<table>
<tr><th colspan="4">Day 06
What Were the First Land Plants?</th></tr>
<tr><td colspan="2">Literacy Strategy: practice evaluating claims and making connections.</td><td colspan="2">Science Concept: Scientists know that collecting information through observations and measurements may provide the evidence they need for answering questions. Investigating bryophytes, the closest living relatives of the first land plants, gives us information about what the earliest plants may have been like.</td></tr>
<tr><td>Reading TEKS:
3.9(E)(i & ii), 3.6(E)</td><td>CCSS:
RI.3.6, SL 3.2, W 3.7, W 3.8</td><td>NGSS:
3-LS2-1, 3-LS4-1, 3-LS4-3</td><td>Science TEKS:
3(b)(2)(A)(B)</td></tr>
<tr><td colspan="4">Materials for Mini-lesson on Science-Based Disciplinary Literacies (referred to as Mini-lesson): chart paper, markers, sample inquiry chart.</td></tr>
<tr><td colspan="4">Materials for Inquiry Circles: team inquiry charts, pencils, a variety of nonfiction texts for each group, access to websites and online books, access to anchor charts already introduced.</td></tr>
<tr><td colspan="4">Materials for Guided Science Investigation: see instructions beginning on page 3.</td></tr>
<tr><td colspan="4">Content Vocabulary:
Evidence—data collected from the investigation that can be used to support explanations and answers.
Data—facts or information collected during an investigation (e.g., images, measurements, or words).
Bryophytes—nonvascular plants without true roots, stems, or seeds (e.g., liverworts, hornworts, and mosses).
Nonvascular plants—plants that do not have any way to transport water or nutrients throughout the plant.
Algae—a phytoplankton capable of making its own food using energy from the sun. It is a primary producer.
Rhizoids—hair-like structures that act like roots to anchor plants.
Fungi—a group of living organisms that are not plants, animals, or bacteria.</td></tr>
<tr><td colspan="4">Science and Literacy Connection: scientists make connections between what is already known and new information that is collected through observations and investigations.</td></tr>
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Mini-lesson—15 minutes

OVERVIEW

Today's mini-lesson should be used as a time to review and practice the reading strategies introduced over the past two days: evaluating claims and making connections across informational texts. 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 needing 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-lessons from Days 4 and 5 with some or all of your teams.

Science Inquiry Circles—30 minutes

OVERVIEW

Scientists often work in teams when conducting inquiry and investigations. Today, we will work in inquiry circles as a team to investigate different questions about plant groups.

Prior to starting the inquiry circle work, be sure to have texts and technology available for your learners. You have been provided with a list of suggested books and websites titled Plant Resources in the Day 6 folder. These are suggestions, and you may use other resources. You may need to provide learners with specific instructions on how to access websites within your school district, or you may want to create a click sheet of approved websites for learners to be distributed in your learning management system (Google Classroom, Schoology, etc.). As teams begin working, you may have some groups working online while others are working with traditional texts. This will depend on your access to technology and texts.

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 circles. 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 in 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 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 of 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—30 to 45 minutes

OVERVIEW

Learners develop a question to investigate as they explore representatives of the earliest land plants.

GUIDING QUESTIONS

What do I want to know about this plant? What information do I need to answer my question?
How is my live plant similar to or different from other plants?

BACKGROUND INFORMATION

By studying the fossil record, scientists believe plants first appeared on land about 500–450 million years ago. The fossil record of plants is not as abundant as that of animals because plants decompose quickly. But seeds, stem, leaves, roots, and other plant parts that are covered by sediments before they decompose can form fossils such as imprints or petrification (like petrified wood). Trace amounts of carbon or plant tissue in rocks and in animal poo can also give scientists evidence of plant life.

The earliest land plants had to adapt to survive when they were no longer surrounded by water. Bryophytes, which include nonvascular plants such as liverworts, hornworts, and moss, first appear in the fossil record about 500–470 million years ago. Nonvascular plants do not have a water-transport system or well-developed stems and roots. Bryophytes can absorb water and nutrients from water that flows over the outside of the plant. For this reason, mosses and their relatives typically grow in damp habitats. However, some bryophytes can also survive in deserts and even in the extremely low temperatures of the Arctic tundra.

The climate on Earth at the beginning of this fossil time period (which spans over a 100 million years) is warming up after ice sheets had covered the Earth for millions of years. The fossil record shows new organisms appear in the seas. However, by the end of this time period the climate becomes colder and

glaciers form again, causing sea levels to drop and some shallow seas dry up. Many organisms die off as a result of several extinction events caused by environmental change.

SAFETY

- Instruct children not to tear off or cut any part of the plants! They may gently lift leaves for inspection if needed.
- Children should avoid touching their faces while handling the plants and should wash their hands after their work.
- Children should wear safety goggles during plant observations.

MATERIALS

Each team member will need:

- science notebook
- goggles

Each team will need:

- Day 6 Images PPT
- copy of the Plant Observations chart
- Leaf Morphology chart (copy or electronic access)
- live moss specimen
- hand lenses
- rulers or measuring tapes

Teacher will need:

- Day 6 Images PPT
- gallon zip-top bags (2 for each team)

SETUP

- *As suggested in the Before the Unit Begins document, the teacher may choose to make copies of the Plant Observations chart on 11 x 17 paper or reproduce it on chart paper.
- **Before class**, make color copies of the Day 6 Images PPT (or allow electronic access). If using paper copies, cut out 1 set of images for each team and place in a zip-top bag labeled *Day 6*.
- For each team, prepare a second zip-top bag containing hand lenses, ruler or measuring tape, and a copy of the Leaf Morphology chart. This bag will be used daily during observations.
- **NOTE: it is important not to identify the plants as representatives of "the first land plants" until after the children have completed their observations.**
- Place a live moss specimen and both material bags in a designated area for distribution.

DAILY OBSERVATIONS

Learners conduct daily observations of different images/live plants.

PROCEDURE

Engage

1. Hold up the live moss where all can see and say, *Think, what do you want to know about this plant?* Inform the class they will observe this live plant specimen today!

2. Explain that scientists know that using what they learn from text information combined with collecting information through observations and measurements may provide the evidence they need for answering questions and making explanations.
3. Distribute the Plant Observations chart. Tell the teams they will record their observations on this chart. Briefly go over the headings, then ask if there are any questions.
4. Instruct the children to always record in their science notebooks any additional information that does not fit into the Plant Observations chart but that is important to remember (e.g., information they learn from discussions with the teacher or each other, or additional questions to investigate during inquiry circles).
5. When ready, each Equipment Director should collect one live moss specimen and one bag of materials for their team.

Explore

6. Instruct the class to take a close look at the specimen, only using their eyes to begin with.
7. As a team, they should come up with a question they want to answer; if they come up with more than one question, ask them to choose one to investigate. (If needed, prompt them with an example, such as, *What kind of leaves does it have?*)
8. After they formulate their question, they should write it on their plant observation chart, along with today's date. (Remind them they need evidence that supports their answers.)
9. Once they have written down their question, point out the tools they have available for use in their bags. Explain that the plant images show representatives from the same group of plants that the live specimen belongs to. **(Do not reveal what the group is yet.)**
10. Instruct them to use the live moss specimen, plant images, and materials from the bag to find the answer to their question. Remind them to identify the evidence that supports ("backs up") their answer. (*How do you know?)*
11. Inform them that if they can't find answers to their questions, they need to use science inquiry circle time to look for the answers!
12. Let them know they have 20 minutes for their investigation. Remind them to work as a team, with each one of them doing a part of the work. They can decide as a team who does what.
13. As the teams work, navigate between them to ask open-ended questions, such as, *What question are you trying to answer? Are you finding the information you need? What do you notice about the plant?*

Explain

14. When time is up, ask the Data Scientist from each team to give a brief report on the question their team was investigating, an explanation of what they discovered, and whether or not they found the answer to their question. Ask, "*What evidence supports your answer?"* Accept their responses.
15. Remind the class they are working with limited information. If they did not find the answer to their question, that is perfectly OK. Scientists don't always find the answers they need right away either! This is why they need to record all the questions and continue their search for answers during science inquiry circle time.
16. After each team has shared, ask, *How was this live plant different from plants in the images? How were they the same?* Accept and discuss responses. *What new questions do you now have?*

17. Share that the group of plants they explored today are called bryophytes. Bryophytes are the closest relatives to the first land plants found in the fossil record. Bryophytes include the liverworts, hornworts, and moss they examined today. Ask, *What did you notice about all the plants in this group? Do you have questions about some of the other plants?* Accept all responses.
18. Add that the plant fossil record is poor because plants had no rigid parts. The time period when bryophytes appear in the fossil record was about 500 million years ago! The fossil record also show that most organisms lived in the seas. Earth's environment was warming up from an ice age, when land plants first appeared. However, millions of years later, ice once again covered the planet with glaciers. We know these events occurred because we have fossil evidence!

Elaborate

19. Pose the question, *Can the "expert" from each team who is investigating moss during inquiry circle time share any other information about mosses?* Accept all responses and discuss.
20. Ask if there are any other new questions that came up during the investigation they could not answer. Encourage them to always write new questions on their observation chart as they work and explain that they may find the answers during inquiry circle time or in the next investigations.
21. Instruct the Lab Directors to collect and store all of the materials used today.

Evaluate

22. Did teams develop a reasonable question to begin the investigation with?
23. Did teams find answers supported by evidence?
24. Were any new questions raised?
25. Was any information from the science inquiry circle work included?
26. Are learners using science language in their communications, either written or verbal?

EXPANDED STANDARDS
Reading TEKS: 3.6 Comprehension skills: listening, speaking, reading, writing, and thinking using multiple texts. The learner uses metacognitive skills to both develop and deepen comprehension of increasingly complex texts. The learner is expected to (E) make connections to personal experiences, ideas in other texts, and society. 3.9E Multiple genres: listening, speaking, reading, writing, and thinking using multiple texts—genres. The learner recognizes and analyzes genre-specific characteristics, structures, and purposes within and across increasingly complex traditional, contemporary, classical, and diverse texts. The learner is expected to (E) recognize characteristics and structures of argumentative text; (E)(i) identify the claim; and (E)(ii) distinguish facts from opinion.
CCSS: RI.3.6 Distinguish their own point of view from that of the author of a text. 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-LS2-1 (Science and Engineering Practices): Construct an argument with evidence, data, and/or a model. 3-LS4-1 Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. 3-LS4-3 Disciplinary Core Ideas: For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
Science TEKS: 3(b)(2) Scientific investigation and reasoning. The learner uses scientific practices during laboratory and outdoor investigations. The learner is expected to (A) plan and implement descriptive investigations, including asking and answering questions, making inferences, and selecting and using equipment or technology needed, to solve a specific problem in the natural world; and (B) collect and record data by observing and measuring using the metric system and recognize differences between observed and measured data.