| Day 07<br>What Are Vascular Plants? | | | |
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| **Literacy Strategy:** extrapolating the main idea by drawing conclusions. | | **Science Concept:** over long periods of time, plant populations developed structures, such as the tubelike tissues found in vascular plants, that helped them survive as the environment changed around them. | |
| **Reading TEKS:**<br>3.6(C, F, & G), 3.9(D)(i) | **CCSS:**<br>RI.3.2, SL.3.2 | **NGSS**:<br>3-LS2-1, 3-LS4-1,<br>3-LS4-3 | **Science TEKS:**<br>3(b)(2)(B)<br>(3)(b)(3)(A)<br>(3)(b)(10)(A) |
| **Materials for Mini-lesson on Science-Based Disciplinary Literacies (referred to as Mini-lesson):** chart paper, markers, sample inquiry chart, Main Idea anchor chart. | | | |
| **Materials for Inquiry Circles:** team inquiry charts, pencils, variety of nonfiction texts for each group, 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:**<br>**Evidence**—data, observations, or other information collected from an investigation that can be used to support explanations and answers.<br>**Data**—facts or information collected during an investigation (e.g., images, measurements, or words).<br>**Vascular plants**—plants with tubelike tissues for moving water, minerals, and sugars throughout the plant. Vascular plants have roots, stems, and leaves.<br>**Bryophytes**—plants without true roots, stems, or seeds; they also lack an internal conducting system for water and nutrients (examples are liverworts, hornworts, and mosses). | | | |
| **Science and Literacy Connection:** science consists of asking questions and conducting investigations to find answers, then drawing conclusions from the information found. | | | |

## Mini-lesson—15 minutes

### OVERVIEW

Scientists draw conclusions every single day. When conducting an investigation, they look at the data and think about what they already know. Then they draw a conclusion about the investigation based on the new information they collected. Scientists also draw conclusions when they collect new information as they read.

When scientists are investigating a topic, they must decide what is the most important part of what they read. When we do this, we are determining the main idea. Scientists don't usually find the main idea written in the text they read. Instead, they have to draw conclusions about what the author wants the reader to know.

### 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 (declarative knowledge)**

- "Today, as we read, we will practice drawing conclusions to determine the main idea of a section about plants. The main idea is the most important thing the author wants us to know about their topic. Getting the main idea is sometimes called 'getting the gist' of a piece. Remember that the author doesn't always tell us what the main idea is, which means we have to 'read between the lines.' When we 'read between the lines,' we are trying to draw conclusions about something that isn't specifically written or said. This is an important step in figuring out the author's main idea."

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

- "Sometimes authors tell us the main idea. Usually, they do that in the first or last sentence of a section. But they don't always do that. Authors can't possibly give me all the information I need to know while I am reading. The text would be too long! Sometimes, they leave out the main idea and make us (as readers) work to extract it. As a strategic reader, I have to 'read between the lines' or draw a conclusion. As a strategic reader, I will do this after each paragraph or section in the text I am reading. I do this because it makes my reading clear and helps me remember what I read."

**Tell how to employ the strategy (procedural knowledge)**

***While you model the strategy, you might want to say something like this to the readers:***

- "The first thing I need to do is think about the topic (my plant) and what I already know about the topic (my plant)."
- "Now, I will draw a conclusion about what the author wants me to know about the topic (my plant). When I draw a conclusion,
    - the first thing I will do is pay attention to the details the author gives me in the text;
    - next, I will think about the author's intentions (what the author wants me to know);
    - then, I will combine what I already know, the details from the text, and the author's intentions to draw a conclusion."
- "Now, I have to put all these things together to get the main idea. I will think, 'What would the author tell me was the most important idea from the reading if he or she were standing here next to me?'"
- "I will put the main idea into my own words and record it on my inquiry chart."

## Science Inquiry Circles—30 minutes

## OVERVIEW

Scientists often work in teams when conducting inquiry and investigations. Today, students will work in inquiry circle teams 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 7 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 are 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 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 Main Idea 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 question(s) on the inquiry chart. Remember, it is important to record on the 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 question(s) 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 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

Learners are introduced to representative vascular plants as they make observations on a live specimen (fern) and consider images of other plants in the vascular plant group.

### GUIDING QUESTIONS

What are vascular plants? How do the structures of vascular plants compare to those of bryophytes?

### BACKGROUND INFORMATION

During the time period approximately 440–354 million years ago, the fossil record shows that there was an explosion of life forms on Earth. The environment was warmer, weather became stable, and glacial melt raised oceans, creating warm, shallow seas. As a result, organisms had to find ways to survive in the changing environment.

The move from primarily aquatic environments to land required that plants develop structures to transport water, minerals, and nutrients throughout the plant. Early vascular plants grew taller than the bryophytes to capture sunlight but were still small in size. Fossils of *Cooksonia pertoni* show that the earliest plants had simple structures and were very tiny in size. However, by the end of this time period, giant ferns, horsetails, and club mosses produced the first forests. The first true ferns appeared about 360 million years ago.

Animal forms in the seas became more diversified during this time period, and the first arthropods and amphibians move onto the land.

## 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 7 Images PPT (paper copies or electronic access)
- Plant Observations chart
- Leaf Morphology chart (paper copy or electronic access)
- live fern specimen
- hand lenses
- rulers or measuring tapes

**Teacher will need:**

- Day 7 Images PPT
- gallon zip-top plastic bag

## SETUP

- **Before class**, make color copies of the Day 7 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 7*.
- **NOTE: it is important not to identify the plants as representatives of "vascular plants" until after the children have completed their observations.**
- Place live fern and material bags (with hand lenses, ruler or measuring tape, and Leaf Morphology chart) in a designated area for distribution.

## DAILY OBSERVATIONS

Learners conduct daily observations of different plant images and the live plant specimen.

## PROCEDURE

**Engage**

1. Announce that it's time for another live specimen observation. Hold up a live fern and ask, *What do you see today?* ( Accept responses.) *What do you want to know about this plant?*
2. Explain that they will conduct their investigation on this new plant in the same way they did in the previous class with the live moss and the other plant images.

3. 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).
4. When ready, each Equipment Director should collect one live specimen and bags of materials for their team.

**Explore**

5. Instruct the class to take a close look at the specimen using only their eyes to begin with.
6. As a team, they should come up with a question they want to answer; if they have more than one question, ask them to choose one to investigate.
7. After they formulate their question, they should write it on their Plant Observations chart, along with today's date.
8. As before, they should record on the chart all of the information from their observations. Remind them to identify the evidence that supports the answer to their question.
9. 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!
10. Let them know that they have 20 minutes for their investigation. Remind them to work as a team, with each one doing a part of the work. They can decide as a team who does what.
11. As 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 these plants compared to the plants you observed yesterday?*

**Explain**

12. When time is up, ask the Data Scientist from each team to give a brief report on the question their team question 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.
13. Remind the class that 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.
14. 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.
15. Share that the group of plants they explored today are called vascular plants. Ask, *What did you notice about all the plants in this group?* Accept all responses.
16. Explain that vascular plants have tubelike tissues for moving water and minerals through the plant. They also have roots, rigid stems, and leaves. Vascular plants grow taller than the bryophytes because of their ability to move water and nutrients throughout the plant. Bryophytes do not have the structures to move water and nutrients like vascular plants. Club mosses, horsetails, and ferns are all relatives of the earliest vascular plants on Earth.
17. Add, *The fossil record shows that Earth's climate was warming up and there were some animals living both in the oceans and on land. Melting glaciers created new habitats in warm, shallow seas for plants and animals*.

**Elaborate**

18. Ask the “experts” on ferns to share any other information they have found in their inquiry circles.
19. Ask if there are any other new questions that came up during the investigation that 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.
20. Instruct the Lab Directors to collect and store all of the materials used today.

**Evaluate**

21. Is there verbal or written evidence that learners notice the changes occurring in plants?
22. Are they asking questions about why the plants are different?
23. Did teams develop a reasonable question to begin the investigation with?
24. Did teams find answers supported by evidence?
25. Were any new questions raised?
26. Was any information from the science inquiry circle work included?
27. Are learners using science language in their communications, either written or verbal?

| Expanded Standards |
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| **Reading TEKS:** 3.6G 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 (C) make and correct or confirm predictions using text features, characteristics of genre, and structures; (F) make inferences and use evidence to support understanding; and (G) evaluate details read to determine key ideas. 3.9 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 (D) recognize characteristics and structures of informational text, including (i) recognize the central idea with supporting evidence. |
| **CCSS**: RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. 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. |
| **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 (B) collect and record data by observing and measuring using the metric system and recognize differences between observed and measured data. (3)(b)(3) Scientific investigation and reasoning. 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 (A) analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing. (3)(b)(10) Organisms and environments. The learner knows that organisms undergo similar life processes and have structures that help them survive within their environments. The learner is expected to (A) explore how structures and functions of plants and animals allow them to survive in a particular environment. |