



Facilitator’s Guide

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Videos

Stream from http://resourcesforearlylearning.org/educators_pd/
“Engaging Children in Math” (overview)
“Integrate Math into Daily Activities”
“Use the Language of Math”
“Assess What Children Understand”

Introduction

This professional development training module is designed to help you lead educators in using best practices to teach math concepts in the preschool environment. It is one of several modules developed for early childhood educators by the Department of Early Education and Care of the Commonwealth of Massachusetts.

This training meets the guidelines for Continuing Education Units (CEUs) as outlined by the Massachusetts Association for the Education of Young Children (MassAEYC).

For more information about this professional development training module, visit http://resourcesforearlylearning.org/educators_pd/.

About this Guide

This Facilitator's Guide provides instructions and narrative for delivering a video-based training for early childhood educators. You'll find an agenda, learning goals, preparation suggestions, talking points, activities, and handouts. You'll also find general tips and resources to help you facilitate the training. Use these materials with the accompanying videos to lead family child care and center- and school-based educators in an engaging, content-rich training.

Note: To view the videos referenced in this guide, go to http://resourcesforearlylearning.org/educators_pd/. Select *“Engaging Children in Math.”* Be sure you have access to the videos prior to and while leading this training.

Learning Goals

After participating in this training, educators will be able to:

- Summarize the best practices for engaging young children in mathematics.
- Recognize how to integrate math learning opportunities into daily activities.
- Describe strategies for using math language throughout the curriculum.
- Assess children's mathematical understanding.
- Apply new knowledge to current practices.

Agenda

Introduction	15 minutes
Engaging Children in Math	5 minutes
Integrate Math into Daily Activities	15–20 minutes
Use the Language of Math	15–20 minutes
BREAK (optional)	5–10 minutes
Assess What Children Understand	15–20 minutes
Try It	15–20 minutes
Wrap Up	15–20 minutes
Total Time	90–120 minutes

Preparation

Before leading this training, you should:

- Watch the videos and get to know the best practices.
- Read through the training module. Become familiar with the talking points so that you can share them in a natural, conversational way.
- Obtain and test the technology you need to share the videos with participants and make sure you have a reliable Internet connection during the training.
- Gather any props or materials needed for the Try It activity.
- Rehearse and fine-tune your presentation to “make it your own.” Time yourself to make sure you are within the allotted time.
- Create a handout packet with copies of the following for each participant:
 - Self-Assessment
 - Learning Log
 - Try It
 - Best Practices
 - Learning Guidelines and Standards
 - Training Evaluation
- Consider working with a partner the first time you lead this training. You can learn from and support each other when preparing, practicing, and facilitating. After the training, you can reflect on participants’ evaluations together.

Facilitation Tips

Whether you're a new or experienced facilitator, these tips can help your training run smoothly.

- Arrive early to prepare the training room for optimal learning.
 - Place handout packets where participants check in.
 - Have pens or pencils and paper on every table.
 - Check your technology setup to make sure the videos play without problems.
- Create a space that is inviting and comfortable.
 - Play soft music as people arrive.
 - Greet participants with a smile and a handshake. A personal introduction helps set the stage for collaboration and learning.
- Invite partner or small group discussion.
 - Before the training begins, invite educators to identify a partner—people learn best when they have a chance to talk about what they are learning or thinking.
 - Allow a few minutes for partners to introduce themselves to each other.
 - During the training, provide opportunities for partner interaction.
- Keep participants engaged.
 - Follow the “ten-two rule” as you present the training: Speak for no longer than ten minutes at a time and then provide participants at least two minutes of interaction or activity.
 - Avoid simply reading the talking points that have been provided. Become familiar with each point so that you can keep the training engaging, fluid, and conversational.

Icebreaker Ideas

When working with a group of educators who may or may not know each other, it's a good idea to provide a few moments to “break the ice.” This allows people to relax, laugh, move, and get to know each other (and you). Below are just a few ideas you can use to begin a training session.

That's Me!

Read a statement aloud to the group. Ask participants to stand up, raise a hand in the air, and shout *That's me!* if the statement applies to them. It's fun to see which statements apply to all participants and which do not apply to any. Statements might include:

- *I teach at a family child care.*
- *I have worked with children for five years or more.*
- *I was born in Massachusetts.*
- *I write down the funny things that kids say.*
- *I laugh out loud at least once a day.*
- *I check Pinterest at least once a week.*
- *I have no idea what Pinterest is.*
- *I believe that there is no problem that good chocolate can't solve.*

You can come up with your own statements or invite a few participants to come up with statements. When they say their statement aloud, others (including you) can reply, *That's me!*

Weave a Web

Holding onto a ball of yarn, share your name and an interesting fact about yourself with participants. Keep the end piece as you toss the ball of yarn to a participant. Ask the participant to share his or her name and a personal fact, and hold onto the yarn as they toss the ball to another participant. Continue until everyone has had a turn and the “web” is complete.

Two Truths and a Lie

Ask participants to jot down two truths and one lie about themselves or their work with children. For example:

- *I speak Japanese.*
- *I am related to Davy Crockett.*
- *I have three sets of twins in my program this year.*

Form participants into small groups of three or four people. Have each person in the group read their statements aloud and ask the rest of the group to guess which statement is not true.

Four Corners

Post a word from a set of four related words in each corner of the room, such as:

- *lion, bear, eagle, deer*
- *desert, beach, mountain, city*
- *sushi, salad, enchilada, pizza*
- *hybrid, convertible, truck, Mustang*

Ask participants, *Are you a hybrid, convertible, truck, or Mustang?* Direct participants to move to the corner of the room with which they most identify. Ask participants, now in small groups in their corners, to share with one another why they chose that corner and how it represents their interests, so that they can discover common attributes they may share. Have each small group pick one person to share the group’s common attributes with the larger group. Repeat the process with another set of four words as many times as you like.

People Bingo

Photocopy and distribute the “bingo card” below. Invite participants to find people who match a fact listed on the card and have them sign off on that fact. Each person can sign off on only one fact. Explain that when a participant has obtained five signatures in a row (horizontally, vertically, or diagonally), he or she should shout *Bingo!* and introduce the people who signed his or her card to the rest of the group.

People Bingo				
Has traveled outside the U.S.	Likes pineapple on pizza	Has lived in MA for more than 10 years	Knows how to juggle	Has never been on a plane
Can speak a foreign language	Has 3 or more brothers	Likes to camp	Has been scuba diving	Reads the Sunday paper
Likes to scrapbook	Has a summer birthday	FREE SPACE	Likes to garden	Can say the alphabet backwards
Likes math	Does crossword puzzles	Owens a cat	Has been to Alaska	Likes to run
Likes thunderstorms	Has watched a meteor shower	Is afraid of snakes	Knows how to sew	Can play basketball

Training

Introduction

(15 minutes)

Welcome Participants to the Training

- Introduce yourself and share your background and experience.
- Announce the length of the training (1½–2 hours) and note other logistics, such as break times, restroom location, and so on.
- Review the agenda and explain the structure of the training.
 - Participants will watch an overview video and then three short videos that explore best practices in creating a learning environment.
 - After each video, participants will briefly discuss the main points and reflect on what they have learned.
 - Participants will also have the opportunity to share and reflect on their own practices.
- Share the learning goals and objectives. Participants will:
 - Explore the best practices for engaging children in math.
 - Learn how to integrate mathematics into daily activities.
 - Discover strategies for using math language throughout the curriculum.
 - Examine how to assess children's mathematical understandings.
 - Apply new knowledge to current practices.
- Introduce the Learning Log.
 - The Learning Log includes questions to help participants identify best practices and distill the important points made in each video. The *viewing questions* reinforce ideas from the videos. The *reflection questions* help educators draw connections to their own experiences.
 - The Learning Log can also be used to jot down notes, questions, and ideas.
- Consider doing an icebreaker activity to get participants “warmed up” and ready to learn and interact. (See Icebreakers Ideas for suggestions.)
- Ask each participant to identify a partner to work with during the training and encourage them to share ideas. (You can offer small group discussions if you prefer.)

Complete the Self-Assessment

Educators grow and hone their skills by continually identifying their own strengths and training needs and reflecting on their own practices.

- Invite participants to complete the first half of the Self-Assessment to help them discover the skills they already possess and to identify those they would like to work on.
- Explain that toward the end of the training, participants will complete the second half of the Self-Assessment to measure their growth and learning.

Engaging Children in Math

(5 minutes)

Introduce the Topic

Young children show an early use of math when they count their fingers and toes, show and tell how old they are, compare who has more or less juice, or figure out who is taller and tallest. Early math experiences like these are the foundation for understanding more complex mathematical ideas and concepts, and are integral in helping children understand, explain, and describe their world. Early childhood educators can help strengthen this beginning foundation by integrating math into daily activities, regularly using the language of math, and observing and assessing children's understanding of math concepts and skills.

Introduce and View the Video

Introduce the overview video featuring Eleonora Villegas-Reimers, Associate Professor of Education at Wheelock College. Use this brief video to set the stage for a discussion of best practices in teaching early math concepts and vocabulary.



"Engaging Children in Math" (approx. 2 min)

Integrate Math into Daily Activities

(15–20 minutes)

Introduce the Best Practice

The early childhood center offers a wealth of opportunities each day for children to think mathematically during daily calendar activities, snack time, read alouds, outdoor play, in learning centers, and so on. Educators can use these experiences, whether formal or informal, planned or organic, to prepare a child for deeper mathematical learning.

- **Use routine play experiences** to encourage children to use their mathematical vocabulary. For example, incorporate words such as *more*, *less*, *bigger*, *shorter*, and *counting* into conversation during art projects, block play, snack time, and physical play.

- **Utilize learning centers** to provide opportunities for children to connect prior knowledge to newly-learned concepts and vocabulary. For example, the Pretend and Play Center might include play money, a scale for weighing, or a yardstick for measuring. In the Block Center, children can group similar shapes together. While painting or drawing in the Art Center, children can trace and identify shapes or identify structures as bigger, smaller, longer, or shorter. In the Library Center, children can browse number and counting books.
- **Provide a range of materials** that support mathematical learning, such as number cards for number recognition, connecting cubes for counting, or nonstandard measuring tools. Scales can help children weigh and compare. Number puzzles and giant hopscotch games are also fun learning tools.

Introduce and View the Video

Tell participants that in this video, they will visit Tracy's family child care program and Liz's center-based program. In both settings, educators offer children a rich menu of math-based learning throughout the day.

Ask participants to look for effective strategies used by the educators in the video. Use these questions to guide their viewing:

- *How is math integrated into daily activities?*
- *How do the learning centers encourage children to use math concepts (such as counting, measuring, and sorting)?*



"Integrate Math into Daily Activities" (approx. 3 min)

Partner/Small Group Share

After viewing the video, get participants thinking, talking, and learning together.

- Invite participants to share with each other, in pairs or small groups, what they noticed as they watched. Challenge them to use the language stem *I noticed...* rather than *I liked...*
- Suggest that participants jot down notes, ideas, or questions in their Learning Log.

Review

Share and expand on key points covered in the video. Use the following questions and talking points in your discussion. Ask participants to offer examples from the video as well as to draw upon their own experiences.

Why is it important to teach math concepts or ideas in a variety of settings?

- Most children need to practice and reinforce a skill or concept over time, in different formats, and in several contexts to help them thoroughly understand the concept.

How can educators utilize everyday activities to encourage children's use of math?

- In addition to providing specific instruction, embed math learning in nearly all activities of the day. For example, children might count, sort, compare, measure, sing counting songs, and participate in counting games and puzzles to practice skills.
- Use daily routines (such as outdoor games or exercise, lining up, waiting a turn, gathering in a circle, and tidying up) to teach and use basic mathematical language and concepts such as *first*, *next*, *last*, *bigger*, *smaller*, *more*, *less*, *fewer*, and *how many in all*.
- Look for opportunities during typical classroom experiences. For example, children could count the number of days in a week or the months in a year, the number of children in a circle, or the number of children wearing red sneakers. They could determine who is first or last in line and who has more letters in his or her name. Children could also draw shapes in chalk on outside play areas to help with geometric recognition.

How can educators design learning centers to promote children's use of mathematical concepts and vocabulary?

- Design learning centers to support the natural exploration of mathematical concepts and vocabulary. Here children can explore by themselves and/or with the support and guidance of an educator. For example,
 - In the Science and Math Center, offer connecting cubes, counters, number lines, hundreds charts, and other manipulatives to help children discover patterns and compare shapes, sizes, length, height, and width.
 - Playing in the Block Center gives children the opportunity to explore, identify, and understand physical relationships and balance, and supports learning about measuring and comparing (e.g., *longer*, *shorter*, *wider*).
 - As children draw or paint in the Art Center, they work with shapes, colors, patterns, textures, size, and shape.
 - The Pretend and Play Center can become a restaurant, store, or a bakery, where play money is exchanged, plates are counted, and snacks are shared evenly. Environmental print on signs announcing prices, times, and “specials” of the day (*buy 2 apples here*) provide additional math and reading opportunities.
 - Reading counting and other number books is a great way for children to learn math vocabulary and concepts.

- At the Sensory Table Center, children can measure and compare amounts of water or sand, fill and empty different-sized containers, and estimate how many cups or teaspoons will fill a container.

View Again (optional)

Emphasize the key messages by showing the video a second time, if possible. Seeing the video again will give participants an opportunity to notice things they may have missed and to expand their learning.

Reflect

Help participants make the connection between what they have learned and what they do in their own programs. Ask them to answer the *reflection questions* in the Learning Log.

Use the Language of Math

(15–20 minutes)

Introduce the Best Practice

To help children develop mathematical ideas and be able to express them naturally, educators can “flood the environment” with mathematical talk and concepts, and encourage children to use math talk, too.

- **Beginning and ending the day routines** offer rich opportunities for math talk. For example,
 - lining up (*Let's count the number of boys and girls in line.*)
 - sorting classroom items (*How many red buttons did you find?*)
 - taking attendance (*We have more boys than girls today.*)
- **Calendar routines** give children daily experience in counting, number recognition, pattern recognition, and concepts of *before*, *after*, *more than*, *less than*, *first*, *next*, and *last*.
- **Outdoor or active play** promotes the use of various math words and math ideas, such as *circle*, *line*, *before*, *after*, *next*, *triangle*, *more*, *fewer*, *shorter*, *longer*, and *add*.
- **Snack time** offers many opportunities to introduce math language. Concepts of shape, size, quantity, position, length, and volume can be introduced when cutting a sandwich, pouring a cup of juice, holding a paper plate, or merely counting the children at the table.

Introduce and View the Video

Tell participants they will watch Liz and Tracy take advantage of multiple opportunities to teach and use math words and concepts throughout the day.

Ask participants to look for effective strategies used by the educators in the video. Use these questions to guide their viewing:

- *How do the educators “flood the environment” with math talk?*
- *How is math talk integrated into daily routines and activities?*



“Teach and Use the Language of Math”

(approx. 3 min)

Partner/Small Group Share

After viewing the video, get participants thinking, talking, and learning together.

- Invite participants to share with each other, in pairs or small groups, what they noticed as they watched. Challenge them to use the language stem *I noticed...* rather than *I liked...*
- Suggest that participants jot down notes, ideas, or questions in their Learning Log.

Review

Share and expand on key points covered in the video. Use the following questions and talking points in your discussion. Ask participants to offer examples from the video as well as to draw upon their own experiences.

Why is it important to “flood the environment” with math language?

- Math language gives children a way to express their growing understanding of math concepts.
- Children need multiple opportunities to use mathematical language in a variety of activities.

How can educators use math talk throughout the day?

- Use daily calendar routines to engage children in patterning, number recognition, and counting to 10.
- Take attendance by counting the number of children present and graphing the results. (*How many are boys? How many are girls? Do we have more boys? Fewer boys?*)
- Use Snack Time to count, sort, and classify. For example, count the crackers on the plate, determine equal shares, find the longest pretzel, or talk about the shape of a sandwich or plate.

- Use concrete objects to model real world addition or subtraction. (*How many crackers do we have now? What will happen if we take one away?*)
- Use lining up to ask children to identify relative positions of objects in space. (*Who is first in line? Who is next? Who is last in line?*).
- Use the clock and a thermometer to teach mathematical vocabulary such as *numbers, temperature, time, higher, lower, before, and after*.
- Utilize learning centers. At the Block Center, for example, have children explore shape, lengths, weights, and volume using words such as *longer, shorter, heavier, lighter, higher, lower, more, fewer, big, bigger, and biggest*.
- Use classroom chores to teach concepts such as *same, different, high, low, inside, outside, on top of, and below*. The task of sorting, for example, requires a basic understanding of classes or kinds of objects. (*Put all the pencils in the case and all the crayons in the bucket.*)
- Use nonstandard measures such as lengths of yarn or Unifix cubes to determine distance, length, or height comparisons. (*How many cubes tall is your tower? What about measuring your tower now with string?*)

View Again (optional)

Emphasize the key messages by showing the video a second time, if possible. Seeing the video again will give participants an opportunity to notice things they may have missed and to expand their learning.

Reflect

Help participants make the connection between what they have learned and what they do in their own programs. Ask them to answer the *reflection questions* in the Learning Log.

Break (optional)

(5–10 minutes)

Assess What Children Understand

(15–20 minutes)

Introduce the Best Practice

To fully support children's math learning, educators should thoughtfully and continually observe and assess what skills children have or do not have, and what concepts they understand or misunderstand.

- **Watch and listen.** Notice what challenges children face and where children excel. Carefully observe performance, interactions with peers and adults, answers to questions, and the words children use to describe their world.
- **Customize instruction.** Use observations to build an intentional math curriculum for each child's needs. For example,
 - Use small group and one-on-one activities to target specific needs for specific children.
 - Challenge children who demonstrate advanced mathematical understandings by introducing more complex ideas and vocabulary.

Introduce and View the Video

Tell participants they will look again at Tracy's and Liz's programs to see how their careful observations of children's math understanding informs their teaching.

Ask participants to look for effective strategies used by the educators in the video. Use these questions to guide their viewing:



"Assess What Children Understand" (approx. 3 min)

- *How do the educators assess children's progress?*
- *How do the educators customize instruction based on each child's math learning needs?*

Partner/Small Group Share

After viewing the video, get participants thinking, talking, and learning together.

- Invite participants to share with each other, in pairs or small groups, what they noticed as they watched. Challenge them to use the language stem *I noticed...* rather than *I liked...*
- Suggest that participants jot down notes, ideas, or questions in their Learning Log.

Review

Share and expand on key points covered in the video. Use the following questions and talking points in your discussion. Ask participants to offer examples from the video as well as to draw upon their own experiences.

What is assessment and why is it important?

- Assessment is the processes of identifying how a child is doing in comparison to how he or she was doing before, and in comparison to what is expected at a child's developmental age.
- Assessment is critical to understanding each child's unique strengths and needs.

- Assessment allows educators to support children's development and learning more effectively as it offers information about the challenges the child is facing and how to best support him/her.

How can educators use informal assessment to identify children's strengths or needs in math?

- Make mental notes or keep a log to track children's math knowledge and plan the next activities or instructional goal.
- Use small group and one-on-one instruction to better assess children's strengths and needs, address unique learning needs, target a skill, and plan for next steps for learning.

How can educators customize the math curriculum for every child's needs?

- Provide opportunities for small group or one-on-one activities.
- Seek an alternate way to teach a topic. If a child does not recognize shapes, try making the shapes in a different medium (such as shaving cream, paint, chalk, or yarn).

View Again (optional)

Emphasize the key messages by showing the video a second time, if possible. Seeing the video again will give participants an opportunity to notice things they may have missed and to expand their learning.

Reflect

Help participants make the connection between what they have learned and what they do in their own program. Ask them to answer the reflection questions in the Learning Log.

Try It**(15–20 minutes)**

The Try It activity helps educators plan how to apply new ideas to their own early childhood program. Ask participants to work with a partner or in small groups. Direct their attention to the Try It handout in their packets.

Math All Around

Participants strategize how to integrate math into various learning centers.

- Ask participants to list the learning centers in their environment and ways to integrate math learning into an activity at each one.
- Ask participants to list the goals and objectives of each activity, and the supporting math vocabulary.
- Have participants list questions they can ask to assess children's understanding.

- Then, have participants think of strategies to meet the needs of children who need extra help and those with accelerated math understandings.
- Have participants discuss their ideas with their partner or group.

Wrap Up

(5–10 minutes)

- Invite participants to complete the second half of the “Self-Assessment” and then measure their growth and learning.
- Ask participants to look over their notes from the training and jot down three things that they want to remember from today in their Learning Log.
- Invite partners or small groups to meet and share their three “keepers.” Then ask a few participants to share their “keepers” with the larger group.
- Thank participants for attending. Remind them to revisit the video or get activity ideas at Resources for Early Learning: <http://resourcesforearlylearning.org/>
- Encourage them to fill out and return the Training Evaluation.

Glossary

assessment: an accounting of what learners know using objective evidence. Informal assessment is ongoing as adults monitor young children’s learning each day

math concepts: early ideas about numbers, counting, shapes, measurement, time, greater than, less than, money

math language: commonly used math vocabulary, such as *more, less, how many in all, fewer, add, take away, number, triangle, square, and circle*

open-ended questions: questions that require critical thinking, invite opinion or explanation, and result in more than a one-word answer



Self-Assessment

Name: _____

Date: _____

Before the training: Place a ✓ in the box that best represents your current comfort level.

After the training: Place a ✓ in the box that best represents your new comfort level.

1 = Very uncomfortable 2 = Uncomfortable 3 = Neutral 4 = Comfortable 5 = Very comfortable

	Before					After				
	1	2	3	4	5	1	2	3	4	5
General I am comfortable with my ability to . . .										
Create an environment that enhances children’s natural interest in mathematics.										
Create opportunities for children to build on the mathematical concepts and language they already understand and use.										
Integrate Math into Daily Activities I am comfortable with my ability to . . .										
Design a learning environment that encourages natural exploration and use of math concepts and ideas.										
Design opportunities for children to use numbers and number concepts in daily activities.										
Design everyday activities that rely on children’s use of mathematical concepts.										
Use the Language of Math I am comfortable with my ability to . . .										
Use math concepts and math language throughout the day.										
Use both indoor and outdoor spaces to teach and reinforce mathematical language and ideas.										
Assess What Children Understand I am comfortable with my ability to . . .										
Be a skilled observer of developing math skills in each child.										
Keep track of the math learning of each individual child from the beginning to the end of the year.										
Use my knowledge of how my students understand certain concepts to plan new learning activities for individuals and groups.										
Design small group activities to address special needs.										



Learning Log

Integrate Math into Daily Activities

View

In the video:

- *How is math integrated into daily activities?*

- *How do the learning centers encourage children to use math concepts (such as counting, measuring, and sorting)?*

Reflect

In your program:

- *Which learning areas are working well to encourage children's mathematical thinking? Which could be improved?*

- *What adjustments could you make in the setup or materials offered in those areas?*

Notes

Use the Language of Math

View

In the video:

- *How do the educators “flood the environment” with math talk?*

- *How is math talk integrated into daily routines and activities?*

Reflect

In your program:

- *What ideas or strategies would you adopt to help children learn and use math language accurately and often?*

- *What did you learn that you might incorporate into your program?*

Notes

Assess What Children Understand

View

In the video:

- *How do the educators assess children's progress?*

- *How do the educators customize instruction based on each child's math learning needs?*

Reflect

In your program:

- *How do you currently assess children's growth in mathematical learning?*

- *What did you learn that you might incorporate into your program?*

Notes



BRAIN BUILDING IN PROGRESS

Resources for Early Learning

Engaging Children in Math

Try It

Math All Around

Strategize how to integrate math into various learning centers.

1. Make a list of the learning centers in your environment.
2. Think of a math activity that can be planned for each center.
3. List three ideas for math vocabulary that might be developed in each center.

Try It (CONTINUED)

4. List the math goals and objectives for each activity.

5. List the strategies you will use to meet the needs of children who need extra help.

6. Suggest ways the activities can be tailored for children with accelerated math understandings.



Best Practices

Young children show an early use of math when they count their fingers and toes, show and tell how old they are, compare who has more or less juice, or figure out who is taller and tallest. Early math experiences like these are the foundation for understanding more complex mathematical ideas and concepts, and are integral in helping children understand, explain, and describe their world. Early childhood educators can help strengthen this beginning foundation by integrating math into daily activities, regularly using the language of math, and observing and assessing children's understanding of math concepts and skills.

Integrate Math into Daily Activities

The early childhood center offers a wealth of opportunities each day for children to think mathematically during daily calendar activities, snack time, read alouds, outdoor play, in learning centers, and so on. Educators can use these experiences, whether formal or informal, planned or organic, to prepare a child for deeper mathematical learning.

- **Use routine play experiences** to encourage children to use their mathematical vocabulary. For example, incorporate words such as *more*, *less*, *bigger*, *shorter*, and *counting* into conversation during art projects, block play, snack time, and physical play.
- **Utilize learning centers** to provide opportunities for children to connect prior knowledge to newly-learned concepts and vocabulary. For example, the Pretend and Play Center might include play money, a scale for weighing, or a yardstick for measuring. In the Block Center, children can group similar shapes together. While painting or drawing in the Art Center, children can trace and identify shapes or identify structures as bigger, smaller, longer, or shorter. In the Library Center, children can browse number and counting books.
- **Provide a range of materials** that support mathematical learning, such as number cards for number recognition, connecting cubes for counting, or nonstandard measuring tools. Scales can help children weigh and compare. Number puzzles and giant hopscotch games are also fun learning tools.

Why is it important to teach math concepts or ideas in a variety of settings?

- Most children need to practice and reinforce a skill or concept over time, in different formats, and in several contexts to help them thoroughly understand the concept.

How can educators utilize everyday activities to encourage children's use of math?

- In addition to providing specific instruction, embed math learning in nearly all activities of the day. For example, children might count, sort, compare, measure, sing counting songs, and participate in counting games and puzzles to practice skills.
- Use daily routines (such as outdoor games or exercise, lining up, waiting a turn, gathering in a circle, and tidying up) to teach and use basic mathematical language and concepts such as *first*, *next*, *last*, *bigger*, *smaller*, *more*, *less*, *fewer*, and *how many in all*.
- Look for opportunities during typical classroom experiences. For example, children could count the number of days in a week or the months in a year, the number of children in a circle, or the number of children wearing red sneakers. They could determine who is first or last in line and who has more letters in his or her name. Children could also draw shapes in chalk on outside play areas to help with geometric recognition.

How can educators design learning centers to promote children's use of mathematical concepts and vocabulary?

- Design learning centers to support the natural exploration of mathematical concepts and vocabulary. Here children can explore by themselves and/or with the support and guidance of an educator. For example,
 - In the Science and Math Center, offer connecting cubes, counters, number lines, hundreds charts, and other manipulatives to help children discover patterns and compare shapes, sizes, length, height, and width.
 - Playing in the Block Center gives children the opportunity to explore, identify, and understand physical relationships and balance, and supports learning about measuring and comparing (e.g., *longer*, *shorter*, *wider*).
 - As children draw or paint in the Art Center, they work with shapes, colors, patterns, textures, size, and shape.
 - The Pretend and Play Center can become a restaurant, store, or a bakery, where play money is exchanged, plates are counted, and snacks are shared evenly. Environmental print on signs announcing prices, times, and "specials" of the day (*buy 2 apples here*) provide additional math and reading opportunities.
 - Reading counting and other number books is a great way for children to learn math vocabulary and concepts.
 - At the Sensory Table Center, children can measure and compare amounts of water or sand, fill and empty different-sized containers, and estimate how many cups or teaspoons will fill a container.

Use the Language of Math

To help children develop mathematical ideas and be able to express them naturally, educators can “flood the environment” with mathematical talk and concepts, and encourage children to use math talk, too.

- **Beginning and ending the day routines** offer rich opportunities for math talk. For example,
 - lining up (*Let's count the number of boys and girls in line.*)
 - sorting classroom items (*How many red buttons did you find?*)
 - taking attendance (*We have more boys than girls today.*)
- **Calendar routines** give children daily experience in counting, number recognition, pattern recognition, and concepts of *before*, *after*, *more than*, *less than*, *first*, *next*, and *last*.
- **Outdoor or active play** promotes the use of various math words and math ideas, such as *circle*, *line*, *before*, *after*, *next*, *triangle*, *more*, *fewer*, *shorter*, *longer*, and *add*.
- **Snack time** offers many opportunities to introduce math language. Concepts of shape, size, quantity, position, length, and volume can be introduced when cutting a sandwich, pouring a cup of juice, holding a paper plate, or merely counting the children at the table.

Why is it important to “flood the environment” with math language?

- Math language gives children a way to express their growing understanding of math concepts.
- Children need multiple opportunities to use mathematical language in a variety of activities.

How can educators use math talk throughout the day?

- Use daily calendar routines to engage children in patterning, number recognition, and counting to 10.
- Take attendance by counting the number of children present and graphing the results. (*How many are boys? How many are girls? Do we have more boys? Fewer boys?*)
- Use Snack Time to count, sort, and classify. For example, count the crackers on the plate, determine equal shares, find the longest pretzel, or talk about the shape of a sandwich or plate.

Best Practices (CONTINUED)

- Use concrete objects to model real world addition or subtraction. (*How many crackers do we have now? What will happen if we take one away?*)
- Use lining up to ask children to identify relative positions of objects in space. (*Who is first in line? Who is next? Who is last in line?*).
- Use the clock and a thermometer to teach mathematical vocabulary such as *numbers, temperature, time, higher, lower, before, and after*.
- Utilize learning centers. At the Block Center, for example, have children explore shape, lengths, weights, and volume using words such as *longer, shorter, heavier, lighter, higher, lower, more, fewer, big, bigger, and biggest*.
- Use classroom chores to teach concepts such as *same, different, high, low, inside, outside, on top of, and below*. The task of sorting, for example, requires a basic understanding of classes or kinds of objects. (*Put all the pencils in the case and all the crayons in the bucket.*)
- Use nonstandard measures such as lengths of yarn or Unifix cubes to determine distance, length, or height comparisons. (*How many cubes tall is your tower? What about measuring your tower now with string?*)

Assess What Children Understand

To fully support children's math learning, educators should thoughtfully and continually observe and assess what skills children have or do not have, and what concepts they understand or misunderstand.

- **Watch and listen.** Notice what challenges children face and where children excel. Carefully observe performance, interactions with peers and adults, answers to questions, and the words children use to describe their world.
- **Customize instruction.** Use observations to build an intentional math curriculum for each child's needs. For example,
 - Use small group and one-on-one activities to target specific needs for specific children.
 - Challenge children who demonstrate advanced mathematical understandings by introducing more complex ideas and vocabulary.

What is assessment and why is it important?

- Assessment is the processes of identifying how a child is doing in comparison to how he or she was doing before, and in comparison to what is expected at a child's developmental age.

Best Practices (CONTINUED)

- Assessment is critical to understanding each child's unique strengths and needs.
- Assessment allows educators to support children's development and learning more effectively as it offers information about the challenges the child is facing and how to best support him/her.

How can educators use informal assessment to identify children's strengths or needs in math?

- Make mental notes or keep a log to track children's math knowledge and plan the next activities or instructional goal.
- Use small group and one-on-one instruction to better assess children's strengths and needs, address unique learning needs, target a skill, and plan for next steps for learning.

How can educators customize the math curriculum for every child's needs?

- Provide opportunities for small group or one-on-one activities.
- Seek an alternate way to teach a topic. If a child does not recognize shapes, try making the shapes in a different medium (such as shaving cream, paint, chalk, or yarn).

Glossary

assessment: an accounting of what learners know using objective evidence. Informal assessment is ongoing as adults monitor young children's learning each day

math concepts: early ideas about numbers, counting, shapes, measurement, time, greater than, less than, money

math language: commonly used math vocabulary, such as *more, less, how many in all, fewer, add, take away, number, triangle, square, and circle*

open-ended questions: questions that require critical thinking, invite opinion or explanation, and result in more than a one-word answer

View the self-paced video workshop at <http://resourcesforearlylearning.org/educators>.



Learning Guidelines and Standards

This professional development training module is aligned to Massachusetts standards and guidelines.

Massachusetts Quality Rating and Improvement System (QRIS)

Center and School Based:

- **Curriculum and Learning 1A: Curriculum, Assessment, and Diversity: Level 2** Staff demonstrate language and literacy skills either in English or the child's language that provide a model for children.
- **Curriculum and Learning 1A: Curriculum, Assessment, and Diversity: Level 4** Program uses progress reports, appropriate screening tools, formative assessments, and information gathered through observation to inform curriculum planning, and use results to monitor each child's progress across developmental domains, and inform program decision-making (e.g. curriculum content, strategies for improved staff implementation, and professional development.)
- **Curriculum and Learning 1B: Teacher-Child Relationships and Interactions: Level 2** All staff receive orientation and ongoing formal professional development and supervision in how to support positive relationships and interactions through positive, warm and nurturing interactions.
- **Curriculum and Learning 1B: Teacher-Child Relationships and Interactions: Level 3** Staff engage children in meaningful conversations, use open-ended questions and provide opportunities throughout the day to scaffold their development of more complex receptive and expressive language, support children's use of language to share ideas, problem solve and have positive peer interactions.
- **Curriculum and Learning 1B: Teacher-Child Relationships and Interactions: Level 4** Staff utilizes teaching strategies that ensure a positive classroom environment, engage children in learning and promote critical thinking skills.

Family Child Care:

- **Curriculum and Learning 1A: Curriculum, Assessment, and Diversity: Level 2** Materials reflect the language and culture of the children in the family child care home, their communities, and represent the diversity of society.

- **Curriculum and Learning 1A: Curriculum, Assessment, and Diversity: Level 3**
Either directly or through a network or system, Educator uses screening tools, progress reports, formative assessments, and information gathered through observation to set goals for individual children across developmental domains.
- **Curriculum and Learning 1A: Curriculum, Assessment, and Diversity: Level 4**
Either directly or through a system or network, provider uses screening tools, progress reports formative assessments, and information gathered through observation to inform curriculum planning, and use results to monitor each child's progress across developmental domains.
- **Curriculum and Learning 1B: Teacher-Child Relationships and Interactions: Level 2**
Educator has participated in formal professional development on how to support positive relationships and interactions with children through positive, warm and nurturing interactions.
- **Curriculum and Learning 1B: Teacher-Child Relationships and Interactions: Level 4**
Educators engage children in meaningful conversations, as age and developmentally appropriate, use open-ended questions and provide opportunities throughout the day to scaffold their language to support the development of more complex receptive and expressive language, support children's use of language to share ideas, problem solve and have positive peer interactions; Educators utilize teaching strategies that ensure a positive learning environment, engage children in learning and promote critical thinking skills.

National Association for the Education of Young Children (NAEYC)

Guidelines for Developmentally Appropriate Practice:

- **(2) Teaching to enhance development and learning B.2** Teachers continually gather information about children in a variety of ways and monitor each child's learning and development to make plans to help children progress.
- **(2) Teaching to enhance development and learning E.4** Teachers provide experiences, materials, and interactions to enable children to engage in play that allows them to stretch their boundaries to the fullest in their imagination, language, interaction, and self-regulation as well as to practice their newly acquired skills.
- **(2) Teaching to enhance development and learning F.2** To stimulate children's thinking and extend their learning, teachers pose problems, ask questions, and make comments and suggestions.

Standards (continued)

- **(2) Teaching to enhance development and learning F.3** To extend the range of children’s interests and the scope of their thought, teachers present novel experiences and introduce stimulating ideas, problems, experiences, or hypotheses.
- **(2) Teaching to enhance development and learning F.6** To enhance children’s conceptual understanding, teachers use various strategies, including intensive interview and conversation, that encourage children to reflect on and “revisit” their experiences.
- **(2) Teaching to enhance development and learning G.1** Teachers recognize and respond to the reality that in any group, children’s skills will vary and they will need different levels of support. Teachers also know that any one child’s level of skill and need for support will vary over time.
- **(2) Teaching to enhance development and learning G.2** Scaffolding can take a variety of forms; for example, giving the child a hint, adding a cue, modeling the skill, or adapting the materials and activities. It can be provided in a variety of contexts, not only in planned learning experiences but also in play, daily routines, and outdoor activities.
- **(3) Planning curriculum to achieve important goals A.1** Teachers consider what children should know, understand, and be able to do across the domains of physical, social, emotional, and cognitive development and across the disciplines, including language, literacy, mathematics, social studies, science, art, music, physical education, and health.
- **(3) Planning curriculum to achieve important goals D.1** Teachers plan curriculum experiences that integrate children’s learning within and across the domains (physical, social, emotional, cognitive) and the disciplines (including language, literacy, mathematics, social studies, science, art, music, physical education, and health).
- **(4) Assessing children’s development and learning C** There is a system in place to collect, make sense of, and use the assessment information to guide what goes on in the classroom (formative assessment). Teachers use this information in planning curriculum and learning experiences and in moment-to-moment interactions with children—that is, teachers continually engage in assessment for the purpose of improving teaching and learning.

Massachusetts Curriculum Framework for Mathematics

Counting and Cardinality:

- **MA.PK.CC.1** Listen to and say the names of numbers in meaningful contexts.
- **MA.PK.CC.2** Recognize and name written numerals 0–10.
- **MA.PK.CC.3** Understand the relationships between numerals and quantities up to ten.

- **MA.PK.CC.4** Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.
- **MA.PK.CC.5** Use comparative language, such as *more/less than*, *equal to*, to compare and describe collections of objects.

Operations and Algebraic Thinking:

- **MA.PK.OA.1** Use concrete objects to model real-world addition (putting together) and subtraction (taking away) problems up through five.

Measurement and Data:

- **MA.PK.MD.1** Recognize the attributes of length, area, weight, and capacity of everyday objects using appropriate vocabulary (e.g., *long*, *short*, *tall*, *heavy*, *light*, *big*, *small*, *wide*, *narrow*).
- **MA.PK.MD.2** Compare the attributes of length and weight for two objects, including longer/shorter, same length; heavier/lighter, same weight; holds more/less, holds the same amount.



Training Evaluation

Thank you for your participation. Please indicate your impressions of the training below.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The training met my expectations.					
I will be able to apply what I have learned.					
The trainer was knowledgeable.					
The training was organized and easy to follow.					
Participation and interaction was encouraged.					
The handouts were pertinent and useful.					

1. How would you rate this training overall?

Excellent *Good* *Average* *Poor*

2. What was most beneficial to you in this training?

3. What suggestions do you have to improve this training?