INSTRUCTOR GUIDE

SESSION THIRTEEN

STUDENT LEARNING GOALS

❖ Understand best practices for involving parents in children’s science and math learning.
❖ Apply concepts of data collection and data analysis to early childhood learning contexts.
❖ Practice integrated curriculum approach of science and math through earthworm investigation.

Materials List

**General**
- Computer with internet access/speakers
- PowerPoint slides for Session 13 (downloaded from website)
- Data projector
- Sign-in sheet (customizable printable)
- Course Reader
- *Big Ideas of Early Mathematics* textbook

**For the Arrival Activity**
- Optional: *One Bean* by Anne Rockwell and Megan Halsey
- **Students provide:** seed germination bags made in Session 12

**For the Math Focus**
- Graph: “*How comfortable are you touching worms?*” (drawn on whiteboard or butcher paper—see image in *Math Focus*, page 6)
- **Sticky notes (1 per student)**

**For the Science Focus**
- Investigating Earthworms exemplar activity guide
- Tray containing a small pile of soil
- Photograph of an earthworm (printable)

For every pair of students and yourself:
- 1 or more live earthworms
- 1 paper plate or small tray
- Damp paper towels
- Small piece of black construction paper (about 3” x 4” for making a tunnel)

For the group:
- Magnifying lenses
- Mister containing water or cup of water to sprinkle worms as needed to keep them moist

**Other Printables and Handouts**
- Extra copies of Reflective Essay assignment (for students absent in Session 12)
### Session at a Glance

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Estimated Time (In Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrival Activity</td>
<td>Students compare their seedling with others at their tables. They share their thoughts about doing this activity with children and discuss ideas for helping them to record the changes they notice.</td>
<td>15</td>
</tr>
<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>
<td>5</td>
</tr>
<tr>
<td>Discussion: Family Involvement</td>
<td>Students engage in a discussion about involving families in science and math.</td>
<td>15</td>
</tr>
<tr>
<td>Math Focus: Data Analysis</td>
<td>Students explore the big ideas about data analysis. They participate in a data analysis activity to find out about their classmates’ level of comfort handling worms.</td>
<td>30</td>
</tr>
<tr>
<td>Science Focus: Investigating Worms</td>
<td>Students participate in the exemplar activity: Investigating Worms. They discuss scenarios related to using live animals in the classroom.</td>
<td>70</td>
</tr>
<tr>
<td>Discussion: Life Science and Dramatic Play</td>
<td>Students see photos that illustrate how dramatic play can contribute to building an ecological perspective.</td>
<td>10</td>
</tr>
<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>
<td>5</td>
</tr>
</tbody>
</table>

Total Estimated Time: 2 hr 30 min

### Before Session
- Obtain either redworms or night crawlers. You can often find nightcrawlers at local bait stores. Large nightcrawlers are impressive, but the size you buy is up to you. Redworms (also called red wrigglers) are used for worm composting and are often available at garden supply stores. You may be able to dig up worms in your own garden. You can also order them online from Delta Education. Worms can be purchased about a week in advance. Keep them in a cool place, out of direct sun.
- Review the materials relevant to this session:
  - Chapter 7: Data Analysis in *Big Ideas of Early Mathematics*
  - Exemplar activity guide: Investigating Earthworms
  - PowerPoint for Session 13 (downloaded from website)
  - Reader Section: Session 13
- Make copies of any printables and/or handouts.
- Set up materials:
  - You may want to mist or gently rinse the worms to clean them before the observation to remove the soil from their bodies and make them easier to observe. You can place rinsed worms in a covered container with damp paper towels until you need them. It is important to keep the worms moist, but not too wet.
  - Place the container of worms, tray with a small pile of soil, magnifying lens, damp paper towel, and small piece of black construction paper where you will model the *Engage* section of the Investigating Earthworms exemplar activity.

### As Students Arrive
- Have students sign in on attendance sheet and check off if they brought their seed germination bag to class.
- Turn homework in at the end of class because they will refer to their homework for class discussion.

Although it requires some effort to obtain live worms, the experience your students will have is well worth it! Even students who have some discomfort will benefit from the opportunity to encounter worms in a safe and supportive learning environment and will be more likely to appreciate the value of engaging children in hands-on investigations with worms and other similar creatures.
Arrival Activity: Compare your seedling with others at your table. Share your thoughts about doing this activity with children and discuss ideas for helping children to record the changes they notice.

1. Debrief the seed germination experiment.
   - Ask questions such as:
     - What happened to the seeds you germinated?
     - What might be some reasons why some seeds developed more than others? (variation in light, warmth, water, type of seed).
     - What parts of the plant can you see? (roots, stem, and leaves - although in one week, not all these parts will necessarily have grown yet). What part grew first? Which way did the roots grow – up or down? What are roots for?
     - How could children record the changes they see? For example:
       - Children can draw a picture of their seed experiment each day.
       - Use a craft stick or straw to measure growth adding a mark on the stick for each new measurement
       - Use Unifix® cubes to measure height
       - Teachers can document seed growth through photos.
     - What other ideas do you have for extending this activity? (Students will likely mention transplanting the seedlings into soil in pots or in the ground.)

Note: You may want to also ask, “What would you do if a child’s seeds didn’t sprout?” Stress that when an experiment doesn’t work out as expected, it can be an opportunity to help children engage in scientific thinking about why things happen. A teacher can encourage children to think about possible explanations and then try the experiment again incorporating their ideas.
   - Optional - Read One Bean by Anne Rockwell and Megan Halse.

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.

Early Childhood Topic

4. Engage students in thinking about family involvement in science and math.
   - Have students share their ideas from last session’s homework about involving parents and families in gardening. Give them time to talk at their
tables, and then ask them to share out any new ideas they got from their discussions.

- Show the slides of general suggestions for connecting with families around the experiences their children are having in science and math. As you talk about the examples provided on the slides, give students the opportunity to contribute more examples from their own experiences. Suggested practices:
  - Newsletters (can be print or electronic)
  - Home/school activities – bringing items from home to extend learning; extension activities that can be done at home
  - Parent helpers
  - Parent and family events
  - Documentation of science learning

5. Introduce Data Analysis as described in Chapter 7 in the *Big Ideas of Early Mathematics* textbook.

- Begin by asking students to think about what data analysis means in the adult world – we generally associate it with detailed charts, graphs, computers, and statistics.
- Explain the basic process of data analysis: Data analysis involves gathering data, then organizing the data in ways that allow us to make comparisons and generalizations, and then analyzing the data to make sense of it and learn something new.
- Have students discuss the following question in their groups: “What kinds of data analysis can young children do?” Then have them share out to the whole group. Let them know that this questions is to get them thinking about the topic. Depending on their experience levels, they may or may not have much to share, which is fine.

6. Consider the photo of the teddy bears as an example of data collection for young children. Ask:

- What data has the class collected? (the teddy bears)
- How have the data been organized? (ordered by height)

7. Show the next four slides of examples of different forms of data representation appropriate in early childhood.

- **Object graphs** allow children to literally see the answer when comparing sets to discover “Which has more?” Because objects can be of different sizes, it is important to help children place them in rows or boxes on a grid for easy comparison.
- **Pictographs** are a more abstract representation than an object graph. Instead of using the objects themselves, each object is represented by a picture. Children will learn that a pictograph has some advantages over an
object graph because it can remain over time as a way to remember what
the data showed at that particular time. A pictograph is a meaningful
transition between the objects themselves and a more abstract
representation.

- **Other types of abstract graphs**, such as: children writing or placing their
  name to show their answer to a survey; using Unifix® cubes to represent
  your answer; using tally marks to represent numbers.

8. Emphasize the importance of connecting data collection and analysis to
authentic problem solving.

- Ask students to read the quote from *Big Ideas of Early Mathematics*:

  “When dealing with young children, we often overlook the fact that for
  authentic problem solving to take place, there must be an authentic
  problem – one whose solution is not obvious or
  predetermined….collecting data is not an end in itself. There should
  always be a reason – a question that can be answered only if we have
  more information.”

- Show the slide of the graph that asks, “Do you like to touch worms?” Ask
  students to discuss the following questions:
  - What might be an authentic reason for collecting this data?
  - What problem does it help solve?
  - What could the class do with the information they learn from this
    graph?

9. Introduce the Big Ideas about Data Analysis from the *Big Ideas of Early
Mathematics* textbook.

  #1. The purpose of collecting data is to answer questions when the
      answers are not immediately obvious. The most important thing children
      can learn about data analysis is why we do it. Experiencing why data
      analysis is useful will motivate them to understand how it works.

  #2. Data must be represented in order to be interpreted, and how data is
      gathered and organized depends on the question. Understanding this
      idea comes with experience and requires adult scaffolding and thoughtful
      guidance.

  #3. It is useful to compare parts of the data and to draw conclusions
      about the data as a whole. Comparing the data and drawing conclusions
      is what allows us to learn something new and makes the entire process of
      data analysis meaningful to children.

10. Have students participate in a data analysis activity to find out about
their level of comfort handling worms.

- Explain that today students will be handling live creatures found in the
garden – earthworms! Just as with children, adults have different levels of
  comfort touching worms and that is okay. We can work together and help
  each other learn about these fascinating animals. We have all been
influenced by different experiences in our backgrounds that shaped our attitudes.

- Show them the graph with the heading, “Are you comfortable touching worms?” Possible responses: “Yes/Somewhat/No.”
- Have students each write their name on a sticky note. One by one have them place their sticky note in the column on the graph that best matches how they feel.
- When all students have placed their sticky note on the graph, ask for observations about the data, such as:
  o What can we learn from this graph?
  o What does this graph make you curious about?
  o How can we use this information?

11. Lead a discussion about how teachers who have negative attitudes towards certain creatures deal with those aversions/fears around the children they teach.
Ask those who have strong positive feelings towards worms where they think those attitudes came from. Ask those who have strong negative attitudes the same question. Ask those in the “somewhat” category to say something about their past experiences as well.

- Acknowledge that it is not necessary for every teacher to love every type of creature, but teachers need to be aware of their own bias and not pass negative attitudes on to children. When people do have phobias and fears, we need to have empathy and gain understanding of their perspective.
- Let students know that when it is time to observe the live worms, you are going to have them form new groups that are balanced in terms of where people placed their sticky note on the graph. That way, those who do not want to touch the worms can participate in other ways, such as:
  o taking photos
  o recording observations from the group
  o doing research to look up answers to the group’s questions using mobile devices
- Use the sticky notes with students’ names from the graph to form groups for the exemplar activity that are balanced in terms of various levels of comfort touching worms.

Science Focus

12. Introduce the Investigating Earthworms 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 students a tray of soil and ask, “What kinds of small animals might live in the soil?”
- After they share their ideas, hold up a photograph of an earthworm and ask questions such as:
  - Where have you seen earthworms?
  - Have you ever touched an earthworm? How did it feel?
  - What do you know about earthworms?

Note: Students may have already talked about their past experiences with worms during the graphing activity, so you may not need to ask them again.

- Show the students a live earthworm. Ask how they think we should handle the worms and take care of them so that we do not hurt them. Emphasize the following: worms are living things, the importance of being gentle, and not hurting the earthworms. Model how to gently pick up and hold the earthworm in your hands.
- Place the worm on a paper plate and show the materials and tools the students can use in their investigations (magnifying lens, wet paper towel, tunnel made of black paper).
- Tell students that their job is to observe the worm’s body and to investigate how it moves, what direction it can go, and where it goes when something blocks its path.

Explore

Refer students to the Earthworm Observation handout and the Earthworm Information sheet in their Course Readers to use in their explorations.

- Distribute the worms, paper plates, damp paper towels, and black construction paper for making tunnels. It works well for students to share a worm, rather than to each have their own.
- Encourage students to touch the worms and make observations about their bodies.
- Encourage students to gently pick up the earthworms and hold them in their hands if they want to.
- Allow plenty of time for free exploration with the worms and materials. Have them refer to the Earthworm Observation handout in their Course Reader to help focus their observations. They can also refer to the Earthworm Information handout to learn more about worms’ bodies and behaviors.
- If the students notice any earthworm castings, explain that they are good for the soil and help plants grow.
- As students observe the worms, circulate around the room modeling questions and comments as you would with children to foster the science process skills.
- You may need to lightly mist or sprinkle the worms with water to keep them moist.
- Invite the students to make observational drawings of their earthworms.
Reflect

- At the end of the activity, have the students place their earthworms in a container of soil (such as the one they were kept in when purchased). Within a short time, the earthworms will dig beneath the surface.
- Lead a discussion with the students about their observations and discoveries. Ask questions such as:
  - What did you learn about earthworms?
  - How is the earthworm’s body the same as/different than your body?
  - What questions do you have about earthworms?
- This discussion is a good opportunity to talk about earthworms’ important role in keeping soil healthy by making tunnels underground that bring air and water to plant roots.
- Ask students to reflect on the earthworm investigation experience as an adult learner. Ask questions such as:
  - What aspects of the earthworm investigation were most meaningful and why?
  - How did this experience affect your ideas about exploring life science with young children?

Clean up: Direct students to clean up their materials and wash their hands.

13. Song: Have everyone stand up and sing along.

**Little Wiggle Worm**
*(Sung to the tune of “I’m a Little Teapot”)*

Stand up and wiggle. On the last line, wiggle down to the ground.

I’m a little wiggle worm, watch me go!
I can wiggle fast, or very slow.
I wiggle all around, then back I go
Down in the ground, to the home I know.

14. Show photos of children investigating worms. Ask for students’ ideas on modifications for different ages and developmental levels.

15. Engage students in discussion of the Worm Scenarios.

- Have students refer to the Worm Scenarios handout in their Course Reader. Introduce the scenarios by saying that worms and other small creatures such as snails, rolly pollies, and caterpillars that are found outside are wonderful for children to investigate. They are in our immediate environment and young children are curious about them and often are eager to handle them. They are an important part of nature. However, situations can arise that require a sensitive adult’s guidance. The scenarios are written about worms, but could apply to other small creatures as well.
• There are different ways you can structure the discussion:
  o You can assign each table one of the scenarios to discuss and then have each group report out about the highlights from their discussion.
  o You can organize a “speed dating” style discussion. Everyone stands up and finds a partner. Ask someone to read Scenario #1 aloud. Let students know they will have a few minutes to discuss the scenario with their partner, and tell them what the signal will be to stop talking. After each discussion, do a quick debrief. Have them find a new partner. Call on someone else to read Scenario #2 aloud. Continue this method for the rest of the scenarios. (Note: It is not necessary to discuss all the scenarios if time becomes an issue.)

• After the scenario discussions, share the following quote to reiterate the crucial role teachers play in shaping children’s ecological perspective and appreciation for nature:

  “Children will learn to love and know the natural world only through interaction with adults who show respect and love for it; we cannot assume that this will happen if we, as adults, do not serve as models.”

  From “The Young Child As Scientist: A Constructivist Approach to Early Childhood Science Education” by Christine Chaille and Lory Britain.

16. Engage students in thinking about how dramatic play can help promote ecological perspective taking.

• Reiterate that having experiences with living things is essential in helping children to appreciate the interconnectedness of living things and to develop “an ecological perspective.”

• Point out that another way to help children consider the world through the eyes of other living things, so to speak, is through dramatic play and role-playing.

• Show the slides of children pretending to be worms, spiders, and butterflies.

• Have students talk at their tables or as a whole group about how these kinds of activities can support an interest in, and appreciation of, nature. Through imaginative play, children can discover similarities and difference between people and other animals, which is an important part of becoming more environmentally aware and responsible.

• Ask students if they have incorporated dramatic play into life science activities, and if so, to describe what they have done.
17. Looking ahead to next session.
   • **Review homework assignment due next session.** Remind them what date their Reflective Essays are due.
   • **Review materials to bring for next session:** Emphasize that student-supplied materials are essential for the hands-on activities in each class.
     - 1 grocery bag of recyclables such as long paper tubes, small empty boxes, yogurt containers, etc. that will be used to build ball runs.