Day 11 What Information Can Fossils Give Us? (Part 1)			
Literacy Strategy: making evidence-based claims part 2: writing claims.		**Science Concept:** Fossils provide a record of how organisms changed over time in response to the changing environments they lived in. Scientists can use what they know about modern-day plants to identify fossil plants.	
Reading TEKS: 3.7(C), 3.13(H)	**CCSS:** SL.3.2, W.3.7, W.3.8	**NGSS:** 3-LS4-1	**Science TEKS:** 3(b)3(C), 3(b)(2)(D), 3(b)(2)(F), 3(b)(3)(C)
Materials for Mini-lesson on Science-Based Disciplinary Literacies (referred to as Mini-lesson): chart paper, markers, sample inquiry chart.			
Materials for Science Inquiry Circles: team inquiry charts, pencils, variety of nonfiction texts for each team, access to websites and online books, access to anchor charts already introduced.			
Materials for Guided Science Investigation: see instructions beginning on page 4.			
Content Vocabulary: **Claim**—a statement that says something is true based on observations or an opinion. **Evidence**—data, observations, or other information collected from an investigation that can be used to support explanations and answers. **Reasoning**—thinking about and explaining *how* the evidence supports a claim. **Data**—facts or information collected during an investigation (e.g., images, measurements, or words). **Species**—a classification of organisms that share characteristics and are alike in some manner. **Extant**—refers to a species that is still living. **Extinct**—refers to a species that is no longer alive.			
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

Scientists communicate in many ways about their investigations. In addition to talking about their work, scientists share their findings, and the procedures they used to reach them, through writing. Scientists make claims about their findings, and they validate their claims by explaining the evidence that proves them to be true. These kinds of claims often appear in products scientists make, such as reports, informational videos, and informational texts.

PROCEDURE

Each statement in quotation marks below contains suggested wording the teacher may choose to use for the lesson.

EXPLAIN THE STRATEGY

Tell what the strategy is and why it is important (declarative knowledge)

- "Remember that evidence-based claims are statements that I (as a scientist) make that are true. I know they are true because I have data (information) to prove those statements. This is different from statements that may be my opinion or something that I think about a topic.

Recently we learned about making evidence-based claims when we speak to other scientists. Today we will learn about writing evidence-based claims."

- "In our previous example, I read that cacti often have sharp spines to ward off predators. This was different from what my cousin told me, which was that the spines on cacti are there to poison me. The information I got from a book could be considered evidence-based, while what my cousin told me is really just his opinion, or he was repeating something someone told him. You probably have seen a lot of claims written on the internet and social media that are not evidence-based."

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

- "Making evidence-based claims is an important part of being a scientist. When other scientists read what I write, they expect me to write things that are true and that I can prove or can show that someone else has proven. This is also true when I'm writing for someone else (who may or may not be a scientist)."
- "I write evidence-based claims not only to communicate true and valid information to others but also to share when I have learned something new and want others to learn as well."
- "When I make a claim, it is a statement about what I think is true about my investigation. Next, I describe or provide the evidence I have collected that supports my claim. Then I explain HOW the evidence supports my claim (my reasoning)."

Tell how to employ the strategy (procedural knowledge)

While you model the strategy, you might want to say something like the following to learners:

- "The first thing I will do is choose one of my inquiry questions and look at the synthesis statement I wrote for that question."
- "Then, I will use my synthesis statement to write a claim. A claim will sound like an answer to my inquiry question. My synthesis statement and my claim might be very similar. My claim should not include my opinions."
- "Next, I will look at the evidence in my inquiry chart and the sources I listed. I will write about what I found in my investigation that supports my claim. I will be careful to include only factual knowledge from my reading or information from my scientific investigations."
- "Then, I will think about how my evidence supports my claim."
- "Finally, I state my claim in writing and cite my evidence as part of my statement."

You might return to the following model claim as part of this mini-lesson:

"My inquiry question was, *What features of your plant allows it to survive and thrive in its habitat?"*

"In my investigation, I found that cacti have adaptations that help them survive and thrive in dry environments. I read on the National Wildlife Foundation website that cacti live mostly in dry places, have thick stems to store water, and have a waxy coating to keep water inside the plant. In my investigation I observed the waxy surface of a cactus. I have also seen cacti living in dry places like Texas and Arizona."

"Note that there are no opinions in this model. I might have an opinion about cacti such as 'some cacti can be scary looking, and some are pretty.' This is my opinion and not a fact, so it does not serve to make my claim more valid."

Science Inquiry Circles—30 minutes

OVERVIEW

Today students will continue research work to find answers to questions on the inquiry charts or to new questions that have been raised.

PROCEDURE

Each statement in quotation marks below contains suggested wording the teacher may choose to use for the lesson; teacher actions in parentheses.:

Before Inquiry Circles

1. "It is time to get into our inquiry circle groups. You will be with the same team as yesterday, but we will rotate the scientific roles." (Assign roles at your discretion and have the Equipment Directors gather the inquiry chart for their team).
2. "You are already familiar with the inquiry chart and the inquiry questions. Today we will continue to look for answers to all of your questions."
3. "As you look for answers to your questions, you will practice your roles as scientists. You will do this because scientists have a special way of looking for answers. One way to look for answers is to do investigations. This means that they look at text (in books and on the computer) that might help them find information they can use."

During Inquiry Circles—20 minutes

4. "Today you will continue to investigate your plant group by using preselected websites on the computer (or tablet) and preselected texts." (The websites and texts are available on the Plant Resources document.)
5. "We have anchor charts to help guide your thinking. Do not forget to use them while working." (Refer to the Evaluating Claims anchor chart and the other anchor charts already introduced. Remind learners that each day they will practice the literacy mini-lesson during this inquiry circle time. Once you have taught several mini-lessons, they can use any of the reading strategies taught, not just the one for that day.)
6. "The Lead Scientist will guide all inquiries for the day by picking which question(s) will be answered. The Data Scientist will record all source information and the answers to your inquiry questions on the inquiry chart. Remember, it is important to record on your inquiry chart where you found the information (source) so that you do not plagiarize." (Point out to learners where sources are located on the inquiry chart and how one source may answer various questions. Remind your learners to record the title and author for texts and the URL for websites.) "The Lab Director and the Equipment Director must help find the answers to the questions online and in texts." (Be sure to model for learners where to record their source and where to record answers to specific questions. Explicitly show them how the inquiry chart will organize their progress.)
7. "My role is to help guide the inquiry circles, but I expect you to work as a scientific team to solve your problems together." (While teams are working together, walk around the room to facilitate as needed.)

After Inquiry Circles—10 minutes

8. "As we conclude our inquiry circles for today, each team will have a chance to share the questions they answered, what they accomplished, and what literacy strategies they used. The Lab Director will lead the discussion about today's results, and the Data Scientist will share your responses with the class. Discuss with your team, considering what you learned about your plant group. What problems did you encounter? How did you resolve those problems? Did you use a reading strategy? Which one, and how did it help you? What new questions do you have?" (After you have allowed the teams to gather their thoughts, have the Data Scientist share with the class.)
9. (After all learners have shared, thank them for their hard work, and point out any excellent behaviors that you observed. If you saw an outstanding example of using a reading strategy or collaborative work, explicitly point it out. If you notice any problems in the teams during the lessons, take a moment to point them out, and explain your expectations for all future inquiry circles. Collect all inquiry charts or have learners put them in their normal classroom place for ongoing work so they can easily access them.)

Guided Science Investigation—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

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.

All fossil images used in this activity are of authentic fossils.

SAFETY

There are no safety concerns.

MATERIALS

Each team member will need:

- science notebooks

Each team will need:

- Plant Observations chart
- Paleobotanist Log
- all bags of representative plant images from previous lessons
- Leaf Morphology chart (one per team)
- Day 3 Fossils PPT, the Plant Adaptations PPT (from Day 5), access to inquiry charts

Teacher will need:

- Paleobotanist Log (paper or electronic version)
- Day 11 Plant Fossil Images PPT

SETUP

- Print color copies of the Day 11 Plant Fossil Images PPT or allow electronic access.
- Print copies of the Paleobotanist Log- 1 per student
- Place all bags of plant images, Leaf Morphology charts, inquiry charts, Plant Observations charts, and materials bags (containing hand lenses and ruler or measuring tape) in a designated area for collection.
- On a sheet of chart paper or the whiteboard, write the title "Paleobotanist Log," then copy the chart below:

> **Paleobotanist Log**
>
> Fossil #_____
>
> **Claim (what plant group we think the fossil represents):**
>
> **Evidence (information that supports our claim)**:

- On a second sheet of chart paper or the whiteboard, write out the following:

> Types of evidence that should be included in the Paleobotanist Log:
>
> - description of the structure of the plant (leaf morphology and other structures present)
> - any other important information that connects it to modern-day plants.
> - extant (still living) or extinct relatives

DAILY OBSERVATIONS

Learners will examine fossil images.

PROCEDURE

Engage

1. Ask, *Who's ready to look at real fossils?* Clarify that the "fossils" they will work with are images of authentic plant fossils found in many 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 may be extant, or still living.
2. Today they will work as true paleobotanists to identify **5** 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 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.
4. 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 those same resources to help them identify the plant groups of **5** different plant fossil images. As a team, they will choose the **5** fossils to identify.
5. Add that you will make both the Plant Adaptations PPT (from Day 5) and the Day 3 Fossils PPT available for their use.
6. They will use any information they have recorded in their science notebooks, all the plant images, the information from their Plant Observations chart, team inquiry chart, and Leaf Morphology chart to help them identify the fossils.
7. Direct their attention to the chart paper or whiteboard where you have written "Paleobotanist Log." Explain that each team will have a copy of the Paleobotanist Log.
8. Tell them that the first step will be to look closely at a fossil image (hold up a sample). As a team, they will use all their resources to discuss their ideas about what they think the fossil is.
9. Let them know that they may or may not agree on what the fossil is but that they do need to discuss it as a team. Remind them to respectfully listen to each other's ideas!
10. Emphasize that it is important for them to record the fossil number (found on each image) on their Paleobotanist Log (show them a sample fossil). Tell them that the fossils do not have to be identified in any particular order as long as they record the fossil number.
11. After they've discussed the image, they will make a claim (a statement) about what they think the fossil is and write it on their own log. Once they have stated their claim, they will add the evidence that "backs up" their claim.
12. Refer to the chart or whiteboard where you have listed all the types of evidence they should include. Read the list out loud. Remind them that all of this information may be found in the resources they are using. (Children do not have to copy this list.)
13. 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's 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.
14. Allow 30 to 35 minutes for completion.

Explore

15. Distribute or make available the fossil images and the Paleobotanist Logs.
16. 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!
17. If there is a dispute over the claim or evidence, remind them that scientists don't always agree with others and that they should respectfully consider all ideas until they have the evidence that proves otherwise. After a team discussion, each team member has the option to develop their own claim as long as they can support it with evidence!
18. When time is up, ask the Lab Directors to collect all of the images and materials and return them to the designated area.

Explain

17. Allow a few minutes for teams to reflect and share any difficulties they encountered in their work and how they resolved their problems.

Elaborate

18. Explain that tomorrow, each team will have an opportunity to defend a claim for their fossil and explain **how** the evidence they collected supports their claim.
19. They will also have an opportunity to describe the likely environment the fossil lived in.
20. Commend the teams for their work, and point out any outstanding examples of teamwork you observed.

Evaluate

21. Was the evidence used to support claims reasonable?
22. Did learners apply prior or new knowledge in their written or verbal communications?
23. Did learners demonstrate effective teamwork skills?
24. Was any information from the science inquiry circle work and/or their science notebooks included?
25. Are learners using science language in their communications, either written or verbal?

Expanded Standards
Reading TEKS: 3.7 Response skills: listening, speaking, reading, writing, and thinking using multiple texts. The learner responds to an increasingly challenging variety of sources that are read, heard, or viewed. The learner is expected to (C) use text evidence to support an appropriate response. 3.13 Inquiry and Research: listening, speaking, reading, writing, and thinking using multiple texts. The learner engages in both short-term and sustained recursive inquiry processes for a variety of purposes. The learner is expected to (H) use an appropriate mode of delivery, whether written, oral, or multimodal, to present results.
CCSS: SL.3.2 Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally. W.3.7 Conduct short research projects that build knowledge about a topic. W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
NGSS: 3-LS4-1 Some kinds of plants and animals that once lived on Earth area no longer found anywhere. Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.
Science TEKS: 3(b)3 The learner knows that information, critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The learner is expected to (C) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists. 3(b)(2) The learner uses scientific practices during laboratory and outdoor investigations. The learner is expected to (D) analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations and (F) communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion.