INSTRUCTOR GUIDE

SESSION TEN

STUDENT LEARNING GOALS

❖ Understand the difference between rote and rational counting.
❖ Become familiar with the principles of rational counting.
❖ Recognize how early science and math experiences support language and literacy development.
❖ Develop a sense of wonder and positive attitudes towards life science concepts through exploring trees and leaves.

Materials List

General

❖ Computer with internet access/speakers
❖ PowerPoint slides for Session 10 (downloaded from website)
❖ Data projector
❖ Sign-in sheet (customizable printable)
❖ Course Reader
❖ Big Ideas of Early Mathematics textbook

For the Math Focus

❖ 1 estimation jar for Arrival Activity (Fill a transparent plastic jar with 10-20 items such as pom-poms, cotton balls, counting bears, uniform sized beads, Unifix® cubes, plastic eggs, marbles, corks, pasta shells, etc. Use only one kind of item, all the same size/shape. The jar does not need to be full to the top.)
❖ Sticky notes or small pieces of paper (1 per student for recording estimates)
❖ Colored markers for each table group
❖ M&M® candies (at least 20 per student)
❖ Paper bowls (1 per table)
❖ Paper towels or napkins (1 per student)

For the Science Focus

❖ Exploring Trees exemplar activity guide
❖ A special leaf with interesting features or a small branch with leaves, flowers, or buds
❖ Magnifying lenses
❖ Crayons for leaf rubbings, one set per table group (preferably large ones with the paper peeled off)
❖ 8.5” x 11” white paper (1 per student)
❖ optional: extra leaves with distinctive features
❖ Students provide: 5 leaves each
### Session at a Glance

<table>
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<tr>
<th>Topic</th>
<th>Description</th>
<th>Estimated Time (In Minutes)</th>
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<tr>
<td>Arrival Activity</td>
<td>Students make estimates about how many objects are in the Estimation Jar. They make observations about the range of guesses and share how they formulated their estimates. They discuss how estimation jar activities can help young children practice and develop mathematical skills and concepts.</td>
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<tr>
<td>Welcome, Announcements, and Agenda</td>
<td>Give a general overview of the session and any relevant announcements, and provide time for sharing.</td>
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<tr>
<td>Math Focus: Counting</td>
<td>Students explore the big ideas about counting. They use M&amp;M® candies, or other items, to gain understanding of the four principles of rational counting. They watch and discuss three Erikson videos of children at different levels of ability with counting.</td>
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<tr>
<td>Discussion: Language and Literacy Development Through Science and Math</td>
<td>Students read and discuss sections from a research-based policy brief about how early math and science experiences support language and literacy development.</td>
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<tr>
<td>Discussion: Life Science in Early Childhood</td>
<td>Students engage in a “thought swap” about life science with young children and are introduced to the goals of life science in early childhood.</td>
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<tr>
<td>Science Focus: Exploring Trees</td>
<td>Students experience tree explorations as a simple, but powerful way to connect children to the natural world. They participate in the exemplar activity: Exploring Trees, going outside to observe a real tree if possible. They explore features of leaves and make leaf rubbings.</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, and address 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:
  - Chapter 3: Counting – More than just 1, 2, 3 in *Big Ideas of Early Mathematics*
  - Exemplar activity guide: Exploring Trees
  - PowerPoint for Session 10 (downloaded from website)
  - Reader Section: Session 10
  - Video: One-to-One Correspondence with Child 6: [http://earlymath.erikson.edu/one-to-one-correspondence-with-child-6/](http://earlymath.erikson.edu/one-to-one-correspondence-with-child-6/)
  - Video: Cardinality with Child 7: [http://earlymath.erikson.edu/cardinality-with-child-7/](http://earlymath.erikson.edu/cardinality-with-child-7/)
- Make copies of any printables and/or handouts.
- Set up materials:
  - Prepare an Estimation Jar for the Arrival Activity and place sticky notes and markers on the tables for students to record their estimates.
  - Fill a bowl with M&M® candies for each table group.
  - Place magnifying lenses on tables.
  - If practical (weather and time or day permitting) identify a real tree (or trees) close by the classroom for the tree exploration activity. Ideally, choose a tree with branches low enough to reach and one that students can stand around comfortably.

### As Students Arrive
- Have students sign in on attendance sheet and check off if they brought their leaves to class.
- Have students turn in their homework.
Arrival Activity: Students make an estimate about how many objects are in the jar and write their estimate on a sticky note.

1. Debrief the Estimation Jar Activity
   • Make sure everyone has made an estimate and written it on a sticky note.
   • Have students refer to the Estimation Jar handout in their Course Readers. Let them know that you are going to model the Estimation Jar activity as if you were doing it with children in order to help them experience the activity through a child’s eyes and to demonstrate the activity as written in the handout.
     o Place the Estimation Jar where everyone can see it.
     o Ask what it means to estimate (to make your “best guess”). Emphasize that it is a guess, so it doesn’t have to be right. You might make connections to real life. For example, if you were buying grapes, you probably wouldn’t count how many are in the bag. You would just estimate and guess if there are enough for everyone to share at snack time.
     o Ask students to place their sticky notes with their estimates on the wall or whiteboard in the front of the room.
     o Ask a couple of students to arrange the estimates in order of lowest to highest numbers.
     o Ask students to share how they came up with their estimates. What strategy did they use?
     o Ask for observations about the estimates (i.e. which are lowest and highest guesses; numbers that were guessed more than once, numbers that no one guessed, etc.).
     o Open the jar and count the objects together. Write the actual number of objects on the board.
     o Discuss which estimates were closest. Remind them that estimating is not about being right, it’s about trying to make a close guess.
   • Ask if anyone has used estimation jars with children and ask them to describe their experience.
   • Ask how they would adapt this activity for younger and older students. The handout provides suggestions. Emphasize that it is important to use objects that are all the same size.
   • Ask students what kind of mathematical concepts children would be building through working with estimation jars. (Understanding sets, measurement/volume, number sense, and counting.)

2. Announcements and sharing.
   • If you have students who are working with children, ask if anyone tried any activities from previous sessions and to share their observations and insights.
   • Share any observations, clarifications, or notable comments that you feel should be mentioned related to the previous session’s homework.

3. Review agenda.
4. Define rational and rote counting.
   - Tell students that counting the objects in the estimation jar is an example of rational counting.
   - Establish the difference between rational and rote counting. First, ask if students have any ideas about what these terms mean. Then show them the definitions on the slide (definitions are animated to appear on click).

5. Have students demonstrate the principles of rational counting using M&M® candies (or other items for counting).
   - Introduce the Four Principles of Rational Counting from the *Big Ideas of Early Mathematics* textbook.
   - Explain that in order for children to go beyond rote counting and to master rational counting, they must master four key principles or rules of counting. Counting may seem simple, but it is actually quite complex.
   - Explain that rather than simply giving them the definitions of these principles, students will do an activity to give them a more concrete understanding of each of the principles.
   - Have students refer to the handout “The Four Principles of Counting” in their Course Reader. Their task is to learn what the principles mean by talking together and demonstrating the principles to each other using items for counting—in this case M&M® candies! Make it clear that this activity is designed to help them, as adult learners, understand the principles. It is not modeling an activity to do with children.
   - Give the following directions:
     - Work with a partner.
     - Read over the principles together.
     - Use the M&M® candies (or other counting items) to demonstrate each principle.
     - “Quiz” each other to check that you both fully understand all four principles. Without looking at the handout, can you explain each principle in your own words?
   - Pass out the bowls of M&M® candies and paper towels and let them know how much time they have for this activity.
   - As they work, circulate around the room and ask students to explain the principles in their own words.

6. Watch and discuss three videos from the Erikson Early Math Collaborative website.
   Show three short videos of different children counting blocks. Ask students to look for evidence of children’s mathematical abilities in terms of the four principles of counting. After each video, ask students to share their observations.
   - Video 1. One-to-One Correspondence with Child 6
     http://earlymath.erikson.edu/one-to-one-correspondence-with-child-6/
     (One-to-one correspondence is still developing.)
   - Video 2. One-to-One Correspondence with Child 18
http://earlymath.erikson.edu/one-to-one-correspondence-with-child-18/
(Child counts cubes using one-to-one correspondence but not yet using the cardinality principle to count on.)

- Video 3. Cardinality with Child 7
  http://earlymath.erikson.edu/cardinality-with-child-7/
(Child is has a good grasp of the numerosity of the set.)

These videos demonstrate how counting seems to be simple, but it is really quite complex for young children.

7. Wrap up the math focus of class by presenting the Big Ideas about Counting from the Big Ideas of Early Mathematics textbook.

#1. Counting can be used to find out “how many” in a collection.
#2. Counting has rules that apply to any collection.

8. Engage students in a discussion about the connections between Mathematics, Science, and Literacy development.

- Give students some time to talk with a partner or in small groups about the question: How do early science and math experiences support language development?
- After a few minutes, get their attention. Explain that researchers have studied the connections between math, science, and literacy. The fact is that literacy skills are strengthened when taught within the context of math and science.
- Tell students that they are going to do an in-class reading from a policy brief from NIEER (National Institute for Early Education Research) that summarizes research finding.
- Give directions:
  - Refer to the handout from “Math and Science in Preschool: Policy and Practice” in Section 10 of their Course Reader.
  - Count off by 3’s.
  - If you are a “1,” you will read the first paragraph.
  - If you are a “2,” you will read the second paragraph.
  - If you are a “3,” you will read the third paragraph.
Reiterate that each student should read only the paragraph they were assigned.
- When everyone has finished reading their assigned paragraph, give directions for the jigsaw discussion:
  - Make groups of three that include “1,” “2,” and “3.”
  - Share the main ideas from your paragraph with your group by responding to these questions:
    - What did you learn?
    - What did you find interesting?
    - What is a question you still have?
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Let them know how much time they have for discussion.

Wrap up this topic by showing the slide with the chart of language strategies. As described in the policy brief, when teachers use these strategies with math and science, they can simultaneously support language and literacy development.

   - Let students know that for the next four sessions, the science focus will be on life science topics.
   - Give directions for the “Thought Swap” activity:
     - Have students stand up and find a partner. If space allows have them stand in two lines facing each other.
     - Tell them that you will read a question aloud and they will have a few minutes to discuss it with their partner.
     - Let them know what the signal will be when it’s time to stop talking (such as a chime, flash the lights, or clap pattern).
     - Read the first question and direct students to begin their conversations.
     - Listen in on the conversations to get a sense of what students are sharing.
     - When time is up, give the signal. Ask a couple of people to share out. Based on what is shared, you can add your own comments and insights.
     - Have everyone pair with a new partner. If standing in lines, simply have everyone in one of the lines move up to face a new partner.
     - Repeat the process with the questions provided below. This activity can be shortened by asking fewer questions, or you could add other questions in addition to those suggested.

   “Thought Swap” Questions:
   1) When you think of life science in the early childhood classroom what comes to mind?
   2) Why is it important for children to have experiences with living things?
   3) As a teacher, what could you do to create an environment and classroom culture that conveys the excitement and wonder of learning about living things?
   4) As a child, who in your life shared the joy of nature with you and how have those experiences influenced you?

   - Have students return to their seats. Provide an overview of the goals of life science for young children with the PowerPoint slide (bullets are animated to appear on click).
10. Introduce the Exploring Trees exemplar activity.
Let students know that you are going to model the Engage part of the activity in much the same way as if you were doing it with children in order to help them experience the activity through a child’s eyes and to demonstrate the teaching strategies as written in the exemplar activity guide.

Engage

- Show the students the special leaf or small branch you brought. Tell them a story about where you found it, the tree it came from, what you noticed about it, and why you wanted to share it with them. Convey a sense of excitement about your discovery.
- Encourage students to share their prior knowledge and experiences about trees by asking them questions such as:
  - Have you ever seen a special tree?
  - What are some things you might see on a tree?
  - What do you like about trees?
- If possible, take the students outside to explore a real tree. Have them use their senses to investigate the different parts of the tree and describe how they look, feel, and smell. Listen to sounds. Hug the tree! Identify the different parts of the tree (roots, trunk, branches, leaves, bark, etc.). Look closely to make more discoveries. You might find insects, spiders, holes in the tree, sap, etc. Notice special features such as fruits, buds, distinctive odors, or nibbled leaves.

Note: If it is not practical to take students outside to explore a real tree due to weather and/or time of day, describe this part of Engage to the students.

- Back in the classroom, share some suggestions for visiting a real with young children.
  - If no trees are on site, take a walking field trip to a tree in the neighborhood. Invite parents to come along as helpers.
  - Explore the tree yourself ahead of time to know what to expect.
  - Visit the tree often with children to observe changes. Take photos for documentation.
  - Collect leaves and other items from the tree to bring back to the classroom to display and investigate.

Explore

- Invite students to share the leaves they brought from home at their tables and to talk about where they collected them.
- Ask them to spend a few minutes observing, comparing, and describing the shapes, sizes, colors, textures, and smells. Encourage them to use their magnifying lenses.
- When students seem ready to move on, get their attention and give directions for making leaf rubbings. Pass out paper and crayons.
  - Directions (also on slide): Place a piece of paper over a leaf. For best results, use large-size crayons with the paper wrapping peeled off. Hold the crayon sideways while rubbing. Discuss the shape of the leaves and the pattern of the veins.
Reflect

- Ask questions such as:
  - What interesting discoveries did you make as an adult learner?
  - What other kinds of science and math activities could children do with leaves?
  - What are the opportunities for supporting language and literacy development?

Clean up: Direct students to put away the leaves and clean up the tables.

11. Song and movement: Have everyone stand up and sing along. Imagine your body is a tree.

   **The Trees Are Growing High**  
   *(Sung to the tune of “The Farmer in the Dell”)*

   The trees are growing high. *(stretch arms overhead)*
   - The trees are growing high.
   - With soil and rain and sunny days,
   - The trees are growing high.
   - The trees are growing roots. *(press feet into ground)*
   - The trees are growing roots.
   - With soil and rain and sunny days,
   - The trees are growing roots.
   - The trees are growing bark. *(move hands up and down sides of body)*
   - The trees are growing bark.
   - With soil and rain and sunny days,
   - The trees are growing bark.

Note: Additional verses can be added for leaves, fruits, or flowers.

12. Show photos of children exploring trees and leaves. Ask for students’ ideas on modifications for different ages and developmental levels.

Wrapping Up

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.
  - One quart-size bag of soil (not potting soil) collected from a clean source.
  - One empty, clear glass or plastic jar with a wide top and lid (such as pasta sauce jar or mason jar).