INSTRUCTOR GUIDE

SESSION TWO

STUDENT LEARNING GOALS

❖ Understand concepts of “mathematizing” and “binary sort”.
❖ Appreciate the importance of embedding math and science learning in children’s prior knowledge and real world contexts.
❖ Deepen understanding of science process skills appropriate for young children.

Materials List

General

❖ Computer with internet access/speakers
❖ PowerPoint slides for Session 2 (downloaded from website)
❖ Data projector
❖ Sign-in sheet (customizable printable)*
❖ Course Reader
❖ Big Ideas of Early Mathematics textbook
❖ Extra course information packets (syllabus, calendar, learner profiles) for new students
❖ Copies of Science Process Skills handout (from Course Reader Section 2) for students who have not yet acquired their Course Reader

For the Arrival Activity

❖ Light colored cardstock 9”x12” (several colors)
❖ Markers

For the Science Focus

❖ Access to sink
❖ 1 large tub for each group of 4-6 (dish tubs will work, but larger tubs are preferable)
❖ Pitcher for filling tubs with water
❖ Several towels or rags
❖ Optional: cart for transporting tubs of water
❖ Recommended: A Cool Drink of Water by Barbara Kerley
❖ Optional: specialized water play materials for each group such as funnels, pieces of clear plastic tubing (cut into 1’-2’ pieces) that fit onto funnels, turkey basters, soap dispenser pumps, etc.
❖ **Students provide:** tools for exploring water (Remember that there may be new students who will not have brought their own items, so extras are recommended.)

* The sign-in sheet is designed to be used to both take attendance and to record if each student brought assigned materials to class.
Session at a Glance

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<th>Topic</th>
<th>Description</th>
<th>Estimated Time (In Minutes)</th>
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<td>Arrival Activity</td>
<td>Students make name cards that represent themselves. They will use this card in the People Sort activity and display it at their seat each session.</td>
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<tr>
<td>Announcements, Agenda, and Teaching Approach</td>
<td>Give a general overview of the session. Review underlying philosophy and teaching approach of the course.</td>
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<tr>
<td>Math Activity: People Sort with Names</td>
<td>Students participate in a name activity that can be done with young children to get to know each other and gain practice with sets and sorting.</td>
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<tr>
<td>Discussion: How paper-copter activity connects with Preschool Foundations in Science</td>
<td>Students talk with a partner about their ideas from last session’s homework.</td>
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<tr>
<td>Hands-on Science and Math Activity: Water Exploration</td>
<td>Students participate in open-ended water exploration, and reflect on the opportunities for math and science learning.</td>
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<tr>
<td>Looking Ahead to Next Session</td>
<td>Discuss the homework and reading assignment to be completed before next session. Go over the materials that the students will be responsible for bringing.</td>
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Total Estimated Time: 2 hr 30 min

Before Session
- Review the materials relevant to this session:
  - PowerPoint for Session 2 (downloaded from website)
  - Reader Section: Session 2
  - California Preschool Foundations in Science pg. 48-72 (or relevant state guidelines if not teaching in California)
  - Literature Connection: *A Cool Drink of Water* by Barbara Kerley
- Make copies of printables and handouts.
- Set up materials:
  - **Note:** Set up for this session takes a little more time than the others due to filling the tubs with water. You may want to arrange for a helper. If practical, you could also have students help fill tubs.
  - For each group of 4-6 students, fill one tub about half way full of water. Set these aside for water exploration.
  - Place cardstock (1 per student) and markers on tables.

As Students Arrive
- Have students sign in on attendance sheet and mark if they brought items for water exploration.
- Have students turn homework in at the **end** of class since they will be discussing the assignment during class.
- If students missed the first class, have them complete a learner profile and provide them with the course syllabus and other essential course handouts.
Getting Started

Arrival Activity: Make a name card that represents you. Fold a piece of cardstock lengthwise. Decorate with a picture or design that says something about you. These will be kept in class and used each session to help everyone learn each other’s names.

1. Announcements and sharing.
   • If you have students who are working with children, ask if anyone tried the paper-copter activity from Session 1, and to share their observations and insights.
   • Let students know that if they do any of the math and science activities from the course with children, you would like them to share those experiences with their classmates during the announcements. These real-life stories will enrich our collective learning.

2. Review agenda.

3. Review course philosophy and teaching approach.
   • Adults also need hands-on experiential learning. Learning by doing is important at any age!
   • It is important for teachers to play and explore materials themselves. Having these experiences will help you guide your students.
   • Learning from each other is as important as learning from instructor.

4. Share the importance of Instructor Modeling a key element of the course.
   • Explain that one of the most effective ways to help students learn how to successfully translate what they learn in this course to young children is through Instructor Modeling. Emphasize the following points:
     o During instructor modeled experiences, the instructor demonstrates activities much as they would be done with children.
     o Students take on the role of children first, then reflect on the experience in the context of classroom implementation.
     o These experiences help students better understand concepts from both the perspective of the child as well as that of the teacher.
     o The purpose of instructor modeling is to help adult students successfully implement novel teaching practices and techniques more effectively with children.

Math Focus

5. Lead “People Sort with Names” activity.
This activity will help your students get to know each other better and at the same time, you will be modeling how to do this same activity with children.
• Have students bring their name cards and stand in a circle. (If there isn’t space in the classroom, go to a hallway or outdoors.)
• Go around the circle and have everyone introduce themselves. Optional: during introduction, have everyone briefly share something about their name (why parents chose that name, nickname, meaning of name, named after family member, etc.).
• Explain that each morning, as part of a greeting routine, a teacher can have children sort themselves according to a particular “rule” about their names. This is a binary sort, in which the set (our names) is sorted into two groups - one group showing the characteristic, and the other one not showing it. A teacher would adapt this activity based on the ages and abilities of the children.
• Choose one of the “rules” from the list below (choose one that makes sense given the names of the particular students in your class). Have the students sort themselves into two distinct groups according to that rule.
  o Names that begin with a particular capital letter.
  o Names that end in a particular letter (“a” and “y” are common).
  o Names with a double letter such as Michelle, Ellen, Anna, or Sammy.
  o Names with 5 (or another quantity) of letters in them.
• Once the group is sorted into two groups, model how to engage in thinking and talking about the way the data (set of names) has been sorted. Ask the people in both groups to check to see if they think everyone is in the right group according to the rule. Ask the people in the “have” group to say their names one by one and explain why they belong there. For example, “My name is Ellen and I have two ‘L’ s”.
• Ask for a volunteer in each group to count how many people are in that group.
• Have students re-sort themselves by one of the other rules suggested above. Debrief in a similar fashion.
• Ask the students to think about other rules that could be used to sort the names. Try some of their suggestions. Point out that children will have their own ideas for ways to sort.
• Ask for thoughts on how this activity might look different in a preschool setting than in a kindergarten or first grade classroom.
• Reflect on what different kinds of math learning children do while doing this kind of activity (observing attributes of names, sorting, counting, comparing quantities, organizing the same set in different ways).
• Ask students to share any ideas or questions they may have about doing this activity with children.
• Sum up the activity by pointing out that using children’s own names for math activities is a great example of mathematizing the world around us. The term mathematize is used when talking about the importance of helping children engage with the mathematics that is all around us. Using their names makes the activity personally meaningful helps them
to get to know each other’s names and builds the classroom community. It also incorporates literacy.

- Return to seats.

6. Show the Erikson Early Math Collaborative website.
Show the students the Erikson Early Math Collaborative website (http://earlymath.erikson.edu/) and walk them through how to find articles, activities, and videos by searching in the Idea Library (top right/green button). Explain that the resources on the website complement the course textbook: Big Ideas of Early Mathematics, and encourage them to use the website on their own to learn about research, get curriculum ideas, and watch videos that demonstrate effective practices in teaching early math.

7. Discuss assigned reading from previous session from California Preschool Learning Foundations in Science.
Have students share about the reading and homework assignment from the Preschool Foundations in Science.

- Instruct students to find a partner and discuss their ideas about the paper-copter activity from last session and how it connects with the Foundations.
- Ask students to share out what they discussed with their partner with the whole group.

- Refer students to the Science Process Skills handout in the Course Reader. Let them know that it is a list of science process skills that young children use when doing scientific inquiry. These skills are practiced in all science disciplines – physical science, life science, and earth science. Give students a few minutes to read it to themselves.
- Ask students to keep these process skills in mind when they do their water explorations, and to notice how water play provides opportunities for children to develop and practice these skills.

Note: Provide handout for students who have not yet acquired a Course Reader.


Introduction
• Water is everywhere - in oceans, lakes, rivers, streams, etc. It comes from the sky as rain and snow. It is essential for life. Water is naturally interesting for children to explore and they love to play with water.
• Ask, “How have you used water today?” Ask students to share out as many examples as they can. You may want to record their ideas on the whiteboard to model how a teacher might record the children’s ideas.
• Share a literature connection: *A Cool Drink of Water* by Barbara Kerley. (Note: You can either read the book aloud or use the PowerPoint slides to familiarize students with the book.) This book is compelling for both children and adults. Ask for observations about how water is being carried and/or used in each of the photos. Through beautiful photos, the book shows that people all around the world are unified by their common need for water. You might ask students if anyone has lived or visited a place where people collected water in an interesting way. Ask students for ideas about using this book with children to spark discussion and to inspire ideas for water explorations.

**Teachers Play and Explore with Water**

• Reiterate the importance of teachers exploring the activities themselves first. Teachers are better prepared when they engage in the same kinds of experiences as their students. Having these experiences themselves will prepare them to act as a guide to children, give them ideas for materials and how to use them, and help them to ask better questions of the children.
• Note that even though we interact with water everyday, we rarely take the time to experiment and use different types of materials and tools to really explore and think about all the interesting properties of water.
• Ask everyone to hold up the items they brought from home for water play. Look at how simple these items are!
• Explain that each table group will bring a tub of water over to their table and then play in the water with the items they brought. Let them know how much time they have. Tell them to follow their own curiosity, and make discoveries. Play like children, think like teachers!
• During the activity: Engage with the students in a similar way as you would with children. Ask them about what they’re doing. Make observations about how they are using the tools, what interests them and what kinds of challenges they set for themselves. Take note of what they say and how they interact with each other. You can refer to your observations during the debrief of the activity.
  * You may want to have them rotate to another tub partway through the activity so they can use some different tools and materials.

**Clean up:** Direct students to remove items from water and ask for volunteers to spill water into a sink or outside. Provide towels to dry tables.
   - As a whole group, or in small groups, have students discuss how they engaged in the activity.
   - Pose questions to encourage reflection, such as:
     - How did you use science process skills during your water exploration? Share concrete examples.
     - What kinds of math learning might children be experiencing during water exploration?
     - What insights did this experience give you about doing water play exploration with children?
   - If working in small groups, encourage them to take notes. Let them know how long they will have for discussion and leave time for some whole group sharing of key takeaways from their discussions.

Note: Some instructors assign each group a different question and then have groups report out highlights from their discussion.

11. Show and discuss photos of children doing water play. Some points you might incorporate into the discussion are:
   - Teacher should introduce tools at circle before children play with them. Don’t put all tools out at once. Talk about what the tools are and any rules for using them. Get children’s ideas about what they want to try.
   - Observe children while they are at the water table. Get ideas for extensions from what you notice them doing and talking about. Build on their interests and ideas.
   - Change tools and materials to keep the center interesting and challenging.
   - Teachers can take children further by focusing their explorations and providing opportunities to deepen their understanding of the properties of water.

12. Give students an opportunity to share other indoor/outdoor ways they have engaged young children in exploring water.

13. Show slides with science background on water. Make it clear that this information is being shared to build their own knowledge as adults, not as instructional material to be used with children.

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 window panes; 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 a 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. Air pressure pushes water up when you squeeze and let go of the bulb on a turkey baster, or...
eyedropper, or when you suck on a straw. Water moves faster or slower depending on the strength of the forces acting on it.

Water Takes the Shape of its Container
- Water does not have a fixed shape and constantly changes its shape to fit the space available.
- When water is in a cup, a pitcher, a tube, a bowl, a swimming pool, or a lake, the surface of the water will be flat unless it is moved by something else (for example, wind or shaking).

Behavior of Air in Water: Air Takes Up Space and Air Bubbles Float to the Top of Water
- Both water and air take up space. In order for water to fill an “empty” cup, funnel, tubing, or turkey baster it must take the place of the air that was already there. When pouring water into a cup, the water easily replaces the air. But if 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 into it. You can see the bubbles of air come out. Since air is less dense than water, those bubbles will quickly float to the top of the water, and pop.

13. Looking ahead to next session.
- Review homework assignment due next session.
- **Review materials to bring for next session:** Emphasize that student-supplied materials are essential for the hands-on activities in each class.
  - 5 small items for sink and float. Try to bring unusual things that others would be curious about. Do not bring anything valuable.