

## DAY 12: WHAT CAN FOSSILS TELL US?



### MINI-LESSON

Teams finish writing claims for each question on their Inquiry Chart and include evidence and reasoning to support each claim.

### SCIENCE INQUIRY CIRCLES

Teams work to finish writing claims for each of their Inquiry Chart questions.



### GUIDED SCIENCE INVESTIGATIONS

Teams apply their new knowledge of plants to identify plant fossils and complete the Paleonbotanist Log.



#### ABBREVIATED STANDARDS

- Reading TEKS: 4.7.C, 4.13.H
- CCSS: SL.4.2, W4.2(b)(d), W.4.7, W.4.8
- NGSS: 4-ESS2-1, 4-ESS2-2, 4-LS1-1
- Science TEKS: 2018–19: 4.2B, 4.2F; 2024–25: 4.1E, 4.3B, 4.12C

## Day 12: What Can Fossils Tell Us?

**Literacy Strategy:** Making evidence-based claims orally and in writing.

**Science Concept:** Fossils provide a record of how organisms changed over time in response to the changing environments they lived in.

**Science and Literacy Connection:** Scientists formulate claims about their investigations, then use evidence acquired through their work to validate them.

### Mini-Lesson (15 minutes)

#### OVERVIEW

In the previous class, teams began writing claims for each remaining inquiry question. Today teams will continue writing claims for their remaining inquiry questions. Teams might be working at different paces. Use this time to support teams as needed. You may need to model making a claim again (using the same materials from the past two days) for teams who are just starting to make claims.

Today's mini-lesson might also be used as a time to review and practice the reading strategies introduced over the past two days: making evidence-based claims orally and in writing. Teachers are encouraged to use this time to best meet the needs of their learners.

Teachers can determine if the mini-lessons will be facilitated with the whole class or a particular inquiry circle team that needs additional support. If you are working with a specific team, we suggest your other learners spend additional time working in inquiry circles. You may want to return to the information in the mini-lesson from Days 10 and 11 with some or all of your teams.

### Science Inquiry Circles (30 minutes)

#### OVERVIEW

Today teams will work to finish writing claims for each of their inquiry questions.

#### MATERIALS

**Each team member needs:**

- science notebook
- pencil

### Each team needs:

- team Inquiry Chart
- team “Plant Observations” booklet

### 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. *It is time to get into our inquiry circle teams. You will be with the same inquiry team as yesterday.*
2. *We have answered all (or most) of our Inquiry Chart questions. Yesterday we began writing claims to answer our inquiry questions. Today we continue writing our claims* (Make adjustments for teams that are not quite ready.)
3. *Now, inquiry teams will work together to make claims.*

#### During Inquiry Circles (20 minutes)

1. *Today your team will follow the same process we followed yesterday.*
2. *As you work on today’s claims, remember the claims you wrote yesterday.*
3. *Choose one inquiry question at a time and write a claim as a team.* (You might also give teams the option to divide up the inquiry questions and have each team member write one claim. Facilitate in a way that works best for your learners.)
4. *Write your claims in your science notebooks. Remember to look in your science notebooks to find the synthesis statements the team wrote for each question. These will help you write claims.*
5. *Work together as a team to examine the important information from one column in your Inquiry Chart and the synthesis statement you wrote. Ask yourselves, what can you claim about all this information?* (Remind learners that a claim might be similar to the synthesis statement, and it will sound like an answer to the inquiry question for that column.)
6. *Remember that each claim you write should be supported by at least one piece of evidence from your Inquiry Chart, your reading, or your science investigations. Do not forget to include your reasoning, or how the selected piece(s) of evidence support(s) the claim.*
7. Remind learners they can use the “Making Evidence-Based Claims” anchor chart to help them, as well as any other anchor charts they have used.
8. *My role is to help guide the inquiry circles, but I expect you to work as a team to solve your problems together.* (While teams are working together, walk around the room to facilitate as needed.)

#### After Inquiry Circles (10 minutes)

1. *As we conclude our inquiry circles for today, the Data Scientist from each team will have a chance to share one claim the team made today, one piece of evidence that supports the team’s claim, and one reason that the evidence supports the claim. Teams may also share a problem they encountered or how they resolved a problem. Lab Directors, take a moment to make sure that your team is ready to share.* (After you have allowed the teams to gather their thoughts, have the Data Scientists share with the class.)
2. *The Data Scientists will now share with the class one of the team’s claims, including their evidence and reasoning.* (**Encourage teams to share how they developed their claims.** If you saw a great example in action, encourage that team to share with the entire class.)

## Guided Science Investigation (30–45 minutes)

### OVERVIEW

Today the teams of paleobotanists apply their new knowledge about plants to identify plant fossils, using evidence to support their claims.

### GUIDING QUESTIONS

What information can plant fossils give us? What information can we use to help us identify plant fossils?

### BACKGROUND INFORMATION FOR THE TEACHER

Paleobotanists rarely find a whole plant fossil. Plant fossils can be found as impressions on rocks or preserved in rocks. Coal balls are an example of plants that petrified and became rock. These are different from the coal used as fossil fuel that forms from decomposed plants. Most fossil plant identifications are made from microscopic spores or pollen, larger tissues, or plant parts such as leaves, stems, and even fossilized tree trunks.

Paleobotanists use information from plant fossils to help them understand the ancient environments and climates plants lived in, as well as the other organisms they may have lived with. Plant fossils can represent plants that are extant (still living) or extinct.

During their investigations, children have had the opportunity to look at images of authentic plant fossils as they examined images of representative plants. Today they will use their new knowledge and skills to identify several new plant fossils. All fossil images used in this activity are of authentic fossils.

### MATERIALS

#### Each team member needs:

- science notebook
- pencil

#### Each team needs:

- team Inquiry Chart
- copy of the Paleobotanist Log
- team “Plant Observations” booklet
- access to all plant specimens
- access to all plant images (Days 6–9)

#### Teacher needs:

- Paleobotanist Log (paper copy or electronic version)
- “Plant Fossils” PowerPoint
- Plant Fossils Key

### SETUP

- Make color copies of the “Plant Fossils” PowerPoint or make images available electronically.
- Make available the team Inquiry Charts, “Plant Observations” booklets, and access to all plant images (Days 6–9).

- Make copies of the Paleobotanist Log (1 copy per team).
- Before the class begins, copy the following phrases on the whiteboard or a sheet of chart paper where all can see:
  - A description of the plant that includes information about leaf morphology and any plant structures that are present or visible.
  - Any information that connects the plant to a specific plant group.

## DAILY OBSERVATIONS

Observations have ended.

## PROCEDURE

### Engage

1. Announce, *It's time for you paleobotanists to use your skills to identify new fossils*. Clarify that the "fossils" they will be working with are images of authentic plant fossils found in different parts of the world by different teams of scientists. Some of the images represent plants that are now extinct; others may represent relatives of plants that are extant, or still living.
2. Today they will work as true paleobotanists to identify **four** fossils. When a paleobotanist discovers a fossil, they use the knowledge and skills they have developed through their own research, the research of others, and their own investigations to identify fossils.
3. Sometimes they are able to use a similar fossil for identification; however, there are times when the discovery of an unknown organism challenges them. Remind the teams that as they conducted their own investigations, they used several different resources to build their new knowledge about plants. Now, they will use information from those same resources to help them **identify the plant groups of four** different plant fossil images. (Resources they can use include the "Plant Observations" booklets, team Inquiry Charts, science notebooks, and all plant images.)
4. Distribute the Paleobotanist Logs. Read aloud to the class as they follow along.
5. Explain that each of the four different plant fossils are numbered and that these numbers should be written in the appropriate space in the log.
6. Tell learners that the first step will be to look closely at a fossil image (hold up a fossil they have already seen). As a team, they will use all their resources to discuss their ideas about what they think the fossil plant group is. Add that each image has a clue for them to consider. If they see the initials "MYA" after a number, that signifies a date "millions of years ago."
7. Let them know that they may or may not agree on what the fossil plant group is but that they do need to discuss it as a team. Remind them to respectfully listen to each other's ideas.
8. After they have discussed the image, they will make a claim (statement) about what they think the fossil plant group is and write it on their log. Once they have stated their claim, they will add the evidence that "backs up" their claim and explain how (or why) the evidence supports their claim.
9. Point to the whiteboard or chart paper where you have written the **types of evidence they can use** to make sure they understand what to look for:
  - a. A description of the plant that includes information about leaf morphology and any plant structures that are present or visible.
  - b. Any information that connects the plant to a specific plant group.
10. **Instruct the teams to write complete sentences and to correctly use any new science language in their work.** The teacher may want to share the following sentence stems as examples of how to write a complete sentence.

Example: We believe the plant group our fossil belongs to is . . .

Example: The evidence that supports our claim includes . . .

Example: This is how (or why) our evidence supports our claim . . .

11. Ask if there are any questions before they begin. (**NOTE:** if questions come up about how to proceed or who does what, tell them that is a decision they must make as a team.) Let them know that you will be moving between teams and can make clarifications or offer guidance as needed, but the work must be their own.
12. Allow 30 minutes for completion of the logs.

### Explore

1. Distribute the copies of the fossil images (or make them available electronically) and the Paleobotanist Logs.
2. As teams work, move between them and listen for the reasoning behind the claims they are making and the evidence they are choosing, but refrain from making any corrections. Remind them to consider any clues given on the slides.
3. If there is a dispute over the claim or evidence, remind them that scientists do not always agree and that they should respectfully consider all ideas and the evidence that may be the strongest or makes the most sense.
4. When time is up, ask the Lab Directors to collect all of the images and materials and return them to the designated area.

### Explain

1. Begin the “Plant Fossils” PowerPoint, projecting one image at a time (or allow teams digital access).
2. Allow time for each team to share and discuss its findings in their own words as you project each fossil image. If needed, offer prompts to clarify what the children are saying, such as, *Can you tell me more about how \_\_\_\_\_ supports your claim?* (**NOTE:** Although there is no definitive information about the **type** of fossil [impression, mold, etc.] they are viewing, allow them to speculate based on what they see.)
3. After all teams have shared their findings, project the Plant Fossils Key. As you reveal the identity of each fossil, acknowledge the claims and evidence the teams presented that were correct, or very close. It is important to validate their work.

### Elaborate

1. Commend the teams for their work and point out any outstanding examples of supporting their claims with evidence you observed today.
2. Explain that they will spend the last three days of this unit working on and presenting a final product: a culminating project that will give them the opportunity to share their “expertise” on plants with others.

### Evaluate

1. Are learners making claims that are based on their data or resources?
2. Is the evidence used to support their claims reasonable?
3. Is there progress in their ability to reason out how the evidence supports their claim?
4. Are learners correctly using science language in their communications, either written or verbal?

## Science Language

- A **claim** is a statement of what you think is true based on observation and evidence.
- **Evidence** is data collected during an investigation to support (back up) explanations and answers.
- **Data** are facts and information (such as images, words, and measurements) collected during an investigation.
- **Reasoning** means thinking about and explaining how the evidence supports a claim.
- **Species** refers to a group of organisms that share similar characteristics.
- An **extinct** species has no living members of its group in existence.
- **Extant** refers to a species that is still living.

## Expanded Standards

### Reading TEKS

**4.7C:** Use text evidence to support an appropriate response. **4.13H:** Use an appropriate mode of delivery, whether written, oral, or multimodal, to present results.

### CCSS

**SL.4.2:** Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally. **W.4.2:** Write informative/explanatory texts to examine a topic and convey ideas and information clearly (**b**) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic, and (**d**) Use precise language and domain-specific vocabulary to inform about or explain the topic. **W.4.7:** Conduct short research projects that build knowledge through investigation of different aspects of a topic. **W.4.8:** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

### NGSS

**4-ESS2-1:** Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. **4-ESS2-2:** Analyze and interpret data to make sense of phenomena using logical reasoning. **4-LS1-1:** Construct an argument with evidence, data, and/or a model.

### Science TEKS

**2018–19: 4.2B:** Collect and record data by observing and measuring, using the metric system, and using descriptive words and numerals such as labeled drawings, writing, and concept maps. **4.2F:** Communicate valid, oral, and written results supported by data.

**2024–25: 4.1E:** Collect observations and measurements as evidence. **4.3B:** Communicate explanations and solutions individually and collaboratively in a variety of settings and formats. **4.12C:** Identify and describe past environments based on fossil evidence, including common Texas fossils.