

DAY 7: WHAT OTHER EXTERNAL FACTORS AFFECT PLANTS?



MINI-LESSON

Teacher introduces the “Synthesizing” anchor chart and models synthesizing evidence from multiple sources.

SCIENCE INQUIRY CIRCLES

Teams begin writing synthesis statements for each question on their Inquiry Chart.



GUIDED SCIENCE INVESTIGATIONS

Teams play a timed game to identify acquired plant traits caused by external factors.



ABBREVIATED STANDARDS

- Reading TEKS: 4.6H
- CCSS: RI.4.9
- NGSS: 4-LS1-1
- Science TEKS: 2018–19: 4.2D, 4.10B; 2024–25: 4.1E, 4.13B

Day 7: What Other External Factors Affect Plants?

Literacy Strategy: Learning how to synthesize information.

Science Concept: Acquired traits in plants can be the result of external factors such as weather, animal, or human activity.

Science and Literacy Connection: Scientists synthesize what they have read by other scientists with what they already know and put that information together in a new way.

Mini-Lesson (15 minutes)

OVERVIEW

Scientists put together new information about the world every day. Before they conduct their own investigations, scientists read lots of texts other scientists have written about their own work. Scientists “synthesize” what they read with what they already know and put that information together in a new way. “Synthesis” means making something new by putting things together. Today, you will model how to write a synthesis statement using a shared inquiry question and Gulf Coast salt marsh as a model.

NOTE: You are encouraged to create the “Synthesizing” 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)
- “Synthesizing” anchor chart as a model
- class Inquiry Chart

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 will practice synthesizing our evidence from multiple sources. We will combine *information from all of our sources and create our own, new information. This is different from*

restating what other scientists have written. When I write a synthesis statement, I combine evidence from multiple sources with my own knowledge, and state the information in a new way.

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

1. *I write synthesis statements because other scientists expect me to show that I have read scientific writing about my topic, but they also expect me to write in my own words. I also synthesize my resources because it helps me construct a deeper and broader meaning about my topic. As a strategic reader and writer, I synthesize to make sense of lots of information. I write a synthesis statement when I want to combine information from different books, online resources, experts, and videos.*

Tell how to use the strategy (procedural knowledge)

1. *The first thing I do is look at one of my Inquiry Chart questions and think about the important from each source that helps to answer this question.*
2. *I compare and contrast the important information from each of the sources to make sure all of my information fits together in a way that makes sense. If the information across sources is similar, I often do not need to do anything. If my sources contradict or disagree with each other, I need to stop and try to evaluate the claims or statements the authors are making.*
3. *Now, I need to think about what I know about this important information and if I can add something from my own knowledge that the authors didn't mention directly. I will be careful to include only my knowledge that is factual and that matches what I have read in the writing of other scientists. I will not include opinions or information that I have heard someone in my life say. If what I know agrees with what other scientists say, I can include it in my synthesis statement.*
4. *Finally, I write a synthesis statement that combines evidence from my sources and my own factual knowledge.*

You might present the following as a model synthesis statement as part of this mini-lesson:

(Explain that their synthesis statements will focus on the ecosystem they have been learning about and the traits of plants that live there; their synthesis statements should also include information related to the concepts the unit has focused on.)

1. *My questions is, What are the traits (both inherited and acquired) of plants that live in the Gulf Coast salt marsh? I found that*
 - *The Gulf Coast salt marsh is a wet, salty environment for plants.*
 - *Plants in the Gulf Coast salt marshes have long stems that allow them to reach past water to find sunlight.*
 - *Plants that grow in shallow areas often have roots that tightly hold onto the soil and stay anchored even when they are pushed by water.*
 - *Plants that grow deeper in the marsh stay anchored by roots in the muddy soil even though they have very long, skinny stems.*
 - *Some plants have leaves that are covered with very fine hairs that reduce the amount of water the plant loses to the air.*
 - *Some plants have tiny salt glands on their leaves to release extra salt.*
 - *A drought (not enough rainfall) can make the marsh too salty, which is toxic to the plants and prevents them from getting the water they need.*
 - *Intense flooding and/or hurricanes can damage the leaves, stems, and roots of plants.*

Model synthesis statement:

Plants in the Gulf Coast salt marsh have inherited traits that include strong roots, long thin stems, and leaves with tiny hairs and salt glands. Over a plant's lifetime, changes in the amount of salt and water in the marsh can damage parts of the plants, resulting in acquired traits.

Science Inquiry Circles (30 minutes)

OVERVIEW

Teams will write synthesis statements for each inquiry question on their Inquiry Charts. You may need to make adjustments for teams who are still working to complete their Inquiry Charts.

MATERIALS**Each team member needs:**

- science notebook
- pencil

Each team needs:

- team Inquiry Chart

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 circles. 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. *We have answered all (or most) of our Inquiry Chart questions. Today we will write our synthesis statements, so we need to be sure we have completed the Inquiry Chart.* (Make adjustments for teams that have not yet completed their Inquiry Charts.)
3. *Now, inquiry circle teams will work together on their synthesis statements.*

During Inquiry Circles (20 minutes)

1. *When all questions are answered on your Inquiry Chart, your team will work together to write a synthesis statement for each one of your inquiry questions.*
2. *When writing your synthesis statements, remember to synthesize all the information in the column under each question. You probably have information from multiple sources as well as some information from your own knowledge.*
3. *As you work to write your synthesis statements, remember the synthesis statement from our mini-lesson today.* (Refer to the written statement.)
4. *Choose one inquiry question at a time and write a synthesis statement as a team.* (You might also give teams the option to divide up the inquiry questions and have each team member write one synthesis statement. Facilitate in a way that works best for your learners.)
5. *Write your synthesis statements in your science notebooks.*
6. *Do not forget to use the anchor charts to help guide your thinking.* (Refer to the posted anchor charts.)
7. *I will help guide the inquiry circles, but I expect you to work as a 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's Lab Director will lead the discussion about today's results. Was the team able to synthesize the questions on their inquiry chart? What problems did the team encounter? How did the team resolve those problems? (After you have allowed the teams to gather their thoughts, have the Data Scientist share with the class.)*
2. *The Data Scientists will now share with the entire class one of their team's synthesis statements. (Encourage teams to share how they developed their synthesis statements. If you saw a great example in action, encourage that team to share with the entire class.)*

Guided Science Investigation (30–45 minutes)

OVERVIEW

Learners play a timed game to identify acquired plant traits caused by external factors.

GUIDING QUESTION

How do external factors affect inherited traits in plants?

BACKGROUND INFORMATION FOR THE TEACHER

In addition to these environmental considerations covered in Day 2, there are other external factors that can impact plants and vegetation, including animal and human activity, and extreme weather events, such as flooding, snow and ice storms, heat waves, droughts, and wildfires. Extreme weather events have a direct impact on inherited plant structures and their functions. In this lesson, learners will engage in a timed game to test their skills in identifying acquired traits that are the result of these kinds of external factors.

MATERIALS

Each team member needs:

- science notebook
- pencil

Each team needs:

- copy of "Justify!" page

Teacher needs:

- "Justify!" slideshow
- "Justify!" page
- "Justify!" answer key

SETUP

- Make copies of the "Justify!" page (1 per team).
- Prepare a tally column on the whiteboard, one for each team, to tally points earned.
- Prepare to project the "Justify!" PowerPoint slideshow to the class.

SAFETY

There are no safety concerns today.

DAILY OBSERVATIONS

Remind learners to make their daily observations on the seed investigations.

PROCEDURE

Engage

1. *It's game time! Today we'll test your skills of observation and what you've learned about traits as you play for points using a special timed slideshow. The slideshow contains images of plants and vegetation that have been affected by external factors, such as weather events, or animal and human activity.*
2. Distribute a "Justify!" page to each team. Review the page together, instructing learners to work together within their teams to find any acquired traits in each image. Suggest they work quietly so that other teams cannot hear their discussion.
3. **Let teams know they have 30 seconds to make their observations on each image.** (Teacher can use a timer or set timing on the PowerPoint presentation.)
4. Add that they will earn 2 points for each acquired trait they identify. However, **they also have to justify their answers to get the points**—in other words, they need to explain why it is an acquired trait.
5. Ask if there are any questions before beginning the slideshow.

Explore

1. When ready, begin the PowerPoint slideshow. Move between the teams and listen for their responses, but make no suggestions.
2. Remind them to include all team members in the discussion.
3. **At the end of the slideshow, have everyone put their pencils away, letting them know they cannot add any more to their observations.**

Explain

1. Explain that you will now show each image again and give each team a chance to share the acquired traits they found, along with their justification. If a team gets **both** the observation and justification correct, they will earn 2 points.
2. However, let them know that another team can challenge their answer. For example, if a team misidentifies an inherited trait as acquired or if the justification is incorrect or insufficient, another team may challenge the answer (trait identification and/or justification) and provide the correct answer for 2 points (the results of the challenge will be at the discretion of the teacher).
3. Allow enough time for teams to explain their observations and justifications for each image, as well as any challenges. Be sure to keep a tally of points earned.

Elaborate

1. Conclude the lesson by sharing information from the "Justify!" answer key.
2. Highlight any spot-on observations or challenges you heard and offer clarification if needed to correct any misunderstandings.

Evaluate

1. During their discussions, did learners communicate a reasonable understanding of the acquired traits they observed in the images?
2. Did learners make reasonable justifications?

3. Are learners correctly using new science language in their communications (verbally or in writing)?

Science Language

- **Observation** is carefully looking at something or someone to gather information.
- **Acquired traits** are not passed down but are the result of environmental or external factors.
- **Environmental factors** that can affect plants include water, temperature, and air.
- **External factors** that can affect plants include weather and animal or human activity.

Expanded Standards

Reading TEKS

4.6H: Synthesize information to create new understanding.

CCSS

RI.4.9: Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

NGSS

4-LS1-1: Construct an argument with evidence, data, and/or a model.

Science TEKS

2018–19: 4.2D: Analyze data and interpret patterns to construct reasonable explanations from data that can be observed and measured. **4.10B:** Explore and describe examples of traits that are inherited from parents to offspring such as eye color and shapes of leaves and behaviors that are learned such as reading a book and a wolf pack teaching their pups to hunt effectively.

2024–25: 4.1E: Collect observations and measurements as evidence. **4.13B:** Differentiate between inherited and acquired physical traits of organisms.