

DAY 1: WE ARE PALEOBOTANISTS!



MINI-LESSON

Teacher introduces the “Inquiry Toolbox” and “Team Roles” anchor charts and assigns rotating team science roles.

SCIENCE INQUIRY CIRCLES

Teams peruse exploratory texts and rank their interest in each of four representative plants.



GUIDED SCIENCE INVESTIGATIONS

Teams make preliminary observations on their model fossil digs and create a paper grid map that each team member will use to select an area for excavation.



ABBREVIATED STANDARDS

- Reading TEKS: 4.13(A)
- CCSS: SL.4.1(b)
- NGSS: 4-PS3-1, 4-PS3-2, 4-PS3-3
- Science TEKS: 2018–19: 4.2A, 4.3B, 4.3C; 2024–25: 4.1A, 4.1B, 4.2A

Day 1: We Are Paleobotanists!

Literacy Strategy: Learning to think, read, write, and speak like scientists.

Science Concept: Scientists ask questions based on observations before they begin gathering information from texts and the natural world, and they benefit from working in teams to find answers.

Science and Literacy Connection: Scientists use different ways to observe the world, including reading scientific texts, conducting investigations, writing reports, and working collaboratively with others in the cycle of inquiry.

Mini-Lesson (15 minutes)

OVERVIEW

Teacher instructions are provided for each day's mini-lesson. These instructions consist of **declarative knowledge** (statement of what children will do or learn), **conditional knowledge** (context or background related to what children will learn), and **procedural knowledge** (explicit instruction and practice).

Today's mini-lesson will simply explain what the children will be doing throughout the unit. **The teacher will need to print out and post the "Inquiry Toolbox" and "Team Roles" anchor charts to use in the discussion.** Alternatively, the anchor charts can be created on chart paper.

MATERIALS

Teacher needs:

- "Inquiry Toolbox" anchor chart
- "Team Roles" anchor chart

PROCEDURE

Each *italicized statement* below contains suggested wording the teacher may choose to use for the lesson; additional teacher actions and considerations are in parentheses.

Tell what the strategy is (declarative knowledge)

1. *Today, we will learn about paleobotanists excavating fossils to discover what plants looked like across time and where different types of plants can be found. Throughout our unit you will learn more about the different groups of plants that have existed (and still exist) on Earth and the relationship between plants and the environments they live in. Paleobotanists can learn a lot by*

studying fossils, but they can also learn from texts written by other scientists.

- 2. You will work together as a team in an inquiry circle to investigate a representative plant that will help you understand more about the relationship between plants and the environments they live in. In your inquiry circles, you will explore texts and media to find out more about your plant. During inquiry circles, you can ask questions, discuss information you collect, and think about other questions you might have about your plant. The text-based inquiry on your representative plant involves asking questions and gathering information to answer questions. In some ways, this is like the inquiry you engage in during a science investigation. We have an inquiry toolbox that will help you in your work. (Point to the “Inquiry Toolbox” anchor chart and read aloud to the class.)*

Tell when and why to use the strategy (conditional knowledge)

- 1. When we investigate our representative plants, we will practice our roles as scientists. We will do this because scientists use different ways to observe the world, including reading scientific texts, writing reports, and conducting investigations. You will take on the role of a scientist conducting inquiry by speaking like a scientist (using new vocabulary), reading like a scientist (using strategies to find information), and writing like a scientist (using journals to organize important information and observations). There is no better way to learn about science than to become a scientist!*

Tell how to use the strategy (procedural knowledge)

- 1. While in inquiry circles, you will take on different science roles with jobs within your team. Typically, science teams have a leader, called the Lead Scientist, and various other positions, such as Lab Director, Data Scientist, and Equipment Director. Each of these roles is important to the overall success of the team. (Point out and read each of the roles on the “Team Roles” anchor chart. **At this point teacher can assign roles or allow children to choose their roles,** letting them know that they will have the opportunity to assume different roles later.)*

Post the “Team Roles” and “Inquiry Toolbox” anchor charts in your classroom where they can be referred to and encourage your learners to use them while in their inquiry circles.

Science Inquiry Circles (30 minutes)

OVERVIEW

During the first day of inquiry circles, teams will select one of four representative plants to investigate: mosses, ferns, conifers, or flowering plants. Teams will first explore informational texts about each representative plant. These informational texts are meant to grab the attention of learners and get them interested in the topic. Refer to the “Plant Resources” spreadsheet in the “Before the Unit Begins” section, which includes suggested exploratory texts and media for selecting inquiry topics.

Today, you may use the suggested print text for each representative plant. If the print texts are not available, you may choose to use the suggested EPIC eBook for each representative plant. If only some of these are available, you may also choose from other texts in the spreadsheet, but we suggest you choose only one print text or eBook for each representative plant. Make sure to have exploratory texts ready ahead of time.

If you feel your learners may have difficulty reading the exploratory texts independently, you may choose to read the texts aloud to your learners prior to starting this unit. That option still allows the opportunity for learners to become interested when deciding which representative plant to investigate.

MATERIALS

Each team needs:

- access to informational texts
- access to “Plant Images for Inquiry Circles” PDF (optional)

Teacher needs:

- “Plant Resources” spreadsheet for ideas
- “Plant Images for Inquiry Circles” PDF (optional)

PROCEDURE

Each *italicized statement* below contains suggested wording the teacher may choose to use for the lesson; additional teacher actions and considerations are in parentheses.

Before Inquiry Circles

1. *In your inquiry circles, you will become experts on the representative plant your team has chosen. Your expertise will be needed to lead other members of your class in an investigation of a representative plant. Since it is not possible to observe all members of a large group of plants firsthand, scientists must turn to text and media resources to expand their knowledge. As scientists, you will also explore texts and media (e.g., books and web pages) to answer your questions about representative plants and build your expertise.*
2. *Today during inquiry circles, you will select a representative plant to investigate together as a team. You can choose from four representative plants: mosses, ferns, conifers, and flowering plants.*
3. *You will investigate that particular representative plant's life cycle, habitat, structures, and adaptations, and how it compares to other plants. Before you decide which representative plant to investigate, you will have the opportunity to read some exploratory texts to see what may interest your team the most. (Be sure to have the books available to display. You may have the Equipment Directors choose a book for the team or you may distribute the books. You may also want to project images of mosses, ferns, conifers, and flowering plants for the learners to see. (The “Plant Images for Inquiry Circles” is provided for this purpose.)*

During Inquiry Circles (20 minutes)

1. *Now that each team has some texts to explore, you need to decide how to read them together. You may want to take turns by paragraph or page but decide before you start. (You may decide if you want your learners to read the text closely or to browse the text and read only certain sections. Encourage learners to look at the texts to spark conversations about what they discover. What do they see in the pictures? What questions do they have?)*
2. *While you are reading, I will be walking around to assist you as needed. (Allow time for the class to read while you facilitate when necessary. Rotate the texts so that each team had a chance to explore a book about each of the plant groups. If you are using the EPIC eBooks, you may want to set a timer and let learners know when it is time to switch to the next book.)*

3. *When all inquiry circles teams are finished reading the exploratory texts, you will work together to briefly summarize what you read and decide which representative plant you want to learn more about. Rank the representative plants from favorite (1) to least favorite (4). The Data Scientist should be ready to share with the class.*

After Inquiry Circles (10 minutes)

1. *The Data Scientist from each inquiry circle will now share your team's top representative plant choices, as well as anything interesting the team discovered today. What grabbed the team's attention? (Be sure all members of the team assist the Data Scientist so that they are prepared to speak. Allow time for all inquiry circle teams to share.)*
2. *I will assign all representative plants for investigation tomorrow. (Each team will investigate a different representative plant. **You will need to assign each team its representative plant by the next lesson.**)*

Guided Science Investigation (30–45 minutes)

OVERVIEW

In this lesson, children are introduced to fossils and the scientists who study them. As teams of paleobotanists, they will observe the surface of a simulated fossil dig and make a plan for excavation. Throughout this unit, the children should be reminded of the importance of teamwork in science.

GUIDING QUESTIONS

What are paleobotanists? How do paleobotanists work in teams to plan an excavation?

BACKGROUND INFORMATION FOR THE TEACHER

Children will plan and conduct investigations as members of their assigned science investigation teams. Working within these assigned teams, the children will each contribute to the overall team process of scientific inquiry. In this way, the children will develop an understanding of the nature and methods of science and how scientists work collaboratively toward a shared goal. Today the children will become paleobotanists to begin a 3-day investigation of a simulated fossil dig. Learners will also take on team roles with jobs during the science investigations. To provide variety for children, the positions can be rotated, allowing each team member to try each team role. In practice, members of each science team will participate in all tasks the team performs during the investigation, such as making observations and recording information. Remind learners that they have an expert from each plant group on their team.

MATERIALS

Each team member needs:

- science notebook
- pencil

Each team needs:

- 4 different-colored straws (a different color for each team member)
- 1 sheet of 11" x 14" copy paper
- 4 ft. of masking tape

- 1 premade fossil site in an aluminum pan

Teacher needs:

- “Taped Dig” image
- “Paper-Folding” video clip
- 1 sheet of 11” x 14” copy paper
- 1 straw
- 1 marker pen

SETUP

- **Before Day 1**, make a fossil-dig site inside an aluminum tray for each team of learners. The tray will contain soil and buried fragments of a plaster cast of a leaf. (See Teacher Fossil-Dig Instructions in the “Before the Unit Begins” section).
- For each team, prepare a bag of materials that includes 1 sheet of 11” x 14” copy paper, 4 different-colored straws, and 4 feet of tape.
- Place the premade fossil digs and the bags of materials in a central location for distribution.
- **Make sure that children are assigned to science teams before you begin the lesson today.** You may choose to assign them a team number or allow them to choose a team name.

DAILY OBSERVATIONS

Team members will observe the surface of the fossil digs.

PROCEDURE

Engage

1. Ask, *What do you think of when you hear the word fossil?* Accept all responses (children will likely refer to dinosaurs or similar animals). After children share their ideas, explain that dinosaurs and prehistoric animals usually come to mind first when people think of fossils. But while dinosaurs or similar animals may be the most well-known examples of fossils, plant fossils are also important in helping us understand what Earth’s environments were like millions and even billions of years ago.
2. Explain that the word “fossil” comes from the Latin *fossus*, which means “having been dug up.” Excavation sites where scientists look for fossils are referred to as “digs” because they are literally digging (excavating) for fossils.
3. Add that scientists who study fossils and the history of life on Earth are called paleontologists and that within that group, scientists who specialize in fossil plants and ancient vegetation are called paleobotanists. Explain that “paleo” means “older or ancient,” that “ology” refers to a subject of study, and that “botany” refers to the study of plants.
4. Announce to the class that, beginning today, they will become paleobotanists.
5. Tell the class their first task as paleobotanists will be to work in teams to explore the **surface** of a simulated excavation site, or dig. Then, like scientists, they will make a plan for digging based on their observations.
6. Explain that you have assigned them to a science team made up of “experts” on different plants. Each expert will be able to contribute important information from their work in inquiry circles. Let them know that they will work in the same science teams every day.

7. Clarify that the team roles and jobs learners had during today's inquiry circles are the same team roles they will have during today's science investigation. However, remind them that the team roles can rotate from day to day.

Explore

1. As you bring out the first prepared fossil dig, ask, *What do you think is buried in here?* Accept and discuss all responses.
2. Explain that each team will have their own dig model to examine. Caution the children not to touch nor disturb the contents of the pan. **Explain that today is only for observing and planning—the actual digging will be done tomorrow.**
3. Distribute one prepared fossil dig to each team of children.
4. Instruct the class to observe the surface of the dig carefully. Ask, *How would you describe what it looks like (color, type of soil)? What interesting features do you see (flat, hilly, etc.)?*
5. Ask learners to write the date on a page in their science notebooks and record any information about what they see on the surface of the dig. Add that they should include a quick sketch of what the surface looks like.
6. Then ask, *How will you decide where to begin to dig?* Accept responses. Share that scientists always make a plan for an investigation before they begin. They, too, will first make a plan based on their observations before digging.
7. Ask the Equipment Directors to collect one bag of materials for their team from the distribution area.
8. Tell learners that the first thing they will do is divide the dig site into a grid of equal parts. Using the "Taped Dig" image, show them how to place the tape on the edge of the pan (not directly on the surface).
9. After the pan is taped, explain that they will now make a **paper grid map** (save for Day 3) to record excavation information.
10. Demonstrate how to create a **paper grid map** by folding a sheet of copy paper in thirds (like a business letter) then in half (hamburger style) to create six equal squares (alternatively, the teacher may use the "Paper-Folding" video clip).
11. Next, each team member will choose a part of the grid they want to excavate. Remind them that they are working as a team and will share whatever they find with the others.
12. Once they have chosen their dig sites, tell the team members that they will each get a chance to probe a part of their grid. Ask, *Why do you think it's necessary to probe the soil first?* (Answers will vary but may include finding something hard under the soil, like a fossil!)
13. Model how to gently insert the straw straight in and out of the soil without digging.
14. Instruct each team member to probe two different places within their grid area to decide which one they will dig tomorrow. They will mark their dig site by leaving their colored straw inserted in the place they choose.
15. Next, each team member will mark their dig site on the paper grid map and label it with their name.
16. After you have reviewed the instructions, ask if there are any questions. Tell the class they have 15 minutes to complete their observations and exploration.
17. Let them know that you will be monitoring them and making observations as they work.
18. Tell them you will give a 2-minute warning and that their dig sites should be marked with the colored straws and their paper grid map completed before time is up.

Explain

1. When time is up, allow each team to explain their discoveries. If needed, prompt them with questions, such as *What observations did you make about the excavation site? Was there anything unusual? Was there anything familiar?* Accept all responses.
2. Ask for volunteers to describe their dig sites. *What made you choose those particular sites?*

Elaborate

1. Ask, *Who would like to share what it was like to work as a member of a team of paleobotanists? Can you describe any examples of how you worked as a team to make your plan for digging up a fossil?*
2. Explain that working in teams just as real scientists do will be very important in the days to come as they each contribute to learning about plant fossils and what we can learn from them.

Evaluate

1. Did children develop or use special strategies to plan their fossil digs?
2. Did children demonstrate the ability to work cooperatively? (**NOTE:** some teams may not work well together, and guidance or adjustments may become necessary.)

Science Language

- **Observation** is carefully looking at something or someone to gather information.
- A **scientist** is a person who is an expert in or who studies aspects of the natural or physical world.
- A **team**, or **teamwork**, is a group of people who work together to accomplish a goal.
- **Collaboration** occurs when two or more people work together, learn from each other, and communicate with each other.
- **Organisms** are living things that carry out the actions needed to live, grow, and survive.
- **Fossils** are the preserved remains or impressions of plants and animals from a past geologic age.
- **Paleontologists** are scientists who study fossils to learn about the history of life on Earth.
- **Paleobotanists** are scientists who specialize in the study of plant fossils.

Expanded Standards

Reading TEKS

4.13: Inquiry and research: listening, speaking, reading, writing, and thinking using multiple texts. The student engages in both short-term and sustained recursive inquiry processes for a variety of purposes. The student is expected to: **(A)** generate and clarify questions on a topic for formal and informal inquiry.

CCSS

SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly. **(b)** Follow agreed-upon rules for discussions and carry out assigned roles.

NGSS

4-PS3-1: Use evidence (e.g., measurements, observations, patterns) to construct an explanation.

4-PS3-2: Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. **4-PS3-3:** Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.

Science TEKS

2018–19: 4.2A: Plan and implement descriptive investigations, including asking well-defined questions, making inferences, and selecting and using appropriate equipment or technology to answer his/her questions. **4.3B:** Represent the natural world using models such as the water cycle and stream tables and identify their limitations, including accuracy and size. **4.3C:** Connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

2024–25: 4.1A: Ask questions and define problems based on observations or information from text, phenomena, models, or investigations. **4.1B:** Use scientific practices to plan and conduct descriptive investigations and use engineering practices to design solutions to problems. **4.2A:** Identify advantages and limitations of models such as their size, scale, properties, and materials.