ALL for Science™
Authentic Literacy and Language for Science

Baylor College of Medicine
DEPARTMENT OF EDUCATION, INNOVATION & TECHNOLOGY
CENTER FOR EDUCATIONAL OUTREACH

Day 12: What Is Scientific Evidence?

Mini-lesson	Children receive support as needed to combine information into synthesis statements.
Inquiry Circles	Today inquiry teams will combine all of their synthesis statements into one synthesis statement about their ecosystem.
Guided Science Investigation	As they conclude their science investigations, children learn how to develop claims and use evidence to support them.

Literacy Strategy: synthesizing all inquiry statements into one statement	**Reading TEKS** ELA.3.6.H	**CCSS** W.3.2, S.L3.2
Science Concept: Scientists rely on evidence to support claims and to explain things. When an investigation is complete, scientists examine the details of their data carefully to look for information that will help them explain the results.	**Science TEKS** **2018–19:** 3.2D, 3.2F **2024–25:** 3.2B, 3.3B	**NGSS** 3-LS4-1
Science and Literacy Connection: after concluding research and investigations, scientists synthesize all the information or data in a manner that will make sense to others.		

Mini-Lesson (15 minutes)

OVERVIEW

You may have teams who wrote their first synthesis statement yesterday and are ready to continue writing synthesis statements for their remaining inquiry questions. You might also have teams who have written all of their synthesis statements.

Team who have answered all their inquiry questions might create one synthesis statement that combines all of their findings on their Inquiry Chart into an overarching synthesis statement about their ecosystem. Use this time to support teams as needed.

The class Inquiry Chart should be posted for learners to reference as they write their own synthesis statements.

Science Inquiry Circles (30 minutes)

OVERVIEW

Today inquiry teams will combine all of their synthesis statements into one synthesis statement about their ecosystem.

MATERIALS

Each team member needs:

- science notebook
- pencil

Each team needs:

- team Inquiry Chart

Teacher needs:

- class Inquiry Chart (pond ecosystem)

PROCEDURE

Each *italicized statement* below contains suggested wording the teacher may use for the lesson; additional teacher actions and considerations are in parentheses.

Before Inquiry Circles

1. (Have the Equipment Directors gather the team's Inquiry Chart and science notebooks with their synthesis statements from yesterday). *Today **you will work as a team** to develop a synthesis statement about your ecosystem. You will need to synthesize (put together) all of your synthesis statements for each of your research questions into one statement about your ecosystem.*

During Inquiry Circles (20 minutes)

1. *What should we do first?* (If necessary, guide them to say, "We will look at all of your synthesis statements and think about what was important from each one.")
2. *What should we do now that we have read all the synthesis statements?* (Learners should say something like, "Compare and contrast the important information and think about how the synthesis statements are the same or how they are different." Refer to the "Synthesizing" anchor chart, if needed).
3. *Using the information we have, think about what can be added from your own schema that we have not mentioned.* (Give learners time to think, then allow them to share and add any relevant additional information to the "What We Know" section of their Inquiry Chart.)
4. *As a team, you will now write a synthesis statement for your ecosystem. Remember, you can combine information from all of your previous synthesis statements to create this synthesis statement.*
5. (Once each team has created a synthesis statement for their ecosystem, ask learners to write their statement in their science notebooks.)

After Inquiry Circles (10 minutes)

1. *As we conclude our inquiry circles for today, each team will have a chance to share what they accomplished. The Lab Director will lead the discussion about today's results. Discuss what the*

team learned about their ecosystem. Was the team able to synthesize the information? What problems did the team encounter? How did the team resolve those problems?

2. *The Data Scientist will now share with the entire class their team's synthesis statement.*

Guided Science Investigation (30–45 minutes)

OVERVIEW

Today learners make final observations on their investigations. Then they learn how to develop claims and organize evidence from their investigations that supports their claims. The process of learning how to use a claims, evidence, and reasoning (CER) chart may take longer than anticipated if learners are not familiar with it. The teacher may allow as much time as needed.

GUIDING QUESTIONS

What is a claim? What claim or statement can I make about my investigation? What data have I collected during my investigation? How does my data provide the evidence to support my claim?

BACKGROUND INFORMATION FOR THE TEACHER

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

When an investigation is complete, scientists organize the data generated to make it easier to understand, discuss, and share. It can also help the scientists decide what their next steps should be.

Analyzing, or taking a careful look, at the information helps scientists look for patterns or connections they can use as evidence to support their claims or hypothesis.

Using a claims, evidence, and reasoning (CER) approach teaches learners how to organize information logically, the way 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.

MATERIALS

Each team member needs:

- science notebook
- pencil

Each team needs:

- Team CER Chart
- Team Data Log

Teacher needs:

- "Data Log Example" sheet
- "CER Chart Example" sheet
- "Shades of Green" color chart
- "Algae in a Bottle" image

SETUP

- Prepare to project the "Algae in a Bottle" image, the "Data Log Example" sheet, and the "CER Chart Example" sheet for the class to see. **Note**: Teacher has the option of either projecting these documents or making color copies for learners to look at during the discussion.

SAFETY

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

DAILY OBSERVATIONS

Today will mark the final day of making observations and documenting information. Allow 5–10 minutes for learners to observe their samples and record data/information on the Team Data Logs in their science notebooks. Teachers may choose what part of the day the observations will be done, as long as they are completed today.

PROCEDURE

Engage

1. Announce, *Today is the last day of your science investigation! You are now ready to make a statement, or claim, about the results of your investigation. I will use my own investigation to model how to proceed. Please let me know if you have any questions as we walk through this together.*
2. 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.
3. Tell them that you are ready to **claim** that light **does** affect the color of the algae.
4. Project or refer the class to the "Algae in a Bottle" image. Tell them that this photo shows the bottle that was in the dark. Ask, *Can you describe what it looks like?* (Possible answers may include "water is clear, not green, no color," etc.)
5. *Does this photo provide enough information to support my claim that light does affect the color?* (Accept all responses.)
6. *The answer is NO. This photo does not provide enough data to show what my investigation revealed. How do you know it's even the same bottle?*
7. Explain that proving your claim (what you think is true) requires much more specific data. Remind them that, like scientists, 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 ("Data Log Example" sheet) you have been keeping. Tell them that you have made this claim based on what you have observed. *Using the color chart, I recorded the number I saw **every day** I made an observation.*
9. (Project or show them "CER Chart Example" sheet*)* Explain the "CER" stands for claim, evidence, and reasoning. *Using my investigation data as a model, I claim that "Light does affect the color of the algae"* (point to your claim, or what you think is true).
10. Next, *Let's look at the evidence, or information, I have collected that supports my claim and the **reasoning** that shows how the **evidence** supports my claim:*

    Evidence: *Using the Color Circles chart, I observed that the numbers for the algae in the dark went down over time—from 2 to 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 to 3.*
Reasoning: *The color of the algae got greener over time because it was in the light. Algae needs light.*

11. Explain 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. (Remind them of what they have learned about algae: it is a photosynthetic phytoplankton, which means it needs light to make its own food!)
12. 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.

Explore

1. *Now, it is time for each team to make their own statement, or claim, about their investigation!* (Equipment Directors should pick up the blank Team CER Chart from the teacher.)
2. Advise learners that before they begin to enter information into their Team CER Chart, the Lab Directors should lead a good discussion between the team members about possible claims, data the team can use as evidence, and ***how*** the evidence supports the teams' claim.
3. Instruct learners to analyze (look carefully at) all the data (measurements, pictures, etc.) they have gathered on the Data Logs in their science notebooks.
4. Then, as a team, they will decide on **one** claim they will make about their investigation.
5. They will organize their supporting information (evidence) on the Team CER Chart to make a convincing explanation of their claim.
6. Let them know that they may have more evidence to their support their claim than you had and that, as they organize their evidence on their Team CER Charts, they will discover whether this evidence is useful or not.
7. Tell them the allotted time they have to complete the activity and let them know that you will be moving between teams to address any questions they may have.
8. Remind them that scientists also have to organize their data and use reasoning to support their claims before they present it to others!

Explain

1. When time is up, gather the attention of the class. Offer any feedback you may have as a result of observing them work.
2. Ask for 2 or 3 volunteers to share their claims and one piece of evidence they believe supports their claim.
3. Follow up by asking ***how*** the evidence supports their claim. Allow time for discussion. **Note:** Time constraints may prevent lengthy discussions about individual claims, but that is up to the discretion of the teacher. This discussion could be continued in the next class time.
4. When ready, ask Equipment Directors to collect the Team CER Charts so that you can review them later.

Elaborate

1. Commend learners for their work in collecting data and organizing it on the Team CER Charts. Point out that they are, in fact, using the strategy of "synthesizing" to organize their science investigation results.

2. Explain that the next step will be to decide how to present their findings at a "science meeting," which they will learn about next!

Evaluate

1. Did teams develop a *reasonable* claim?
2. Was the evidence they used to support their claim valid? Did it come directly from their observations/investigation?
3. Were they able to reason out their how evidence supports their claim?
4. Was collaboration between team members evident as they worked on their claims?
5. Are learners using scientific language in their written and oral responses?

Science Language

- A **claim** is a statement of what you think is true based on observation and evidence.
- **Evidence** is data collected from the investigation that supports (backs up) explanations and answers.
- **Data** are facts and information (such as images, words, and measurements) collected during an investigation.
- **Reasoning** means thinking about and explaining how the evidence supports a claim.

Expanded Standards

Reading TEKS

ELA.3.6H: 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.

CCSS

W.3.2: write informative/explanatory texts to examine a topic and convey ideas and information clearly. **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-LS4-1: analyze and interpret data to make sense of phenomena using logical reasoning. **3-LS4-3:** construct an argument with evidence.

Science TEKS

2018–19: 3.2D: analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations. **3.2F:** communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion.

2024–25: 3.2B: analyze data by identifying any significant features, patterns, or sources of error

3.3B: communicate explanations and solutions individually and collaboratively in a variety of settings and formats.