ALL for Science™
Authentic Literacy and Language for Science

Baylor College of Medicine
CENTER FOR EDUCATIONAL OUTREACH

DAY 4: HOW HAVE PLANTS SURVIVED THROUGH TIME?

MINI-LESSON

Teacher introduces the "Evaluating Claims" anchor chart and models the strategy for the class.

SCIENCE INQUIRY CIRCLES

Teams use a different resource to answer another inquiry question or add information to a question already answered.

GUIDED SCIENCE INVESTIGATIONS

Teams work together to complete the "Plant Structures" page, then help the teacher match plant structures and functions on the "Plant Puzzler."

ABBREVIATED STANDARDS

- Reading TEKS: 4.9.E(i)(iii)
- CCSS: RI.4.8, W.4.7
- NGSS: 4-ESS2-1, 4-LS1-1
- Science TEKS: 2018–19: 4.2.B, 4.10.A; 2024–25: 4.1.E, 4.13.A

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Day 4: How Have Plants Survived through Time?

Literacy Strategy: Evaluating claims.

Science Concept: The fossil record provides evidence of how adaptations helped ensure the survival of plant populations in many different environments.

Science and Literacy Connection: Scientists make connections between what is already known and new information that is collected through observations and investigations.

Mini-Lesson (15 minutes)

OVERVIEW

Anyone can publish a website—if you can write and have access to the internet, you can create a webpage. So, how do scientists know that the information they are reading on a website is true and reliable? They use a reading strategy called "evaluating claims." A claim is a statement that can be supported by evidence. This strategy is used to evaluate the claims written by other scientists, book authors, and authors who write online.

NOTE: You are encouraged to create the "Evaluating Claims" anchor chart with your learners as you move through the lesson, using the provided anchor chart as a model. Post it for easy reference when completed and remind learners to refer to the anchor charts during inquiry circles.

MATERIALS

Teacher needs:

- chart paper
- marker(s)
- "Evaluating Claims" anchor chart as a model
- informational text or website about cacti to model the strategy (suggested)

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're going to learn a strategy that will help us determine if the claims an author is making are true and reliable. This strategy is called evaluating claims.*

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

1. *I use this strategy when I read informational text, including text in reports other scientists write, but also when I'm reading on social media and someone is making a claim about something happening in the world. I know to use this strategy because it's important to me to know if what I'm reading is something I can believe and supported by science.*

Tell how to use the strategy (procedural knowledge)

1. *The first thing I do as I evaluate an author's claim is to think about what I know to be true about the topic.*
2. *Next, I think about is where the information is coming from and I ask questions, such as*
    - *Is the source reliable? Is it one I've used before, and do I generally trust this source and the information I get from it? If so, I can probably believe the claims.*
    - *Is the site hosted by a research center or university (e.g., is the domain address .net, .org, or .edu)? If so, I can probably believe the claims made by the source.*
    - *Is the site hosted by the government (e.g., is the domain address .gov?). If so, it's probably trustworthy, but it may be a controversial source. I might need to see if the claims in the source agree with claims made by other authors.*
    - *Is the site hosted by a for-profit (e.g., is the domain .com)? If so, I want to read the claims made by the authors very carefully. I want to be sure that the claims are grounded in evidence and facts and that the claims agree with claims I've read by other sources.*
    - *What is the credibility of the author? Is the author a scientist or an expert on the subject? Is the author making claims that are grounded in evidence? If the author is presenting claims based on opinion rather than evidence, I might consider not including the author's statements in my inquiry because these claims may not be evidence-based.*
3. *For those claims that I take as authentic and true, I will note them on my Inquiry Chart and include the name of the source where I found them.*

Model the strategy:

Visit the University of Minnesota's information about cacti at
https://extension.umn.edu/houseplants/cacti-and-succulents

- *The author's claim is that cacti "often have scales or spines ranging from microscopically small to wickedly large and barbed. These protect against predators and are thought to aid the plant in withstanding the sun's heat."*
- *I ask myself if this matches what I know to be true.*
- *This site ends with* .edu *and is associated with a university. I can most likely trust this site.*
- *A quick search for the author's name tells me that Deborah Brown is "a garden writer and former extension horticulturist with the University of Minnesota." (StarTribune). A horticulturist is a plant scientist, so this author is most likely credible.*

Science Inquiry Circles (30 minutes)

OVERVIEW

Scientists work in teams when conducting inquiry and investigations. Today, learners 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. As teams begin working, you may

have some groups working online while others are working with traditional texts. This will depend on your availability to technology and texts.

MATERIALS

Each team needs:

- team Inquiry Chart
- pencils
- access to informational texts/media

Teacher needs:

- "Plant Resources" spreadsheet for ideas

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 your inquiry circle groups. You will be with the same team as yesterday, but we will rotate the science 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. Yesterday, we started looking for answers to your first inquiry question. Today you will answer more questions or add additional information to a question you've already answered.*
3. *As you look for answers to your questions, you will practice your roles as scientists. As scientists, you will make sure to carefully record your findings and your sources on your Inquiry Chart.*
4. *As your read, take note of any claims you might need to stop and evaluate.*

During Inquiry Circles (20 minutes)

1. *Today you will use a different book, website, or eBook to find answers to the question you're investigating about your plant group or to add information to a question you've already answered.* (You might choose to show or project the sample Inquiry Chart as a guide. Also, you may choose to be more explicit for your class and only allow them to answer one question at a time daily. Use your judgement on the level of guidance, especially in the first few days.)
2. *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.)
3. *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 answer to your inquiry question on the Inquiry Chart.*
4. *Remember, it is important to record where you found the information (source) on the Inquiry Chart so that you do not plagiarize.* (Point out to learners where sources are located on the Inquiry Chart and how one source may answer multiple questions. Remind your learners to record the title and author for texts and the title and URL for websites or videos.)

5. *Everyone should help find the answers to the questions online and in texts.* (Be sure to model for learners where to record their source as well as where to record answers to specific questions. Explicitly show them how the Inquiry Chart will organize their progress.)
6. *My role is to help guide the inquiry circles, but I expect you to work as a science team to solve your problems together.* (While teams are working, walk around the room to facilitate as needed.)

After Inquiry Circles (10 minutes)

1. *As we conclude our inquiry circles for today, each team will have a chance to share the information they found related to their questions, what they accomplished, and what literacy strategies they used. The Lab Director will lead the discussion about today's results. What has the team learned about its plant group? What problems did the team encounter? How did the team resolve those problems? Did the team use a reading strategy? Which one and how did it help? What new questions does the team have?* (After you have allowed the teams to gather their thoughts, have the Data Scientists share with the class. Try to encourage teams to share a variety of things—you do not want just facts about plants, just reading strategies, or just cooperative learning strategies.)
2. (After all teams 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 the usual classroom place for ongoing work so they can easily access them.)

Guided Science Investigation (30–45 minutes)

OVERVIEW

Today learners will be introduced to the structures of plants and how these structures function to ensure a plant's survival.

GUIDING QUESTIONS

What structures do plants have? What role do these structures have in providing what a plant needs to survive?

BACKGROUND INFORMATION FOR THE TEACHER

Fossils provide information about organisms that lived on Earth through time. Most children's early experiences with fossils focus on dinosaurs and other animals that once lived. However, we need to understand how all organisms interacted with each other and their environment and why some organisms survived while others did not. The fossil record gives us evidence of plant adaptations that allowed plants to live and grow in response to Earth's changing environments.

Four basic structures of some plants include the leaves, stems, roots, and flowers; however, not all plants have all of the same structures. As children investigate different groups of plants, they will observe the structures that are present and how they function to keep the plant alive. In this 4th-grade unit, a flower will only be described as a specialized structure that allows some plants to reproduce.

MATERIALS

Each team member needs:

- science notebook
- pencil
- copy of the “Plant Structures” page

Each team needs:

- access to the digital “Plant Puzzler” Google Doc
- access to the Day 4 Plant Image (or 1 live plant or plant cutting)

Teacher needs:

- chart paper (or whiteboard)
- marker
- “Plant Puzzler” Google Doc (https://tinyurl.com/Plant-Puzzler)
- “Plant Structures” page
- Day 4 Plant Image
- Optional: teacher may choose to use a live plant instead of the Day 4 Plant

SETUP

- Make copies of the “Plant Structures” page (1 per team member).
- Reproduce the “Plant Structures” page on chart paper or the whiteboard (the teacher will use this for discussion).
- Prepare to project the Day 4 Plant Image
- Prepare access to the digital “Plant Puzzler” Google Doc (teacher must make copy of the original for classroom use; see instructions of slide 1 of the “Plant Puzzler”).
- Optional: Teacher may choose to provide a live plant for the first part of the lesson. Live plant will need to have all 4 plant structures present, if possible. Each team will need a plant or plant cutting to examine.

SAFETY

There are no safety concerns today.

DAILY OBSERVATIONS

There are no observations today.

PROCEDURE

Engage

1. Begin with, *Give me a thumbs up if you like puzzles. How about a good mystery where you have to find clues or evidence to explain what happened?*
2. Explain that today teams will use a simple puzzle to learn about plant structures (or parts) and how these structures help a plant to live.
3. Add that, in the coming days, as paleobotanists (scientists who study fossil plants), they will be putting together the pieces of a much larger puzzle that spans a long period of time, collecting clues and using evidence to understand how plants have survived over millions of years in Earth’s changing environments.

Explore

1. Ask the Equipment Directors to collect a "Plant Structures" page for each team member.
2. Direct the class's attention to the whiteboard or chart paper where you have reproduced the "Plant Structures" page. Let learners know that they will work as a team to complete the chart on the "Plant Structures" page; however, each team member will keep a copy of the page in their science notebooks for future reference. Explain that this lesson has two parts.
3. Project the Day 4 Plant Image. Explain that teams will use this image for the first part of the lesson: working together as a team, identify the 4 plant structures (parts) they see and record this information in the first column on the "Plant Structures" page. **NOTE: If using live plants, distribute a plant or a plant cutting to each team and proceed as above.**
4. Next, working together as a team, discuss and write down in the second column on the "Plant Structures" page what the team already knows about each plant structure identified. Explain that teams will add information to the "**Functions"** column after they complete the second part of this lesson.
5. Allow 10 minutes for this part of the activity.

Explain

1. When ready, direct the learners' attention to the chart paper or whiteboard where you have reproduced the "Plant Structures" page.
2. Ask the Data Scientist from each team to identify one of the plant structures and allow time for them to describe or explain what the team already knows about the structure. Record what they share on the large chart you created. You may invite responses from the other teams for the same plant part. **Accept all responses but make no corrections at this time.**
3. After teams have shared, project and give electronic access to the "Plant Puzzler" Google Doc.
4. Reference the boxes with the names of the plant structures and the functions. Explain to learners how to drag the box with the name of the structure to the correct place, then drag the function it performs underneath the name. Remind the teams to work together to complete the puzzler.
5. When finished, teams will save their work, but ask them not to write anything on their "Plant Structures" chart until you confirm correct answers.
6. When all teams have finished, project the "Plant Puzzler" and ask learners to help you position the structures and functions correctly. Use the following key to confirm the functions of each plant structure:
    - **Leaves:** absorb sunlight, exchange gases, and make food for the plant.
    - **Stem:** provides structural support and transports water, minerals, and food through the plant.
    - **Roots:** anchor and support the plant, absorb and transport water and minerals, and store food.
    - **Flowers:** specialized structures that allow some plants to reproduce. Not all plants have flowers.
7. When the puzzler is complete, instruct learners to write the functions in the last column on the "Plant Structures" page as you do the same on the class chart. How close were the teams to the correct answers?

Elaborate

1. Ask, *Can a plant survive if it's missing one of its structures? Why or why not?* Accept responses. *Is one part more important than another*? Listen to arguments.

2. Explain that the parts of a plant work together as a **system**. Each **structure** has a special **function** to keep a plant alive. Remind learners that not all structures are the same for all plants. Add that the fossil record gives us evidence of plant structures that allowed some species of plants to survive the changes that were occurring in Earth's environment.

Evaluate

1. Based on prior knowledge, have learners communicated a reasonable understanding of the different plant parts?
2. Using new knowledge, have learners communicated a reasonable understanding about the function of plant structures?

Science Language

- Plant **structures** include roots, stems, leaves**,** and flowers**.** Structures have **functions**, or jobs, that provide what a plant needs to survive.
- A **flower** is a specialized structure that allows some plants to reproduce. Not all plants have flowers.
- A **leaf** is the part of a plant that absorbs sunlight, exchanges gases, and makes food for the plant.
- The **stem** of a plant provides structural support and transports water, minerals, and food throughout the plant.
- **Roots** anchor and support a plant, absorb and transport water and minerals, and store food.

Expanded Standards

Reading TEKS

4.9E: Recognize characteristics and structures of argumentative text, including **(i)** identifying the claim and **(iii)** identifying the intended audience or reader.

CCSS

RI.4.8: Explain how an author uses reasons and evidence to support particular points in a text. **W.4.7:** Conduct short research projects that build knowledge through investigation of different aspects of a topic.

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-LS1-1:** construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

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. **4.10A:** Explore how structures and functions enable organisms to survive in their environment.

2024–25: 4.1E: Collect observations and measurements as evidence. **4.13A:** Explore and explain how structures and functions of plants such as waxy leaves and deep roots enable them to survive in their environment.