| Day 14<br>What is Scientific Evidence? | | |
|---|---|---|
| **Reading Strategy:** Synthesizing | | **Science Concept:** Scientists rely on evidence to support claims and to explain things. Scientific evidence comes from investigations in the form of data. |
| **Reading TEKS:** 3.6H | **ELPS:** Reading 2-12, 19 TAC 74.4(c)(4) | **Science TEKS:** 3b2B, 3b4, 3b2E |
| **Materials for Reading Mini-lesson:** Chart paper, markers, pond ecosystem inquiry chart, pond text to model strategy | | |
| **Materials for Inquiry Circle Groups:** Group inquiry charts, pencils, variety of nonfiction texts for each group, access to websites and online books | | |
| **Materials for Science Whole Group Lesson:** See Lesson | | |
| **Content Vocabulary:**<br>**Claim –** a statement that says something is true based on observations or an opinion<br>**Evidence** – data collected from the investigation that can be used to support explanations and answers<br>**Data**- facts or information collected during an investigation; EX: images, measurements, or words<br>**Reasoning**- thinking about and explaining *how* the evidence supports a claim | | |
| **Science and Literacy Connection:** Scientists synthesize all of the information that comes from research and investigations to produce evidence that supports their claims and explains their work. | | |

For an expanded version of the Standards listed above, see page ___.

## Reading Mini-lesson — 15 minutes

### OVERVIEW

Scientists make discoveries about the world every day! They take what they have read, what they already know, and then make observations that lead to thinking about a topic in a new way.


For the three days dedicated to synthesis, it is suggested that you start with a whole group synthesis statement about pond ecosystems, followed by inquiry circle groups creating their own synthesis statement. Last, facilitate a whole group discussion around all of the ecosystems to create a synthesis statement for the class.

Explain the strategy:

- **Tell what the strategy is (declarative knowledge)**
  - Say something like, "Today we will practice synthesizing what we know about our topic (pond ecosystems). We will combine information across our sources and create our own, new information."

- **Tell when and why to use the strategy (conditional knowledge)**
  - Say something like, "I synthesize because it helps me construct a deeper and broader meaning about my topic across resources. As a strategic reader, I synthesize when I find information from different books, online resources, experts, and videos."

**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 will do is look at my inquiry chart and think what was important from each source. I'll do that as I consider each of my research questions.
- Then I will compare and contrast the important information from each of the sources.
- Now, I need to think about what I know about this important information and if I can add something from my own schema that the authors did not mention.

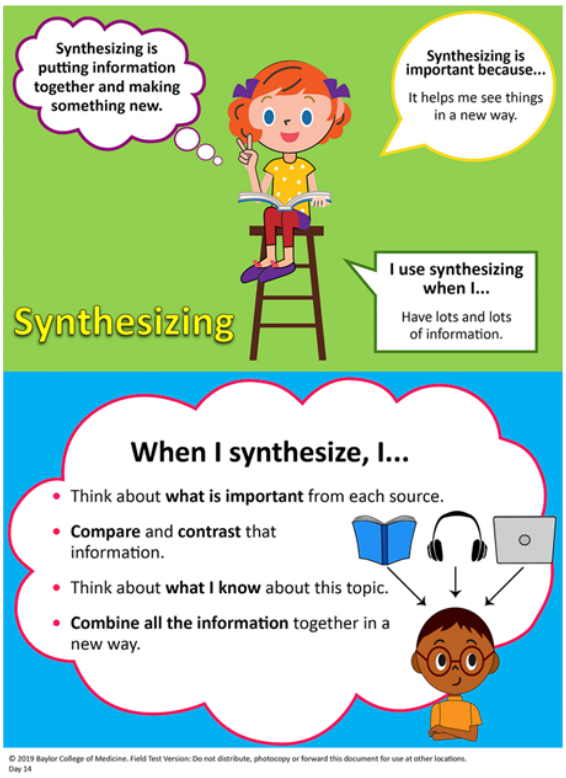
*Model the mini lesson (above) and create a synthesis statement about pond ecosystems.*

*The synthesis statement may be something like, "The organisms in a pond ecosystem all depend on each other and rely on the nonliving environment, too. If one part of the food chain is changed, all of the other parts will change."*

*Remember that the concepts this unit has focused on are:*

- *Organisms rely on the living and nonliving things in their environments.*
- *Animals get energy from the food they eat, and pass along that energy when they are eaten.*
- *A change in one part of an ecosystem affects all of the other parts of the ecosystem.*

*The synthesis statement you will write about pond ecosystems during this mini lesson should incorporate all of these concepts.*




**Practice in text (print, video, or interview)**

Post the anchor chart in your classroom so students can refer to it while in their inquiry circles. Encourage scientists to use the strategy during in their Inquiry Circles.

## Inquiry Circle Groups — 30 minutes

### OVERVIEW

Scientists work in teams when conducting research and investigations. Each day of this unit, students will work in inquiry circle groups while embodying the role of a scientist. They will do so by taking on roles of scientists in research by speaking like a scientist, reading like a scientist, and writing like a scientist.

## PROCEDURE

**Before Inquiry Circle Groups — 5 minutes**

***You might want to say something like this to the readers:***

- It is time to get into our inquiry circle groups. You will be with the same research team as yesterday.
- When we research ecosystems, we will practice our roles as scientists. We will do this because scientists have a special way in which they observe the world, read scientific texts, and write reports. There is no better way to learn about science than to become a scientist!

**During Inquiry Circle Groups — 20 minutes**

***You might want to say something like this to the readers:***

- We have anchor charts to help guide your thinking. Do not forget to use them while in groups. (Refer to the "Inquiry Tool Box" anchor chart and the daily anchor chart. Remind students that they can use all the reading strategies taught, not just the one for that day.)
- My role is to help guide the inquiry circle groups, but I expect you to work as a scientific team to solve your problems together.
- Do not forget to answer your research questions and record it on the inquiry chart. It is important to record your sources on the inquiry chart as you complete it. (Be sure to explicitly explain how students should use the chart.)

(While groups are working together, walk around the room to facilitate as needed.)

**After Inquiry Circle Groups — 5 minutes**

***You might want to say something like this to the readers:***

- As we are concluding our inquiry circle groups for today, each group will have a chance to share what they accomplished and learned.
- The Lab Director should lead the discussion with their inquiry circle group about today's results. For example, what did you learn about your ecosystem? Which reading strategies did you use? What problems did you encounter? How did you resolve those problems?
- The Data Scientist will now share with the entire class either something the group learned about their ecosystem, which reading strategy(ies) were used, or how the group solved a problem.

## Science Whole Group Lesson — 30-45 minutes

### OVERVIEW

Students learn how to develop claims and organize evidence from their investigations to support them.

### GUIDING QUESTIONS

What is a claim? What do I think my investigation proves? What is evidence? What information or data can I use as evidence from my investigation? How does that information support my claim?

## BACKGROUND INFORMATION

Scientific evidence is data used to support answers to questions or claims generated by investigations. Evidence can come from your own investigations, the investigations of others, and from reasoning.

Using a Claims, Evidence and Reasoning (CER) approach teaches students how to organize information logically like scientists do. It also helps them understand how to support an explanation by using relevant data. Moreover, making the connections between their claims and evidence develops reasoning skills that lead to successful argumentation in Science or any other core discipline.

## SAFETY

Remind students to follow safety rules for making observations on their sample.

## MATERIALS

- Student Data logs (from their science notebooks)
- Data Log Ex. docx. (from Lesson 6)
- Claim chart.docx.
- Algae in a bottle jpeg.
- Projector, computer (if projecting dot plot)
- Science notebooks

## SET UP

- Prepare to project "Algae in a Bottle" image and the Data Log EX. From Lesson 6 for the class to see (or make color copies for the students)
- Note: Teacher has the option of projecting docx. or making copies for the students to look at during the discussion.

## DAILY OBSERVATIONS

Students observe their samples and record data/information on data logs in their science notebooks.

## PROCEDURE

## ENGAGE

1. Remind the class that your investigation was planned to see if light affected the color of the "green substance", which we now know is algae. Your idea was that the algae in the dark would not be as green as the algae in the light.
2. Tell them that your own investigation is over, and you are ready to claim that light does affect the color of the algae. *Remind the students that your investigation was an example and that their investigations will have data for 5-7 days.*
3. Project or refer the class to the photo of the "Algae in a Bottle".
4. Tell them that this photo shows the bottle that was in the dark. Ask them to describe it. (not green, water is clear, etc.)
5. Does this one photograph give enough proof to support my claim that light does affect the color?
   Why or why not? (Accept all responses)

6. Is there enough information from my investigation on this photo to support my claim? (Accept all responses)
   (The answer is NO. There is not enough data to show what my investigation revealed. How do you know it's even the same bottle??)

**EXPLORE**

7. Explain that proving your claim is correct requires much more specific data. Remind them that they have been recording information in their science notebooks for just this reason – to be able to justify their claim or support an answer with enough evidence.
8. Project or show them the data table you have been keeping in your notebook.
9. Ask them to describe what they see. (The color of the algae has changed over time).
   How do we know it has changed over time? (Using the color chart, I recorded the number I saw **every day** I made an observation.)
10. Project and direct their attention to the Claims chart. Describe the chart as a tool that they will use to organize their information in preparation for presenting their data.
11. Using the teacher's model investigation data, point out your claim (Light does affect the color of the algae). Tell them that you have made this claim based on what you have observed.
12. Next, I will describe the evidence I have collected and the reasoning that supports my claim.
    **Evidence:** Using the color chart, I observed that the numbers for the algae in the dark went down over time- from 2-1.
    **Reasoning**: The algae lost its color over time because there was no light. Algae needs light to stay green.

    **Evidence**: Using the color chart, I also observed that the numbers for the algae in the light went up over time – from 2-3.
    **Reasoning**: The color of the algae got greener over time because it was in the light. Algae needs light.

**EXPLAIN**

13. Say to the class that "reasoning" makes the connection between the evidence and your claim. It is a way to explain **how** the evidence supports your claim. (In this case, the **specific** numbers of the color change show the difference between the algae in the light and in the dark.)
14. Advise the class to look carefully at the data they have collected. They will organize their information in the same way you have to make a convincing explanation of their claim. Add that they will make **one** claim about their investigation.
    But they may have more evidence to their support their claim than you had, and as they organize it into their charts, they will discover whether it is useful or not.
15. Remind them that scientists also have to organize their data and use reasoning to support their claims before they present it to others!
16. This is a good place to ask if there are any additional questions that have not been answered about how to make a claim and support it with evidence. Let the class know that you will be available to help them when they begin their own claims chart in the next few days.

**ELABORATE**

17. Give the class this writing prompt to answer in their science notebooks:
    "What is another possible reason that the algae color got darker in the presence of light?"
    (The algae are blooming, making the color appear darker as more cells are added!)

**EVALUATE**

18. Did students communicate a beginning understanding of how to make a claim?
19. Did they communicate an understanding of how to use the Claims chart to organize their evidence?

20. Did their answer to the writing prompt indicate what they have learned about algae as a living organism or producer?
21. Are students using science vocabulary in their oral or written responses?

## Expanded Standards

**ELAR TEKS:** 3.6H Comprehension skills: listening, speaking, reading, writing, and thinking using multiple texts. The student uses metacognitive skills to both develop and deepen comprehension of increasingly complex texts. The student is expected to: (H) synthesize information to create new understanding

**ELPS:** Student Expectations for Reading 2-12, 19 TAC 74.4(c)(4) The student is expected to: (K) demonstrate English comprehension and expand reading skills by employing analytical skills such as evaluating written information and performing critical analyses commensurate with content area and grade-level needs.

**Science TEKS:** 3b2B: The student is expected to collect and record data by observing and measuring using the metric system and recognize differences between observed and measured data. 3b4: The student is expected to collect, record, and analyze information using tools, including cameras, computers, hand lenses, metric rulers, Celsius thermometers, wind vanes, rain gauges, pan balances, graduated cylinders, beakers, spring scales, hot plates, meter sticks, magnets, collecting nets, notebooks, and Sun, Earth, and Moon system models; timing devices; and materials to support observation of habitats of organisms such as terrariums and aquariums. 3b2E: The student is expected to demonstrate that repeated investigations may increase the reliability of results.