BASIC WORKSHOP 1

Introduction to *Exploring Water with Young Children*

At a Glance

Purpose:

- Gain beginning understanding of this approach to teaching and learning in the early childhood classroom.
- Begin to understand the science concepts and inquiry skills.
- Learn about the teacher's guide and how it is organized.

Activity	Time: 3 hours	Materials
Introduction Introduce teachers to the basic workshops and the teacher's guide. Use a video vignette to show the program "in action." Invite teachers to share any previous experiences with water.	55 minutes	• Handouts: agenda, "Read and Reflect 1" • Copies of *Exploring Water with Young Children* teacher's guides • Self-adhesive note pads • VCR, monitor, and video cued to vignette 1 • Overhead projector, screen, and overhead 1.1
Water Flow Exploration Facilitate an exploration of water flow. Model the role that teachers will play with children by encouraging engagement and focusing on the properties of water.	1 hour 10 minutes	• Materials for exploring water • Books about water • Posters or pictures of water flow • Charts: "What We Notice about Water" and "What We Notice about the Materials" • Camera and film or digital camera (optional)
The Science Introduce the science concepts and inquiry process, and help teachers connect them to their own water experiences.	55 minutes	• Overhead projector, screen, and overheads 1.2 and 1.3 • Copies of "Read and Reflect 2"

Pre-assignment: Read introduction to *Exploring Water with Young Children* and excerpts from a teacher's journal and respond to reflection questions.

Basic Workshop 1: Introduction

Objectives

- Gain beginning understanding of this approach to teaching and learning in the early childhood classroom.
- Begin to understand the science concepts and inquiry skills.
- Learn about the teacher's guide and how it is organized.

Overview

- Introduction (55 minutes)
- Water flow exploration (1 hour 10 minutes)
- The science (55 minutes)

Instructor Preparation

- Distribute "Read and Reflect 1" with the teacher's guide at least one week before the workshop. Ask teachers to complete the assignment before the first workshop.
- Prepare an agenda that outlines the seven basic workshops, as well as where and when they will take place.
- Prepare the materials for the exploration. You will need a variety of materials, listed below, and water tables or tubs for small groups of teachers. Refer to the resources section of the teacher's guide for advice about finding and setting up the water materials. Select a convenient place for the session. This activity will be easiest if you are near a source of water. Have supplies on hand to clean any spilled water.
- Review step 1 of open exploration in the teacher's guide in preparation for facilitating the exploration. The exploration will model the approach described in the open exploration section of the teacher's guide. The exploration described in this workshop differs from the teacher's guide in that it is designed to help adults learn about the properties of water in preparation for teaching young children. It is not an exact replication of the approach to use with children.
- Review "Step 1: Preparing Yourself—Science" in the "Getting Ready" section of the teacher's guide (p. 13) in preparation for talking with teachers about science concepts.
- Preview video vignette 1. As you look at the video, find the teacher and child actions that exemplify the points you want to make about this approach. The instructions that follow provide suggestions.

Materials

- Handouts: agenda, "Read and Reflect" 1 and 2
- *Exploring Water with Young Children* teacher's guides for each teacher
- Materials for exploring water (see the resources section in the teacher's guide for a description of materials), such as: large container (at least 10 by 15 by 9 inches), about ½ to ⅔

filled with water (this can include one standard-size water table); three or four small, clear plastic containers of various shapes and sizes for pouring and containing water (such as recycled plastic bottles, cups, and measuring cups); one or two clear plastic pump bottles (such as those for liquid soap); three pieces of clear flexible tubing of different diameters (one piece of ¼-inch inner diameter [ID], one piece of ⅜-inch ID, one piece of ½-inch ID), cut to ½- to 2-foot lengths; one or two turkey basters that can fit into at least one of the pieces of tubing; two funnels that can fit into at least one of the pieces of tubing; one kerosene or bilge pump; two or three T- or Y-connectors that can fit into at least one of the pieces of tubing

- Wire water wall (see the resources section in the teacher's guide for a description)
- Books about water
- Posters or pictures of water flow
- Small self-adhesive note pads for each teacher
- Charts: "What We Notice about Water" and "What We Notice about the Materials"
- Camera and film or digital camera (optional)
- Overhead projector, screen, and overheads 1.1–1.3
- Video cued to vignette 1, VCR, and monitor

For the first fifteen minutes of the exploration, provide all materials listed above except for the following:

- T- and Y-connectors
- Wire water wall

Activity

Introduction (55 minutes)

Purpose:

- To set the stage by introducing the curriculum, its vision for science teaching and learning, and the nature of the work teachers will be doing with you during the workshops
- To uncover what teachers already know about water, how it moves, and some of its other properties

1. **Give a short presentation** (5 minutes) that provides teachers with a brief overview of the workshops. Distribute the agenda and review it with teachers, being explicit about any requirements for their participation in the workshops and use of the curriculum. Tell them they will be learning about the following:
    - How to use the *Exploring Water with Young Children* teacher's guide to explore water over time with children
    - Science concepts and inquiry skills of water exploration
    - The teacher's role in facilitating children's inquiry and science learning

2. **Introduce the teacher's guide and the "Read and Reflect" assignments** (10 minutes). Tell teachers that the guide provides information and direction for conducting an investigation of water that can take place over several months. Mention that the read and reflect assignments are meant to introduce them to the teacher's guide and can be used to prepare for each workshop. Explain that you will refer them back to sections of the guide during the session and suggest that they use the self-adhesive notes to mark pages that are discussed for easy reference.

3. **Use vignette 1 to introduce *Exploring Water with Young Children*** (30 minutes).

   a. Begin by using overhead 1.1 to review the guiding principles listed in the introduction. Suggest that teachers look for these things as they watch the video.

Overhead 1.1: *Exploring Water with Young Children* Guiding Principles

- All three- to five-year-olds can successfully experience rich, in-depth scientific inquiry.
- The science content draws from children's experiences, is interesting and engaging, and can be explored directly and deeply over time.
- Expectations are developmentally appropriate; that is, they are realistic and can be tailored to the strengths, interests, and needs of individual children.
- Discussion, expression, and representation are critical ways in which children reflect on and develop theories from their active work.
- Children learn from one another.
- Teachers take on specific roles to actively support and guide children's science learning.

   b. Introduce the vignette by saying that one classroom from a Boston Head Start, one from a Connecticut childcare program, and three Boston kindergartens are shown. The children are all three, four, and five years old and engaged in a water exploration. Show the vignette, asking the teachers to note examples of the guiding principles at work.

   c. Ask for reactions using these questions: "Did you see anything that reminded you of a guiding principle? What did you see and which principle did it exemplify?" You might also want to discuss how the teachers in the vignette compare to teachers A, B, and C in the introduction to the teacher's guide. Ask for specifics.

Make these points about the vignette and this approach to teaching and learning.

- The children seem engaged and excited about exploring water.
- Children are able to engage at varied levels of ability.
- Representation and conversation provide important opportunities to reflect and draw meaning from water explorations.
- The teacher is key in the process of engaging in inquiry and using experiences to gain a deeper understanding of science ideas.

When discussing how the teachers in the vignette compare to teacher C, be sure to highlight the following:

- They are building on interests expressed in children's water play.
- Hands-on experiences combined with dialogue and representation promote learning key science concepts.
- They use carefully selected materials that encourage children to explore the properties of water and how it moves.
- The teachers guide inquiry, encouraging close observation and representation, and helping with data collection and analysis.

4. **Discuss teachers' daily experiences with water** (10 minutes). Mention that we all experience water every day. Encourage a few people to talk about how water is important in their lives. After participants share their experiences for a few minutes, help them think about how water moves. Accept all comments. This is not a time to talk about the underlying science; it is just an exercise to help teachers feel comfortable with the topic.

   Use the following questions to guide the discussion:

   - What are some of the ways water is important in your lives?
   - What are the different ways you have used water?
   - What have you noticed about the different ways water moves?
   - Have you ever wondered what makes water go up, down, fast, or slow?

It is important for learners to talk about what they already know. Making the connections to their knowledge and everyday experiences acknowledges their value and helps them integrate new information. In this case, it can ease them into science by helping them realize science is already a part of their lives.

Water Flow Exploration (1 hour 10 minutes)

Purpose: Through the process of engaging teachers in a water exploration you will achieve the following:

- Provide a beginning experience with inquiry and the science content on which you will build throughout the workshops
- Reinforce the importance of having firsthand experience using different materials to explore water flow
- Model the teacher's role in facilitating scientific explorations
- Model a science talk that helps teachers build on one another's understanding

1. **Introduce the water flow exploration with a chart** (5 minutes) by saying that they will spend some time exploring some of the materials and science concepts relating to water flow. Tell them that this activity will include some open-ended exploration and some time when they will try some specific things. Begin the exploration by showing teachers each material they will use to explore water.

Ask the teachers to form groups of three or four. Tell them to spend the next ten minutes finding out how to use the different materials to explore water. Also ask them to pay attention to the water itself. Keep group size as small as you can to increase engagement. Tell teachers that you will be modeling the kinds of interactions they should have with their children during their early water explorations. Ask them to pay attention to your comments and questions and note how they influence their work and thinking.

For this portion of the exploration, provide all materials listed above except for the following:

- T- and Y-connectors
- Wire water wall

2. **Help teachers get started** (10 minutes). As teachers explore the materials and water in an open-ended way, walk around the room and observe what they are doing. As teachers become engaged, encourage them to describe what they notice. Make comments or ask questions that encourage people to be descriptive, such as the following:
    - When pouring from one container to another of a different size—"Notice the height of the water in each container. Before you pour, predict how high the water will go into the new container."
    - When connecting a funnel to tubing and pouring into the funnel—"What do you think would happen if you put your finger over the end of the tubing and then poured the water into the funnel?"
    - "What do you think would happen if you connected a piece of tubing to the baster?"

3. **Bring the teachers together for a ten-minute science talk.** Ask the teachers to stop their exploration for a moment to discuss briefly what they've noticed about the materials and the water itself. Ask probing questions to get specific comments about their observations. List people's observation on the charts, "What We Notice about Water" and "What We Notice about the Materials."

4. **Facilitate an exploration of water flow with the wire water wall** (30 minutes). Introduce the wire water wall and the T- and Y-connectors. Demonstrate how the connectors fit into the tubing so it is possible to have more than one stream of water flowing at a time. Demonstrate how the tubing can be passed through or attached to the water wall, freeing up their hands. Tell teachers that these materials are being added as a way for them to support the tubing and expand the possibilities for their water flow explorations. Ask them to use these materials to make water flow in as many ways as possible.

    As teachers return to their explorations, make sure each small group is using its time well. Connect the work of two groups if one needs encouragement. Facilitate their experience by trying the following:
    - Encourage teachers to try connecting the tubing together with the T- or Y-connectors.
    - Encourage teachers to find different ways to move the water.

- Help teachers identify questions they want to investigate.
- Suggest teachers document their work and findings by taking notes, making drawings, or writing down bits of conversation.

5. **Facilitate a large group science talk** (15 minutes). Bring teachers together and ask questions that focus on how they use the materials to control water flow. Refer back to the charts, adding new observations.

An example of probing questions:
What were you doing with the tubing? . . . And what happened? . . . Did that surprise you? . . . What did you expect to see?

The Science (55 minutes)

Purpose: Inquiry is a concept that is central to science and should be a part of all science education. Therefore, one of the teacher's primary goals is to help children experience and use the processes of inquiry, integrating them into their daily experiences. The science content is also an important feature of *Exploring Water with Young Children*. It is central to every water experience and conversation. The inquiry and content are introduced here and will be reinforced throughout the workshops.

1. **Introduce the concept of inquiry** (10 minutes). Tell teachers that they have been engaged in a part of the process of inquiry and that it is a central idea in science and *Exploring Water with Young Children*. Refer them to the inquiry diagram on p. 96 of the teacher's guide as you show overhead 1.2: Inquiry Diagram. Make the following points as you talk about the diagram:
   - *It is a dynamic process.*
     This process is cyclical in nature. It cannot be fully represented in a linear two-dimensional diagram.
   - *It begins with engagement and wondering.*
     Experience with things, materials, and events is the basis of inquiry. This is a time for play and messing around. At this point, the teachers and children are noticing the characteristics of water, the materials, and what they will do.
   - *Wondering leads to more focused observation and questions.*
     As you explore, you may have lots of questions. "How much water does it take to fill this container? What happens when I get to the top? How much can I get in here with one squeeze?" Some people ask their questions; others may reveal their questions through actions.
   - *Questions focus observation and lead to investigation.*
     In order to pursue something in depth, a single question needs to be identified and refined. There are many kinds of questions. At this point, you and the children need to consider which questions can be answered through simple investigations or which

can be modified and pursued through investigation. Ask predicting questions, such as "What will happen if . . ."

- *Investigation is a cyclical process.*
  Investigations begin with a focus or question: "How can I get the water in the baster? What happens when I connect tubing to the baster? Can I make the water come out of two places?" They involve planning, observing closely, recording experiences, and reflecting in order to identify patterns and construct theories and explanations. New questions arise and are pursued. With your guidance, the children can engage in this experimental stage of inquiry.
- *Share, discuss, reflect, and draw conclusions.*
  This is a time for making meaning of investigations. In small and large groups, you and the children share and form simple ideas and generalizations that will deepen their understanding of the concepts being explored.

2. **Reflect on the role inquiry played in their exploration** (15 minutes). Ask teachers what aspects of the diagram describe experiences they had during the exploration. Here are some guiding questions:
   - How would you describe the inquiry you just engaged in? Did you experience particular aspects of the diagram during your exploration? What are they?
   - Which questions drove your investigation?
   - What kind of data did you collect related to your questions? How did you document the data?

   Now help them think more analytically about their inquiry:
   - Did identifying questions play a role in your exploration of water flow? What role did it play?
   - How did you use the data you collected? (Ask for specifics about insights they might have had as they documented.)
   - What evidence influenced you to change your thinking?
   - When and how did you draw some conclusions?

As you make specific connections between their activity and the diagram, emphasize the following:

- Questions and focused activity grow out of an early period of engagement called open exploration.
- Questions help focus observation and investigations.
- Sharing ideas exposes one to more data and to different perspectives and ideas, and opens new doors for investigation.
- Recording data as it is collected is useful because it provides a reference for analysis.
- Science is grounded in evidence. An important part of inquiry is finding the evidence.

3. **Introduce the science concepts** (25 minutes) by saying that your questions and comments during their exploration were designed to focus them on particular science concepts. Refer them to descriptions of the science concepts that appear in "Getting Ready" on p. 16 of the teacher's guide. Be sure to mention, as the teacher's guide does, that you are not recommending that they talk about these concepts with children the same way that they are presented here, but their understanding of these concepts will be important as they observe and facilitate the children's experiences. Suggest marking the page with a self-adhesive note for quick reference. Review overhead 1.3.

Overhead 1.3: Science Concepts

- **Water flows**
  Water's movement is generally described as flow, and water flows down due to gravity. This can be seen in many different ways—rivers flow from higher places to lower ones, drops of rain flow down windowpanes, streams of rain flow down gutters and downspouts, and water poured slowly from one cup to another will flow to the lower container.

  Water can also be made to move up when the force exerted on it is stronger than the downward pull of gravity, such as when you push on it to squirt it up out of a dropper or syringe. It goes up into a turkey baster or eyedropper, or when you suck on it and air pressure pushes it up a straw. Water moves faster or slower as well, depending on the strength of the forces acting on it.

- **Water takes the shape of its container**
  When water is in a cup, pitcher, tube, bowl, swimming pool, or lake, the surface of the water will be flat unless it is moved by something else (for example, wind or shaking). All parts of the container will be filled with water.

- **Cohesion**
  Water molecules stick together (cohesion). When the amount of the water is small, this property of water causes it to form drops. It is also the cause of surface tension, as water forms a kind of "skin" at its surface. Some bugs, for example, can scoot across the surface of a pond or puddle. If you fill a glass to the top you can keep adding a small amount until it is actually a little more than full. This is also because of surface tension.

- **Adhesion**
  Water sticks to other materials (adhesion). It sticks more or less strongly depending on what the material is. Water does not stick well to waxed paper, so drops are round, but it sticks well to paper towels or newspapers, so drops are pulled apart. This property of water is what makes things wet.

- **Objects can sink, float, or stay suspended in water**
  Whether a solid object will sink, float, or stay suspended in water has to do with the relationship between its density and the density of water. Density is the mass of a substance per unit volume—or we can also say it is the weight per unit volume. Some materials will sink in water in one shape and then float if their shape is changed. (For example, a ball of clay will sink whereas that same amount of clay, if spread out and shaped like a boat, will float.) The ball of clay is denser than water and sinks. But the boat, made out of the same amount of clay (the same mass), is bigger (more volume). Its density is less than the density of water and it floats. Thus, an ocean liner floats, even though it is made of metal. If we took all that metal and made it into a solid ball, it would certainly sink. There are factors other than shape that also can determine whether an object will sink or float in water. For example, some materials such as Styrofoam or many kinds of wood are less dense than water no matter what their shape. Also, some things sink when they are not well balanced because they tip and water comes in.

- **Air takes up space and floats to the top of water**
  Both water and air take up space. In order for water to enter an "empty" cup, funnel, piece of tubing, or turkey baster, it must take the place of the air that was already there. When pouring water into a cup, the air is easily replaced by the water. But it you put a cup under water with its open end down, you have to tip it to let the air out so the water can get in it. You can see the bubbles of air come out. Since air is always less dense than water, those bubbles will quickly float to the top of the water and pop. Sometimes, such as when trying to put water into a narrow piece of tubing that is closed at the bottom, the air in the tubing can't get out the top, allowing no water to get in.

Relate the science concepts to their explorations by reviewing the charts, "What We Notice about Water" and "What We Notice about Materials" and asking them to relate their observations to the science concepts. Encourage participants to come up with an example of how they may have been exposed to that concept during their exploration.

Look for ideas such as the following:

- When I was holding the tubing in a *U* shape, the water level was the same in both parts of the *U*.
- The water would always flow down the tubing, except when I squeezed the baster into the bottom of the tubing—then the water went up.
- I noticed that when I filled up a container all the way, I could even add a little more water to it, so the top seemed to hold together without spilling over.

4. **Conclude the workshop** (5 minutes) by telling teachers that they will have more opportunities to engage in and talk about inquiry, the science concepts, and the teaching approach in future workshops. You might want to collect "Read and Reflect 1" to get a better understanding of what teachers are thinking. Thank teachers for their participation. Give them "Read and Reflect 2" and confirm the time and place for the next workshop.

Read and Reflect 1: Introduction to *Exploring Water with Young Children*

Name: _____

Before coming to workshop 1, read the introduction to the teacher's guide and the excerpts from a teacher's journal. Respond to these questions as you reflect on what you read. This information will be helpful in the workshop discussion.

1. As you read about teachers A, B, and C, did you make connections to your own teaching? Which teacher was most like you?

2. What were the similarities?

3. What challenges will you face in learning the approach of teacher C?

Read and Reflect 2:
Getting Ready

Name: _____

Before coming to workshop 2, read "Getting Ready" and "Essential Information," as well as the "Books and Web Sites" sections in "Resources" at the back of the teacher's guide. Copy and complete the classroom environment checklist in the appendices. Once it is complete, reflect on the following questions. This information will be helpful in the workshop discussion.

1. What are the strengths of your environment? What important elements do you have for your water exploration?

2. What challenges do you face? What important elements are you missing?