Facilitator's Guide

Table of Contents

Videos

Stream from http://resourcesforearlylearning.org/educators_pd/
"Leading Children in Hands-On Exploration" (Overview)
"Prepare Ahead"
"Guide Children's Explorations"
"Help Children Make Connections"

Introduction

This professional development training module is designed to help you lead educators in using best practices to lead hands-on explorations with young children. 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 access the videos referenced in this guide, go to http://resourcesforearlylearning.org/educators_pd/. Select "Leading Children in Hands-On Exploration." 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 leading children in hands-on exploration.
- Describe how to prepare for leading children in hands-on exploration.
- Formulate open-ended questions that help deepen children's thinking.
- Use strategies to help children make connections between science concepts and their everyday lives.
- Apply new knowledge to current practices.

Agenda

Introduction	15 minutes
Leading Hands-On Exploration (Overview)	5 minutes
Prepare Ahead	15–20 minutes
Guide Children's Explorations	15–20 minutes
BREAK (optional)	5–10 minutes
Help Children Make Connections	15–20 minutes
Try It	15–20 minutes
Wrap Up	5–10 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
    - 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**	**F R E E S P A C E**	**Likes to garden**	**Can say the alphabet backwards**
Likes math	**Does crossword puzzles**	**Owns 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 leading children in hands-on exploration.
    - Learn how to prepare for leading children in hands-on exploration.
    - Examine how to use open-ended questions to guide children's thinking.
    - Discover strategies to help children make connections between science concepts and their everyday lives.
    - 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.

Leading Children in Hands-On Exploration (5 minutes)

Introduce the Topic

Young children are naturally inquisitive and curious about the world around them. They want to know how things work, what things do, and what will happen next. Educators can build upon children's natural curiosity by guiding them in hands-on science explorations. When children engage in hands-on science, they acquire scientific knowledge and learn the processes and practices of science. They are introduced to the concepts and big ideas that are central to science.

Educators can make these experiences more meaningful for children by being intentional in their planning so that they understand the science concepts, can guide and support children's explorations, and can help children make connections and express their thinking in multiple ways.

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 leading children in hands-on exploration.

"Leading Children in Hands-On Exploration " (approx. 2 min)

Prepare Ahead (15–20 minutes)

Introduce the Best Practice

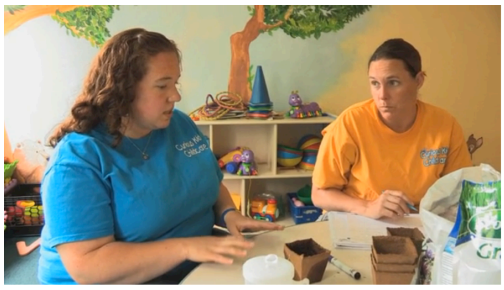
Meaningful science exploration can happen when an educator takes the time to carefully and thoughtfully prepare. Being well prepared fosters intentional teaching.

- **Identify the learning goals**. Know the underlying science ideas and concepts and what you want children to learn from the experience. For example, learning goals could include having children begin to understand how things grow or begin to understand what all living things need to thrive.
- **Plan the curriculum**. Plan activities that connect to the science ideas and concepts you are introducing. Know the steps of the activity and the strategies you will use to support children's learning.
- **Try the activity yourself**. It's important for educators to see themselves as learners and experience the same science phenomena children will experience later. Dig in and engage in the exploration.
- **Recognize potential challenges.** Are there any parts of the activity that will be difficult for some or all children? Plan ways to scaffold instruction during the exploration. For example, when exploring liquids and solids with "goop," there may be a child who has some discomforts with messy activities. If so, provide that child with a t-shirt or smock.
- **Formulate open-ended questions.** Plan *what, why,* and *how* questions to ask that will support children's reasoning and problem-solving. Questions like these have the potential to encourage higher-level thinking.
- **Gather materials and supplies** that will be needed for the exploration and think through logistics. For example, if doing an exploration on sounds, choose an appropriate space without extraneous noise or interruptions.
- **Share ideas and work together with other educators.** Educators can prepare to lead hands-on science explorations independently, but if the opportunity allows, work with another educator. You'll have an opportunity to support and learn from each other.

Introduce and View the Video

Tell participants they will watch a video in which educators are preparing to lead children in a seed planting activity.

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



"Prepare Ahead" (approx. 3 min)

- *What steps do the educators take in order to be fully prepared to lead children in a hands-on exploration?*
- *How does trying the activity before using it with children help the educators lead a more effective activity?*
- *How does their preparation, in general, lead to a more meaningful exploration for children?*

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 kinds of things can educators do to prepare to lead hands-on exploration?

- Learn the basic science ideas related to the topic. (For example, a concept such as "What do plants need in order to grow?")
- Consider the learning goals. Ask yourself, *What can young children learn from this exploration?* If children are planting seeds, ask, *What should children learn about plants and living things from this activity?*
- Try the activity.
- Think ahead and recognize children's potential interests and questions, as well as challenges they might encounter. This will help you to plan meaningful questions and troubleshoot any possible problems.
- Gather materials for the group and make sure the exploration areas are well-equipped with all of the items children will need.
- Plan ways to scaffold instruction for children at different levels.
- Formulate open-ended questions that will draw children's attention to the science phenomena being explored. For example, ask, *What do you notice about how the grass seed looks and feels?* rather than, *What color is the grass seed?* These kinds of questions will encourage children to think more deeply and keep exploring.

Why is it important for educators to try the activity first?

- Participating as a learner allows educators to:
    - Experience what is involved in carrying out each step and to see what actually happens (e.g., does the grass seed grow and how fast?)
    - Anticipate challenges for children.
    - Make modifications to materials.
    - Think of ways to individualize instruction.
    - Formulate open-ended questions to help children think critically, like scientists.
    - Plan ways to model the steps of the activity for the children.

How does being well-prepared lead to a more meaningful experience for children?

- Being well-prepared fosters intentional teaching which leads to more meaningful learning experiences for children. It allows educators to:
    - Know the basic science concepts to avoid teaching misconceptions and to identify science that is too abstract for young children to understand. For instance, common misconceptions include the ideas that plants get their food from the soil (plants make their own food through photosynthesis) and that heavy things sink. Things sink when their density is greater than the density of water.
    - Plan for unexpected occurrences, such as seeds not sprouting or taking longer to sprout than expected.
    - Plan a curriculum with activities that relate to one another, so that children can make connections between explorations from day to day. For example, if you know how fast the grass will grow, you can plan for how and when children will observe and measure their growing plants.

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.

Guide Children's Explorations (15–20 minutes)

Introduce the Best Practice

As children investigate scientific phenomena (such as seeds sprouting) related to important concepts (a plant's life cycle), they need to explore on their own and talk about their work just as scientists do. This is how they process their experiences and develop deeper understandings. Educators can foster this exploration and help them begin to build their understanding of concepts with thoughtful guidance.

- **Work alongside children**. As the children explore, so should you. Express what you are doing, what you are thinking, and what you are wondering about as you do it. This models scientific inquiry for children, and provides examples of how to explore, ask questions, and engage in discussion.
- **Watch and listen.** Observe children to determine what they understand, what ideas they have, what they are wondering about, and what problems they are trying to solve.
- **Ask open-ended questions.** Prepare and ask questions that draw children's attention to phenomena related to the science concepts you are introducing. When possible, ask questions that provoke their problem-solving abilities.
- **Encourage peer discussion.** Learning for young children is a social process, so provide opportunities for children to explain their thinking to their peers. *(What do you think might happen to the "goop" when we add more water? Turn and tell your partner what you are thinking.)* Encourage children to compare their observations and ideas. *(How was that different from what you observed?)*
- **Inspire children to use the language of science**. As you guide children's explorations, use the language that scientists use. *(Let's* observe *the seeds. How many days do you* predict *it will take for the seed to sprout?)*

Introduce and View the Video

Tell participants they will see center-based and family child care educators guide children in hands-on explorations. Though their environments differ, the educators use the same strategies to encourage children to think, predict, describe, and explain using the language of science.

"Guide Children's Explorations" (approx. 3 min)

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 guide children's explorations without directing them?*
- *What kinds of questions do the educators ask children to support their explorations?*

- *What other strategies do the educators use to support children's inquiry and exploration?*

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 to help elicit best practice and supporting strategies.

Why is it important for educators to guide rather than direct children's explorations?

- The best way to support children's science learning is to encourage, facilitate, and interact in ways that stimulate children's thinking rather than just reciting the facts. Questions and comments such as *I wonder what would happen if…* or *Why do you think…* can inspire children to make predictions, try things out, look closely, collect data, and draw thoughtful conclusions based on evidence from their own explorations.
- Facilitating exploration rather than directing it promotes conversation that can deepen children's understanding of what they observe and experience. It enhances their ability to describe, explain and share observations and ideas related to key science concepts.

How does an educator guide from the side?

- Ask questions that focus children in on the science phenomena they are observing related to key concepts.
    - Encourage children to use all of their senses and invite them to describe what they are doing and noticing. *(What do you notice about these seeds? How do they look, feel, and smell? How are they the same or different from other seeds we've planted?)*
    - Support problem-solving by asking questions beginning with *What do you think would happen if…* and *How do you think we could…*
- Observe what children are doing and saying, and how they use the materials as they engage in exploration in order to:
    - Assess what they are learning, and how their ideas are changing as a result of their experiences.
    - Support children according to their individual needs.

- Provide experiences that extend children's thinking. For example, if children are learning about seeds and plants, you might provide an opportunity for children to explore different kinds of indoor and outdoor plants at a nearby nursery or botanical garden.
- Document what children are doing and saying by jotting down notes and/or taking photographs so that you can notice patterns in their thinking. For example, if you notice that most children think that *big* items sink and *small* items float, you can introduce a big item that will float to challenge their thinking.
- Be a co-explorer. Come alongside children and dig in yourself. Talk about what you see, share your predictions and ideas, and talk about what you are wondering. Model the behaviors of a scientist.
- Look for teachable moments. Keep your eyes and ears open to opportunities that may emerge, unplanned, during the regular daily routine that you may be able to connect to children's science explorations.

What are open-ended questions and why do educators use them to guide children's exploration?

- Open-ended questions have many possible responses. These questions encourage children to articulate their own observations and ideas rather than give "correct" answers. The questions may begin with words like *how, what, what if, and why do you think….* Because they usually cannot be answered with just one or two words, open-ended questions are one of the most effective ways to encourage science talk.
- Open-ended questions help to develop children's abilities to observe, describe, and explain their observations and ideas, and to extend their investigations. These questions encourage children to reason and to develop their ideas based on evidence from their observations. (*What did you notice about…? Why do you think that happened? What do you think will happen if we…? How did you figure that out?)*

In addition to open-ended questions, what other kinds of intentional conversation and language strategies help guide children's science exploration?

- Use the language of science**.** Even very young children use the scientific process as they engage in exploration. Let them know it. Introduce science process words such as *explore, investigate, predict, notice, observe, sort, categorize, measure, compare, represent, discover, communicate, explain,* and *evidence.*
- Name children's actions in context. Young children learn best when content is taught in context, so the best time to introduce the language of science is when children are actively engaged in a hands-on exploration. For example, when children are exploring things that sink and float, ask, *What do you* notice *about what the rock does in water compared to the piece of wood?* and *Let's make a* prediction*. What do you think will happen to the plastic ball when you put it in the water?*

- Facilitate science talks and provide frequent opportunities for children to share their observations and ideas with one another. Communicating supports children's reasoning and problem-solving skills and helps them make meaning from their hands-on explorations. Some of this will happen *during* the exploration itself, but be sure to plan time for discussion before and *after* exploration, too.
- Ask questions beforehand that draw out children's prior knowledge like *(What do you think it means to sink? To float? What things have you noticed sinking? Floating?)* Afterwards, encourage discussion with questions. *(What did you observe at the sink and float areas today? What did you notice about things with holes? Did they float or sink? Why do you think so?)*

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)

Help Children Make Connections (15–20 minutes)

Introduce the Best Practice

To develop understanding of key science concepts, young children need to experience them in a variety of contexts. They need many opportunities to connect new knowledge with what they already know or have experienced. Educators can help children make these connections in different ways across the curriculum.

- **Give children opportunities to reflect on their predictions and express their observations and ideas in multiple ways,** such as talking about them with a partner or the group, and writing and/or drawing them.
- **Provide materials for different types of representing and recording of their observations,** such as charting what they observed, drawing and writing about their observations and ideas, or creating a collage.
- **Plan for time to help children make meaning from their observations and experiences**, such as a group reflection time at the end of the day.

- **Build on prior knowledge.** Think about other learning experiences children have had before and help them connect previous experiences to new ones.
- **Incorporate science concepts into daily activities** like Snack Time, Circle Time, or Outside Time. For example, read a related book before a hands-on exploration to introduce a new idea or after the exploration to extend the learning and provide context.

Introduce and View the Video

Tell participants they will now see educators help children make connections before, during, and after hands-on exploration.

"Help Children Make Connections" (approx. 3 min)

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

- *What are some different ways the educators help children make connections to science concepts and ideas?*
- *How do they encourage children to express their observations, ideas, and thinking?*

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.

How can educators help children make connections to the science concepts and ideas that are central to their explorations?

- Engage children in direct science explorations and invite them to observe science phenomena on a topic in different settings, contexts, or venues (e.g., indoors, outdoors, in videos, at home) and across different domains (e.g., science, language, art).
- Help children make connections between their own hands-on science explorations and books about the topic. Choose quality fiction and nonfiction books that address the science concepts you are investigating, and read them before and/or after children's science explorations.

- Make videos or take photographs of children's explorations and invite children to view them to support their learning.
- Incorporate science talk into children's routines so that they become a frequent part of classroom conversations. For example, if children are learning about seeds, invite them to notice any foods that contain seeds during snack time or lunchtime.

What are some ways educators can encourage children to share their thinking and new learning?

- Invite children to record their observations by drawing and/or writing them on classroom charts. This can be done *during* and/or *after* science explorations.
- Invite children to create drawings, labels, or diagrams to show others what they have observed or learned.
- Ask questions and provide opportunities for children to talk about what they observed and what they are wondering.
    - As educators ask questions and encourage peer conversation, children build science inquiry skills, discover new ways to express their thinking, and practice using language in different ways. *(What happened when we poured the warm water on the ice? How did that compare to what we thought would happen?)*

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 and direct their attention to the Try It handout in their packets.

Planning with Intentionality

Have partners work together to engage in the science exploration "Dropping Objects" (see Try It handout). Then, invite them to think together and use what they learned about leading hands-on exploration to complete the following tasks:

- List the key learning outcomes or big ideas to convey to children.
- Note the supplies and materials needed.
- Note some ways to scaffold instruction to support individual children.
- List 5–7 open-ended questions that would help children think more deeply about the topic.
- Note ways to help children make connections to what they've learned.

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.
- Encourage them to fill out and return the Training Evaluation**.**

Glossary

concept: an idea or understanding about something

data: what has been observed or experienced

evidence: data that support an explanation or conclusion

model: to explicitly demonstrate a process, behavior, or task

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

phenomenon(a): an object, material, living thing or event that can be directly observed

represent: to make a drawing or model of something that has been observed

scaffold: a temporary support that helps children learn; it may include prompts, hints, reminders, or models

science talk: words that are commonly used by scientists such as *compare, predict, measure, sort*

Produced by WGBH for the Massachusetts Department of Early Education and Care with federal funds from The Race to the Top – Early Learning Challenge Grant.

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 . . .**										
Use hands-on exploration to engage children in key concepts and big ideas.										
Facilitate activities in ways that spark conversation and deepen children's ability to describe, explain, and share ideas about a science concept.										
Prepare Ahead **I am comfortable with my ability to . . .**										
Identify learning goals before an exploration opportunity.										
Try an activity on my own or with another adult before leading it with children.										
Create a clear teaching plan that facilitates learning.										
Recognize potential challenges for children and adapt materials and content if needed.										
Formulate questions to help children think deeply and critically during an exploration.										
Support Children's Explorations **I am comfortable with my ability to . . .**										
Ask/formulate questions during an activity to help children think, talk, and act like scientists.										
Guide exploration using questions that connect to what children are doing and talking about.										
Observe and listen to children in order to plan my next teaching move.										
Help Children Make Connections **I am comfortable with my ability to . . .**										
Provide children with opportunities to express their observations and ideas in multiple ways.										
Provide materials for different types of representing and for recording observations.										
Plan for time, outside of exploration activities, for children to make meaning from what they have observed.										

Produced by WGBH for the Massachusetts Department of Early Education and Care with federal funds from The Race to the Top – Early Learning Challenge Grant.

WGBH

eec Department of Early Education and Care

Learning Log

Prepare Ahead

View

In the video:

- *What steps do the educators take in order to be fully prepared to lead children in a hands-on exploration?*

- *How does trying the activity before using it with children help the educators lead a more effective activity?*

- *How does their preparation, in general, lead to a more meaningful exploration for children?*

Reflect

In your program:

- *How do you prepare for hands-on exploration?*

- *What did you learn that you will put into practice in your own learning environment?*

Notes

Guide Children's Explorations

View

In the video:

- *How do the educators guide children's explorations without directing them?*

- *What kinds of questions do the educators ask children to support their explorations?*

- *What other strategies do the educators use to support children's inquiry and exploration?*

Reflect

In your program:

- *How do you guide children's explorations?*

- *What did you learn that you will put into practice in your own learning environment?*

Notes

Help Children Make Connections

View

In the video:

- *What are some different ways the educators help children make connections to science concepts and ideas?*

- *How do they encourage children to express their observations, ideas, and thinking?*

Reflect

In your program:

- *What strategies do you use to help children make connections between science concepts and everyday life?*

- *What did you learn that you will put into practice in your own learning environment?*

Notes

Produced by WGBH for the Massachusetts Department of Early Education and Care with federal funds from The Race to the Top – Early Learning Challenge Grant.

Try It

Planning with Intentionality

Try the activity "Dropping Objects" from *PEEP and the Big Wide World.* Then, prepare to use it with children.

Gather a variety of items of different shapes, weights, and materials, like a feather, a piece of paper, a small rock, an eraser, a ball, or anything else that isn't too heavy or won't be damaged by being dropped.

- Feel and hold each item. Then, drop the items one at a time from a table onto a relatively flat surface.
- *How does each item move? Why do different items fall in different ways?*

1. List the key learning outcomes or big ideas you want children to learn.

2. What supplies and materials are needed?

Try It (CONTINUED)

3. How will you scaffold instruction to support individual children?

4. Create a list of 5-7 open-ended questions that would help children think more deeply about the topic.

5. How will you build on children's own experiences and connect the key science concepts to everyday life?

Produced by WGBH for the Massachusetts Department of Early Education and Care with federal funds from The Race to the Top – Early Learning Challenge Grant.

Leading Children in Hands-On Exploration

Best Practices

Young children are naturally inquisitive and curious about the world around them. They want to know how things work, what things do, and what will happen next. Educators can build upon children's natural curiosity by guiding them in hands-on science explorations. When children engage in hands-on science, they acquire scientific knowledge and learn the processes and practices of science. They are introduced to the concepts and big ideas that are central to science.

Educators can make these experiences more meaningful for children by being intentional in their planning so that they understand the science concepts, can guide and support children's explorations, and can help children make connections and express their thinking in multiple ways.

Prepare Ahead

Meaningful science exploration can happen when an educator takes the time to carefully and thoughtfully prepare. Being well prepared fosters intentional teaching.

- **Identify the learning goals**. Know the underlying science ideas and concepts and what you want children to learn from the experience. For example, learning goals could include having children begin to understand how things grow or begin to understand what all living things need to thrive.
- **Plan the curriculum**. Plan activities that connect to the science ideas and concepts you are introducing. Know the steps of the activity and the strategies you will use to support children's learning.
- **Try the activity yourself**. It's important for educators to see themselves as learners and experience the same science phenomena children will experience later. Dig in and engage in the exploration.
- **Recognize potential challenges.** Are there any parts of the activity that will be difficult for some or all children? Plan ways to scaffold instruction during the exploration. For example, when exploring liquids and solids with "goop," there may be a child who has some discomforts with messy activities. If so, provide that child with a t-shirt or smock.
- **Formulate open-ended questions.** Plan *what, why,* and *how* questions to ask that will support children's reasoning and problem-solving. Questions like these have the potential to encourage higher-level thinking.

- **Gather materials and supplies** that will be needed for the exploration and think through logistics. For example, if doing an exploration on sounds, choose an appropriate space without extraneous noise or interruptions.
- **Share ideas and work together with other educators.** Educators can prepare to lead hands-on science explorations independently, but if the opportunity allows, work with another educator. You'll have an opportunity to support and learn from each other.

What kinds of things can educators do to prepare to lead hands-on exploration?

- Learn the basic science ideas related to the topic. (For example, a concept such as "What do plants need in order to grow?")
- Consider the learning goals. Ask yourself, *What can young children learn from this exploration?* If children are planting seeds, ask, *What should children learn about plants and living things from this activity?*
- Try the activity.
- Think ahead and recognize children's potential interests and questions, as well as challenges they might encounter. This will help you to plan meaningful questions and troubleshoot any possible problems.
- Gather materials for the group and make sure the exploration areas are well-equipped with all of the items children will need.
- Plan ways to scaffold instruction for children at different levels.
- Formulate open-ended questions that will draw children's attention to the science phenomena being explored. For example, ask, *What do you notice about how the grass seed looks and feels?* rather than, *What color is the grass seed?* These kinds of questions will encourage children to think more deeply and keep exploring.

Why is it important for educators to try the activity first?

- Participating as a learner allows educators to:
    - Experience what is involved in carrying out each step and to see what actually happens (e.g., does the grass seed grow and how fast?)
    - Anticipate challenges for children.
    - Make modifications to materials.
    - Think of ways to individualize instruction.

- Formulate open-ended questions to help children think critically, like scientists.
- Plan ways to model the steps of the activity for the children.

How does being well-prepared lead to a more meaningful experience for children?

- Being well-prepared fosters intentional teaching which leads to more meaningful learning experiences for children. It allows educators to:
  - Know the basic science concepts to avoid teaching misconceptions and to identify science that is too abstract for young children to understand. For instance, common misconceptions include the ideas that plants get their food from the soil (plants make their own food through photosynthesis) and that heavy things sink. Things sink when their density is greater than the density of water.
  - Plan for unexpected occurrences, such as seeds not sprouting or taking longer to sprout than expected.
  - Plan a curriculum with activities that relate to one another, so that children can make connections between explorations from day to day. For example, if you know how fast the grass will grow, you can plan for how and when children will observe and measure their growing plants.

Guide Children's Explorations

As children investigate scientific phenomena (such as seeds sprouting) related to important concepts (a plant's life cycle), they need to explore on their own and talk about their work just as scientists do. This is how they process their experiences and develop deeper understandings. Educators can foster this exploration and help them begin to build their understanding of concepts with thoughtful guidance.

- **Work alongside children**. As the children explore, so should you. Express what you are doing, what you are thinking, and what you are wondering about as you do it. This models scientific inquiry for children, and provides examples of how to explore, ask questions, and engage in discussion.
- **Watch and listen.** Observe children to determine what they understand, what ideas they have, what they are wondering about, and what problems they are trying to solve.
- **Ask open-ended questions.** Prepare and ask questions that draw children's attention to phenomena related to the science concepts you are introducing. When possible, ask questions that provoke their problem-solving abilities.

- **Encourage peer discussion.** Learning for young children is a social process, so provide opportunities for children to explain their thinking to their peers. *(What do you think might happen to the "goop" when we add more water? Turn and tell your partner what you are thinking.)* Encourage children to compare their observations and ideas. *(How was that different from what you observed?)*
- **Inspire children to use the language of science**. As you guide children's explorations, use the language that scientists use. *(Let's* observe *the seeds. How many days do you* predict *it will take for the seed to sprout?)*

Why is it important for educators to guide rather than direct children's explorations?

- The best way to support children's science learning is to encourage, facilitate, and interact in ways that stimulate children's thinking rather than just reciting the facts. Questions and comments such as *I wonder what would happen if…* or *Why do you think…* can inspire children to make predictions, try things out, look closely, collect data, and draw thoughtful conclusions based on evidence from their own explorations.
- Facilitating exploration rather than directing it promotes conversation that can deepen children's understanding of what they observe and experience. It enhances their ability to describe, explain and share observations and ideas related to key science concepts.

How does an educator guide from the side?

- Ask questions that focus children in on the science phenomena they are observing related to key concepts.
    - Encourage children to use all of their senses and invite them to describe what they are doing and noticing. *(What do you notice about these seeds? How do they look, feel, and smell? How are they the same or different from other seeds we've planted?)*
    - Support problem-solving by asking questions beginning with *What do you think would happen if…* and *How do you think we could…*
- Observe what children are doing and saying, and how they use the materials as they engage in exploration in order to:
    - Assess what they are learning, and how their ideas are changing as a result of their experiences.
    - Support children according to their individual needs.

- Provide experiences that extend children's thinking. For example, if children are learning about seeds and plants, you might provide an opportunity for children to explore different kinds of indoor and outdoor plants at a nearby nursery or botanical garden.
- Document what children are doing and saying by jotting down notes and/or taking photographs so that you can notice patterns in their thinking. For example, if you notice that most children think that *big* items sink and *small* items float, you can introduce a big item that will float to challenge their thinking.
- Be a co-explorer. Come alongside children and dig in yourself. Talk about what you see, share your predictions and ideas, and talk about what you are wondering. Model the behaviors of a scientist.
- Look for teachable moments. Keep your eyes and ears open to opportunities that may emerge, unplanned, during the regular daily routine that you may be able to connect to children's science explorations.

What are open-ended questions and why do educators use them to guide children's exploration?

- Open-ended questions have many possible responses. These questions encourage children to articulate their own observations and ideas rather than give "correct" answers. The questions may begin with words like *how, what, what if, and why do you think….* Because they usually cannot be answered with just one or two words, open-ended questions are one of the most effective ways to encourage science talk.
- Open-ended questions help to develop children's abilities to observe, describe, and explain their observations and ideas, and to extend their investigations. These questions encourage children to reason and to develop their ideas based on evidence from their observations. (*What did you notice about…? Why do you think that happened? What do you think will happen if we…? How did you figure that out?)*

In addition to open-ended questions, what other kinds of intentional conversation and language strategies help guide children's science exploration?

- Use the language of science**.** Even very young children use the scientific process as they engage in exploration. Let them know it. Introduce science process words such as *explore, investigate, predict, notice, observe, sort, categorize, measure, compare, represent, discover, communicate, explain,* and *evidence.*
- Name children's actions in context. Young children learn best when content is taught in context, so the best time to introduce the language of science is when children are actively engaged in a hands-on exploration. For example, when children are exploring

things that sink and float, ask, *What do you* notice *about what the rock does in water compared to the piece of wood?* and *Let's make a* prediction*. What do you think will happen to the plastic ball when you put it in the water?*

- Facilitate science talks and provide frequent opportunities for children to share their observations and ideas with one another. Communicating supports children's reasoning and problem-solving skills and helps them make meaning from their hands-on explorations. Some of this will happen *during* the exploration itself, but be sure to plan time for discussion before and *after* exploration, too.
- Ask questions beforehand that draw out children's prior knowledge like *(What do you think it means to sink? To float? What things have you noticed sinking? Floating?)* Afterwards, encourage discussion with questions. *(What did you observe at the sink and float areas today? What did you notice about things with holes? Did they float or sink? Why do you think so?)*

Help Children Make Connections

To develop understanding of key science concepts, young children need to experience them in a variety of contexts. They need many opportunities to connect new knowledge with what they already know or have experienced. Educators can help children make these connections in different ways across the curriculum.

- **Give children opportunities to reflect on their predictions and express their observations and ideas in multiple ways,** such as talking about them with a partner or the group, and writing and/or drawing them.
- **Provide materials for different types of representing and recording of their observations,** such as charting what they observed, drawing and writing about their observations and ideas, or creating a collage.
- **Plan for time to help children make meaning from their observations and experiences**, such as a group reflection time at the end of the day.
- **Build on prior knowledge.** Think about other learning experiences children have had before and help them connect previous experiences to new ones.
- **Incorporate science concepts into daily activities** like Snack Time, Circle Time, or Outside Time. For example, read a related book before a hands-on exploration to introduce a new idea or after the exploration to extend the learning and provide context.

How can educators help children make connections to the science concepts and ideas that are central to their explorations?

- Engage children in direct science explorations and invite them to observe science phenomena on a topic in different settings, contexts, or venues (e.g., indoors, outdoors, in videos, at home) and across different domains (e.g., science, language, art).
- Help children make connections between their own hands-on science explorations and books about the topic. Choose quality fiction and nonfiction books that address the science concepts you are investigating, and read them before and/or after children's science explorations.
- Make videos or take photographs of children's explorations and invite children to view them to support their learning.
- Incorporate science talk into children's routines so that they become a frequent part of classroom conversations. For example, if children are learning about seeds, invite them to notice any foods that contain seeds during snack time or lunchtime.

What are some ways educators can encourage children to share their thinking and new learning?

- **I**nvite children to record their observations by drawing and/or writing them on classroom charts. This can be done *during* and/or *after* science explorations.
- Invite children to create drawings, labels, or diagrams to show others what they have observed or learned.
- Ask questions and provide opportunities for children to talk about what they observed and what they are wondering.
    - As educators ask questions and encourage peer conversation, children build science inquiry skills, discover new ways to express their thinking, and practice using language in different ways. *(What happened when we poured the warm water on the ice? How did that compare to what we thought would happen?)*

Glossary

concept: an idea or understanding about something

data: what has been observed or experienced

evidence: data that support an explanation or conclusion

model: to explicitly demonstrate a process, behavior, or task

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

phenomenon(a): an object, material, living thing or event that can be directly observed

represent: to make a drawing or model of something that has been observed

scaffold: a temporary support that helps children learn; it may include prompts, hints, reminders, or models

science talk: words that are commonly used by scientists such as *compare, predict, measure, sort*

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

Produced by WGBH for the Massachusetts Department of Early Education and Care with federal funds from The Race to the Top – Early Learning Challenge Grant.

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 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 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 D** Teachers plan for learning experiences that effectively implement a comprehensive curriculum so that children attain key goals across the domains (physical, social, emotional, cognitive) and across

the disciplines (language literacy, including English acquisition, mathematics, social studies, science, art, music, physical education, and health).

- **(2) Teaching to enhance development and learning E** Teachers plan the environment, schedule, and daily activities to promote each child's learning and development.
- **(2) Teaching to enhance development and learning E.1** Teachers arrange firsthand, meaningful experiences that are intellectually and creatively stimulating, invite exploration and investigation, and engage children's active, sustained involvement. They do this by providing a rich variety of materials, challenges, and ideas that are worthy of children's attention.
- **(2) Teaching to enhance development and learning E.2** Teachers present children with opportunities to make meaningful choices, especially in child-choice activity periods. They assist and guide children who are not yet able to enjoy and make good use of such periods.
- **(2) Teaching to enhance development and learning E.3** Teachers organize the daily and weekly schedule to provide children with extended blocks of time in which to engage in sustained play, investigation, exploration, and interaction (with adults and peers).
- **(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** Teachers possess an extensive repertoire of skills and strategies they are able to draw on, and they know how and when to choose among them, to effectively promote each child's learning and development at that moment. Those skills include the ability to adapt curriculum, activities, and materials to ensure full participation of all children. Those strategies include, but are not limited to, acknowledging, encouraging, giving specific feedback, modeling, demonstrating, adding challenge, giving cues or other assistance, providing information, and giving directions.
- **(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.
- **(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.

Standards (continued)

- **(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 H** Teachers know how and when to use the various learning formats/contexts most strategically.
- **(2) Teaching to enhance development and learning H.2** Teachers think carefully about which learning format is best for helping children achieve a desired goal, given the children's ages, development, abilities, temperaments, etc.
- **(2) Teaching to enhance development and learning J.1** Teachers incorporate a wide variety of experiences, materials and equipment, and teaching strategies to accommodate the range of children's individual differences in development, skills and abilities, prior experiences, needs, and interests.
- **(3) Planning curriculum to achieve important goals D** Teachers make meaningful connections a priority in the learning experiences they provide children, to reflect that all learners, and certainly young children, learn best when the concepts, language, and skills they encounter are related to something they know and care about, and when the new learnings are themselves interconnected in meaningful, coherent ways.
- **(3) Planning curriculum to achieve important goals D.2** Teachers plan curriculum experiences to draw on children's own interests and introduce children to things likely to interest them, in recognition that developing and extending children's interests is particularly important during the pre- school years, when children's ability to focus their attention is in its early stages.

Produced by WGBH for the Massachusetts Department of Early Education and Care with federal funds from The Race to the Top – Early Learning Challenge Grant.

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?

Produced by WGBH for the Massachusetts Department of Early Education and Care with federal funds from The Race to the Top – Early Learning Challenge Grant.

WGBH

eec Department of Early Education and Care