

SESSION FOUR

STUDENT LEARNING GOALS

- ❖ Understand the application of constructivist learning in early childhood settings.
- ❖ Apply principles of sorting and classifying by different attributes to rocks.
- ❖ Identify components of an engaging, high-interest science area.



Materials List

General

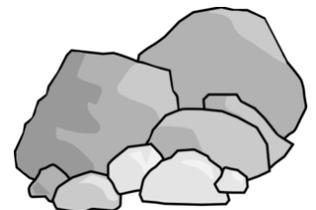
- Computer with internet access/speakers
- PowerPoint slides for Session 4 (downloaded from website)
- Data projector
- Sign-in sheet (customizable printable)
- Course Reader
- *Big Ideas of Early Mathematics* textbook
- Recommended: *Fish is Fish* by Lio Lionni

For the Science Focus:

- Exploring Rocks exemplar activity guide
- Recommended: *If You Find a Rock* by Peggy Christian
- Bowls or small containers of water for washing rocks (2 per group)
- Paper towels for drying and polishing rocks
- Easel paper (1 sheet per group)
- Optional: additional rocks and old toothbrushes
- **Students provide:** Rocks, old toothbrushes

For the Arrival Activity:

- Magnifying lenses



Session at a Glance

Topic	Description	Estimated Time (In Minutes)
Arrival Activity	Students use magnifying lenses to observe common objects such as their own fingerprints, jewelry, pencils, print, and other readily available items.	10
Welcome, Announcements, and Agenda	Give a general overview of the session and any relevant announcements, and provide time for sharing.	10
Discussion: Constructivism	Use the story, <i>Fish is Fish</i> by Lio Lionni to engage students in a discussion on constructivism and the teacher's role in implementing a constructivist model of science education.	20
Science Focus: Exploring Rocks	Students participate in the exemplar activity: Exploring Rocks. They brainstorm ways to further investigate rocks with young children and discuss the value of free exploration.	40
Math Focus: Sorting Rocks	Students sort rocks by different attributes. They watch and discuss an Erikson video of a child sorting rocks.	40
Discussion: The Role of the Environment as Teacher / The Classroom Science Area	Students explore the idea of the environment as the third teacher. Students engage in a "Thought Swap" to exchange ideas about creating a high-interest science area.	20
Looking Ahead to Next Session	Discuss the homework and reading assignment to be completed before next session, and address the materials that the students will be responsible for bringing.	10

Total Estimated Time: 2 hr 30 min

Before Session

- Review the materials relevant to this session:
 - Exemplar activity guide: Exploring Rocks
 - PowerPoint for Session 4 (downloaded from website)
 - Reader Section: Session 4
 - California Preschool Foundations in Science pg. 79 (or relevant state guidelines if not teaching in California):
<http://www.cde.ca.gov/sp/cd/re/documents/preschoolfoundationsvol3.pdf>
 - Video: Sorting Rocks with Child 14: <http://earlymath.erikson.edu/sorting-rocks-with-child-14-explorations-in-core-math/>
 - Literature Connection: *Fish is Fish* by Lio Lionni
 - Literature Connection: *If You Find a Rock* by Peggy Christian and Barbara Hirsch Lember
- Make copies of any printables and/or handouts.
- Set up materials:
 - For each group of 4-6 students, fill two small bowls of water that students will use for washing their rocks and place them on the tables.
 - Place magnifying lenses on the tables.
 - Place paper towels on the tables for drying and polishing rocks.

As Students Arrive

- Have students sign in on attendance sheet and mark if they brought their five rocks and an old toothbrush to class.
- Have students turn in their homework at the **end** of class since that will be discussing the assignment during class.

Getting Started

Arrival Activity: Use a magnifying lens to practice your observation skills. What details can you observe that are too tiny to see with your eyes alone?

Look at objects such as:

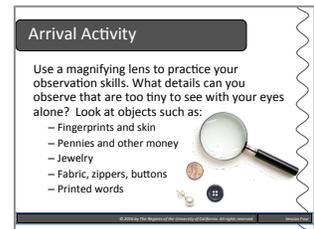
- Fingerprints and skin
- Pennies and other money
- Jewelry
- Fabric, zippers, buttons
- Printed words

Point out that for young children, using a magnifying lens is often a new skill and takes practice.

1. 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.

2. Review agenda.

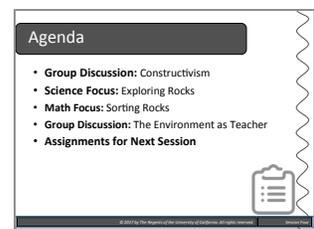


Arrival Activity

Use a magnifying lens to practice your observation skills. What details can you observe that are too tiny to see with your eyes alone? Look at objects such as:

- Fingerprints and skin
- Pennies and other money
- Jewelry
- Fabric, zippers, buttons
- Printed words

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Agenda

- **Group Discussion:** Constructivism
- **Science Focus:** Exploring Rocks
- **Math Focus:** Sorting Rocks
- **Group Discussion:** The Environment as Teacher
- **Assignments for Next Session**

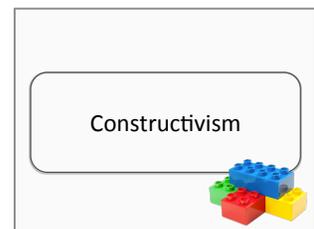
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Early Childhood Topic

3. Have students discuss constructivism with a partner.

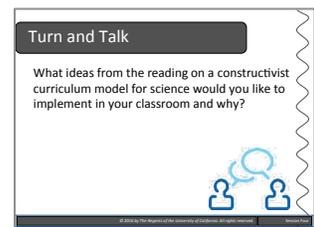
Have students refer to their homework. Ask, “What ideas from the reading on a constructivist curriculum model for science would you like to implement in your classroom and why?” Share with a partner.

- Take a few comments from the whole group about what came up in discussions.
- Review the main principles of constructivism:
 - Learners do not *acquire* knowledge that is transmitted to them; rather they *construct* knowledge through their intellectual activity and make it their own.
 - Learners come to the educational setting with many different experiences, ideas, and approaches to learning (this is referred to as prior knowledge).
 - Young children are social beings, influenced by and influencing others around them.
- Ask students to think about the Sink and Float activities from last session from a constructivist view. Within one group of preschoolers, some children will already have had many chances to construct theories about objects and how they act in water and may have very clear ideas about sinking and floating. Others may have more incomplete theories, and still others may have very little prior knowledge and may not even know what sinking and floating is. It's the teacher's job to tap into



Constructivism

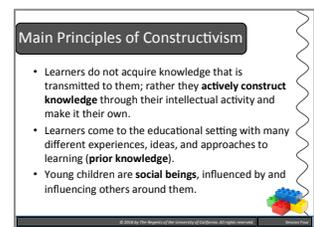
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Turn and Talk

What ideas from the reading on a constructivist curriculum model for science would you like to implement in your classroom and why?

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Main Principles of Constructivism

- Learners do not acquire knowledge that is transmitted to them; rather they **actively construct knowledge** through their intellectual activity and make it their own.
- Learners come to the educational setting with many different experiences, ideas, and approaches to learning (**prior knowledge**).
- Young children are **social beings**, influenced by and influencing others around them.

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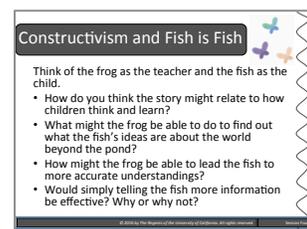
children’s current constructions/understanding (prior knowledge) and to design learning experiences that respond to the diversity of learners in any given classroom.

4. Use the story *Fish Is Fish* by Leo Lionni to further explore constructivism.

- Using the book, or the PowerPoint slides of selected pages, read the story aloud and show the pictures. If not reading the whole book, give a brief summary: Two friends, a tadpole and a fish, live in a pond until the tadpole becomes a frog and leaves the pond. The frog goes out of the pond and onto the land and has all kinds of new adventures. When he comes back to the pond he tells the fish all about what he has seen. The fish imagines everything the frog is saying, but only in the context of what he himself knows.
- Read aloud the page that starts with: *“Then one day, with a happy splash that shook the weeds, the frog jumped into the pond.”* (This is the first slide from the book on the PowerPoint.) Continue reading the next nine pages (stopping at the two-page pictorial spread showing the fish’s ideas about birds, cows, and people).
- Tell students to think of the story as a metaphor for our relationship to children when we’re trying to introduce them to new concepts. Think of the frog as the teacher and the fish as the child. In the book, the frog (teacher) tries to explain what birds, cows, and people look like to his friend the fish (child). The fish imagines each of these as fish-like creatures.
- In small groups, have students discuss questions about how the story relates to constructivism.
 - What might the frog (teacher) be able to do to find out what the fish’s (student’s) ideas are about the world beyond the pond? (ideas child hasn’t experienced yet)
 - How might the frog be able to lead the fish to more accurate understandings?
 - Would simply telling the fish more information be effective? Why or why not?
- After groups have had time to talk, have them share out their ideas with the class.
- Point out the difficulty in knowing what children really understand. Explain that a person could try to explain something to a child, but even if the child says, “I understand,” one could never be sure what their understanding really is, and how close it is to that of the person who explained it. Of course, this is also true of adults as well!



Slides of Book Pages



Science Focus

5. Introduce the Exploring Rocks 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.

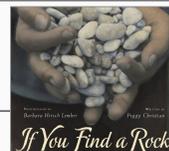
Engage

- Share a literature connection: *If You Find a Rock* by Peggy Christian. (Note: You can either read the book aloud or use the PowerPoint slides to familiarize students with the book.) This story will help to inspire thinking and talking about rocks.
- Talk with the students about rocks, as you would do with children. You might ask if anyone has a rock collection at home or if they have collected rocks before. Ask, “Where have you found rocks?” “What is a rock?” “What do you like about rocks?”

Explore

- Explain that with children, the *Explore* part of the exemplar activity begins with going outside on a rock hunt to collect rocks to bring back to the classroom. For the context of this session, students will be exploring the rocks they brought from home rather than collecting them.
- Show the slides of children collecting rocks and ask students to share their thoughts on what they think the value of this experience is for children? What kinds of discoveries might they make?
- Explain that the exemplar activity has suggestions for different ways children can investigate the rocks they collected. Emphasize that there is no one way to do it. Teachers and children are sure to have many creative ideas about what to do with the rocks. The more experiences children have to touch, feel, sort, and play with rocks, the more they will discover about their interesting characteristics.
- **Free exploration with rocks that students brought to class.** Direct students to:
 - Show each other the rocks they brought and share where they collected them and why they selected those particular ones.
 - Observe rocks with magnifying lenses and notice different attributes.
 - Wash rocks with brushes and water, and “polish” with paper towels.
- After some time for observing, cleaning, and talking about their rocks, have students draw one or more of their rocks on a piece of paper. Emphasize, as one would with children, not to worry about if they are “good at drawing.” The purpose is to hone their observation skills and to practice drawing what they see. They may also write about their rock. Encourage them to use lots of descriptive words.

Exploring Rocks



If You Find a Rock by Peggy Christian

Slides of Book Pages

Slides of children collecting rocks

Note to Instructor: It may be surprising how much adults can have emotional connections to rocks. They are usually interested in hearing each other’s reasons for selecting the particular rocks they brought to class. Certain rocks may remind them of memories and elicit sharing personal stories.

Free Exploration with Rocks

- Show each other the rocks you brought. Share where you collected them and why you chose them.
- Observe rocks with magnifying lenses.
- Wash rocks with brushes and water, and “polish” with paper towels.
- Draw one or more of your rocks. You may also write about your rock.

Reflect

- After students have had enough time to observe, wash, draw, and talk about their rocks, ask reflection questions such as, “What did you learn from observing and investigating the different rocks?” “How were you being a like a scientist?”

6. Discuss the importance and value of free exploration.

- Explain that as with any new material, children need many opportunities to freely explore the rocks in an unstructured way before moving on to more directed activities.
- Ask students to brainstorm why free exploration is important for 1) the children and 2) the teacher. You may want to record their ideas.
- Refer to the Free Exploration handout in the Course Reader and have students read it either to themselves or ask for volunteers to read it aloud.

Think about the learning

What did you learn from observing and investigating the different rocks?

“How were you being a like a scientist?”



Why is *free* exploration important?

Math Focus

7. Have students do sorting with rocks in small groups.

- Let the students know that now they are going to do a more structured activity with the rocks. Rocks are a great manipulative for sorting since they have so many different interesting attributes.
- Direct students in their groups to place all of the rocks in the center of the table and come up with different ways to sort them. Try a binary sort first (2 groups). Then they could do a multiple set sort (more than 2 groups). Some possibilities are: by size, texture, color, shiny/not shiny.
- Optional: Have groups do a “Secret Sort.” Tell each group to choose a way to sort their rocks (according to a certain attribute), but to whisper it so others don’t know what their rule for sorting is. Each group should leave their sorted rocks organized in the center of their table. If some rocks are not being used they should be placed out of site so as not to cause confusion. Have everyone walk around the room and try to figure out each table’s “rule.” Then have students share their guesses about how each group’s rocks were sorted.

Clean up: Direct students to clean up the tables, and spill out the water in the sink or outside. Place rocks on towels to dry.



8. Watch and discuss Erikson video: Sorting Rocks with Child 14. The video shows a kindergartener organizing a collection of rocks into unique sets. <http://earlymath.erikson.edu/sorting-rocks-with-child-14-explorations-in-core-math/>



9. Show photos of children doing various activities with rocks. Ask for students’ ideas on modifications for different ages and developmental levels.

Sorting Rocks



Sorting Rocks

- Place all of your groups’ rocks in the center of the table.
- Think of different ways to sort them.
- Try binary sorts (2 groups) first.
- Try a multiple set sort (more than 2 groups).
- Explore different possibilities.



[Erikson Institute Video: Sorting Rocks](http://earlymath.erikson.edu/sorting-rocks-with-child-14-explorations-in-core-math/)

From: *Big Ideas of Early Mathematics*

This video is taken from a one-on-one interview with an individual child by a teacher researcher. The interview is designed to elicit evidence of children’s mathematical thinking. It is not a teaching episode or a formal assessment.

<http://earlymath.erikson.edu/sorting-rocks-with-child-14-explorations-in-core-math/>



Photo Slides

10. Ask students to share additional ideas about how to build on children’s interests and experiences with rocks.

11. Reflect on rock investigations in the context of the California Preschool Foundations for Earth Science.

- Read aloud Foundation 1.1 Properties and Characteristics of Earth Materials and Objects for 48 months and 60 months.
- Ask students to reflect on the rock activities in the context of helping children achieve the understandings outlined in the Foundations.

12. Ask students to brainstorm ways people use rocks in our everyday lives.

- Show the photos of rocks used for building, jewelry, roads, decoration, play, sculpture and art, tools, etc.
- Make the point that rocks are an invaluable resource for us, and people need to know about the properties of rocks in order to understand our planet.

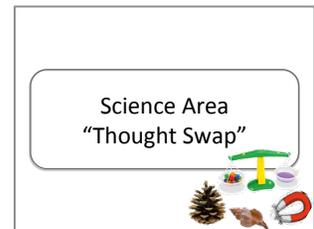
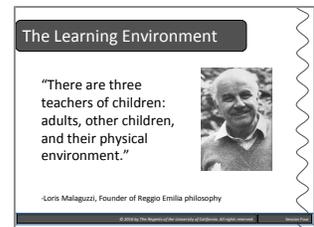
1.0 Properties and Characteristics of Earth Materials and Objects
<p>At around 48 months of age</p> <p>1.0 Investigate characteristics (size, weight, shape, color, texture) of earth materials such as sand, rocks, soil, water, and air.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Observe different rocks collected on a nature walk using the senses of sight and touch. “Come out all the smooth rocks.” • Place each rock and observe that she can use a rock to draw on a sidewalk. • Fill a bucket with soil and concrete. “We need water to make them dry?” • When playing in the sandbox, pour sand into a bucket and comment. “The sand is the same language.” “I can fill all the holes with sand all the way?” • When sifting, observe a variety of pebbles. “Look! Not the same. That’s a beautiful!” • A child who is usually quiet asks different rocks and comment. “This one looks really smooth. But this one is not very smooth?” • Take a magnifying glass to observe sand and dirt. “This one looks like a pebble!” • Explain that sand and water are needed to make a new name.
<p>At around 60 months of age</p> <p>1.1 Demonstrate increased ability to investigate and compare characteristics (size, weight, shape, color, texture) of earth materials such as sand, rocks, soil, water, and air.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Place water in a bowl and compare the dry sand with the wet sand. “The wet sand sticks together”. Demonstrate how to make a cone with wet sand on the floor and the bucket and turn it upside down. • Place water in the sandbox to form craters, hills, and dunes. • Investigate the surface of different rocks and give the rocks based on how they are. Comment. “This one is very smooth, and this one is not so smooth.” • Investigate all stones in the field and comment. “This sand looks really hard and the other rocks look like they are smooth!” • Collect soil from the garden and use a magnifying glass to observe the composition of soil. Compare the soil with the soil from the garden. “The soil has tiny roots in it. The soil has some other things and some things that I don’t know what they are.”



Early Childhood Topic

13. Engage students in a “Thought Swap” about the classroom science area.

- Emphasize that the science area is an essential part of the preschool/classroom environment.
- Share the quote from Loris Malaguzzi, founder of Reggio Emilia philosophy: “There are three teachers of children: adults, other children, and their physical environment.”
- Tell students that they are going to do an activity to share ideas with each other for creating a classroom science exploration area.
- Give directions for the “Thought Swap” activity: To begin, 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 and they will have 3 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 lights, or clap pattern).
- Read the first question. When time is up, ask a couple of people to share out. Have them find 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 other questions provided below. This activity can be shortened by asking fewer questions, or you could add other questions in addition to those provided.
- “Thought Swap” Questions:
 - What do you think should be the goals of the science area in an early childhood classroom?



- What kinds of materials could you provide for exploring physical and earth science?
- What kinds of materials could you provide for exploring life science?
- How could you keep the science area fresh and novel?



14. Show the photos of science areas from different classrooms. Engage the students in sharing their thoughts on the pros and cons of each one. This should be a conversation rather than presenting them as “good” or “bad” examples.

15. Refer the students to the “Creating a Preschool Science Exploration Area” handout in the Course Reader. Give them a few minutes to look it over. Point out that math tools and practices can be incorporated into the science area.

Science Area Photo Slides

Wrapping Up

16. 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.
 - 1 ice cube tray, mini muffin pan (metal or disposable), or Styrofoam[®] egg carton (not cardboard) to use for mixing ingredients.
 - For Solids and Liquids next session, each table group will need 1 cup flour, 1 cup salt, and 1 box of powdered gelatin (any color is okay). Explain that students will sit in the same groups next session. It’s up to the group to decide who will bring which ingredient. Emphasize how important attendance is if your group is counting on you to bring one of the ingredients. Suggest that group members share contact information with each other.

Reading/Homework
for Next Session



What to bring next session:

- One ice cube tray, mini muffin pan, or Styrofoam egg carton
- One cup of the solid that is assigned to you in a baggie or plastic container: flour, salt, or powdered gelatin (any color)

