What did Christina learn about the children as they explored the materials?
- In what ways was Christina responsive to children's interests, learning, and development?

### Meaningful Math Interactions

- What open-ended questions and prompts did Christina use to encourage children's exploration of math ideas?
- What scaffolds did Christina provide to support the children in making sense of mathematical concepts, such as spatial relationships, number sense, classification, and problem solving?

### Math Language

- What are some ways Christina helped children build their math vocabulary?
- In what ways did Christina invite the children to show their understanding of math vocabulary words such as *more*?

## Math Concepts and Skills Highlighted in This Video

- **Number sense:** Infants are learning that there are different amounts of things, and they begin to show an understanding of words like more or one.
- **Classification:** Infants show awareness of how objects connected to each other (e.g., objects that are round), and they match objects that are the same.
- **Spatial relationships:** Infants discover how objects and their own bodies move and fit in space and use trial and error when manipulating objects. They explore the size and shape of objects and show an understanding of words to describe size.
- **Problem solving:** Infants use simple physical actions to solve problems involving objects or their bodies. They try out multiple possible solutions to a problem or watch others solve a problem.

For more information about how infants and toddlers develop these concepts, visit the California Infant/Toddler Learning & Development Foundations.

## Unpack M$^5$

### Materials and Learning Environment

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

The environment included a variety of open-ended play materials to promote children's exploration, discovery, and learning. The tubs, jars, bowls, cylinders, and baskets were available for children to manipulate, fit together, or fill up with smaller objects such as balls or even their own bodies.

The materials offered many possibilities for infants to explore math concepts of size (e.g., big tub, little tub), quantity (e.g., one ball, two balls, more balls), position in space (e.g., inside the tub, on), and volume (e.g., filling up the cylinder, empty, full). For example, children discovered how only one child fit in the little tub, but two fit in the big tub. The infants used the small white tubs to sit inside, to fit in the bigger tubs, and to fill up with balls and dump the balls out.

Open-ended play materials that vary in size, volume, and shape allow children to explore ideas and approach learning in creative ways that the teacher may not anticipate.

### More from the Teacher

Watch Christina share about her choice of materials and early math interactions with the infants in her care.

## Multiple Experiences

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

Everyday play and interactions provide multiple ways to promote math learning in a variety of settings. Christina used indoor play time as an opportunity to invite infants to explore math concepts of size, quantity, position, and volume (empty vs. full).

Christina allowed the children to explore the materials on their own and then used teacher talk, such as describing events and verbally labeling objects, to provide early language support and make math concepts more visible. As the infants combined the objects in different ways (e.g., by putting the napkin rings and balls inside the basket or sitting inside the red tubs), Christina used effective ways to talk about math concepts and support children's learning and play.

## Mutual Learning

- What did Christina learn about the children as they explored the materials?
- In what ways was Christina responsive to children's interests, learning, and development?

As the children explored their environment, Christina observed how individual children interacted with different objects and with their peers. For example, when Deegan, Betsy, and Sophia put the balls inside the white tub, Christina observed the children filling the tub and said, "More in. Let's see if we can pick them all up."

Then, as Betsy pointed to a yellow ball that rolled away, Christina responded by providing words for Betsy's communication. "Oh, I see a yellow one over there. Would you like to get that one?" Then Sophia dumped the balls out of the tub. Christina joined Sophia and expressed her excitement about the balls falling. Each child explored the objects in their own ways. Christina followed their interests and responded to each individual child's learning and development by offering words for infants' communication, asking questions, and making suggestions.

> "Let's see if we can pick them all up."

Another example of Christina's responsiveness to individual children's interests was her interactions with Azaria. Throughout this clip, Azaria showed interest in the ice cream jar, exploring how the lid fit on top and how it could be taken off. Several times she walked to Christina and gave her an ice cream jar with the lid on top. The first time Azaria did this, Christina asked, "Do you want yours open?" and opened the jar while saying, "twist, twist, twist, open." Near the end of the clip, Azaria dropped the jar and then put the lid on top of the cylinder when she reassembled the pieces.

Azaria had discovered that both the cylinder and jar were round. Using language to describe Azaria's actions, Christina said, "You put the lid on top. How does that fit?" Christina observed closely, learned about Azaria's interests and actions, and responded in ways that supported her exploration and learning.

## Meaningful Math Interactions

- **What open-ended questions and prompts does Christina use to encourage children's exploration of math ideas?**
- **What scaffolds did Christina provide to support the children in making sense of mathematical concepts, such as spatial relationships, number sense, classification, and problem solving?**

Christina used a variety of strategies to support the children's exploration of math ideas, encourage thinking, and scaffold conceptual understanding. Christina described what the children were doing as they explored different materials, which helped provide early language support and nurture children's exploration of math ideas.

When Christina noticed that Yolo was interested in sitting inside the white tub, she introduced the big tubs. Then a few children sat inside the big tubs, and Christina described what the children were doing: "They put the little tubs *inside* the big tubs." When Betsy filled an ice cream jar with balls, Christina offered early language support by describing what Betsy was doing. Christina said, "Oh, you've got two in there. Pour it in the bowl. Oh, one rolled away!" As she described the action, Christina pointed to the ice cream jar and then to the ball that rolled away, which helped Betsy make connections between what happened and Christina's language.

> Oh, you've got two in there. Pour it in the bowl. Oh, one rolled away!"

Christina used prompts and questions to engage children and support their learning. For example, when Yolo began to climb into the tub with Deegan, Christina introduced math concepts related to spatial relationships: "Is there room for two boys in a tub?" In addition, when Yolo came by with a basket in which he had collected only round objects (balls and napkin rings), Christina asked, "What are you collecting, Yolo? Would you like a ball for your basket, Yolo?" Then after Yolo took a ball, Christina asked, "Do you want more?" Each prompt and question invited children to continue and extend their explorations, offered exposure to math vocabulary, and scaffolded conceptual understanding of number and classification.

## Math Language

- What are some ways Christina helped children build their math vocabulary?
- In what ways did Christina invite the children to show their understanding of vocabulary such as *more*?

Throughout the exploration of the tubs, Christina used math and spatial vocabulary to describe position or location (e.g., inside, in, on, into, top), volume (e.g., empty, full), size (e.g., little, big), and quantity (e.g., one, two, more). For example, she supported children's meaningful understanding of *two* when she chanted "tap, tap, tap *two* balls, tap, tap, tap *two* balls." To support understanding of *more*, Christina used some infant sign language when she signed "more" while verbally asking Sophia, "Do you want *more*?"

> "Would you like a ball for your basket, Yolo? Do you want more?"

Although the infants themselves were not yet about to produce their own math vocabulary, Christina invited them to demonstrate their understanding of some of the math vocabulary when she asked questions. For example, Christina asked Yolo, "Would you like a ball for your basket, Yolo? Do you want *more*?" Yolo then grabbed the ball and added it to his collection.

### More from the Teacher

Watch Christina describe the ways she uses mathematical vocabulary with the infants in her care.

## **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 to support early math that you observed in the video that you already use with infants 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 infants' early math learning?
  - How might you create an environment that nurtures infants' early math development?
  - What are some ways you might offer opportunities for infants 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 infants to help them explore math concepts and skills in their environment?
  - In what meaningful ways might you model math language?
- How might you promote meaningful interactions for children who are dual language learners? What are some ways you could support children's home language development during math experiences?
- 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 M[5] Early Math Practices with infants?