

Day 2: What’s the Green Stuff in the Bottle?

-  **Mini-lesson** Children develop questions to investigate about ecosystems and learn how to record information on an inquiry chart.
-  **Inquiry Circles** Children discuss what they already know about ecosystems and record their ideas on the inquiry chart.
-  **Guided Science Investigation** Children are introduced to a jar containing an unknown green substance to stimulate discussion and raise questions.

Literacy Strategy: generating research questions and recording with a visual format	Reading TEKS ELA.3.13A	CCSS W.3.8
Science Concept: scientists conduct research or make observations that raise questions to investigate.	Science TEKS 2018–19: 3.2A, 3.2B, 3.4 2024–25: 3.1D, 3.1E	NGSS 3-LS2-1
Science and Literacy Connection: an important first step in scientific research is preparation, which may be formulating your research question or preparing for your investigation.		

Mini-Lesson (15 minutes)



OVERVIEW

Each day, the teacher will model a mini-lesson to explain a literacy strategy relevant for use with exploratory texts or videos. Today learners will develop questions to investigate during inquiry circles.

Scientists always identify a question to investigate, and they record their data in an organized manner. While a true inquiry project would allow learners to develop their own questions, for this guided inquiry, learners will explore possible questions while the teacher guides them to open-ended questions that can be answered for each ecosystem being investigated.

Learners will record their findings on an Inquiry Chart during inquiry circles time. The teacher will demonstrate how to record information, using a class Inquiry Chart about a pond ecosystem as a model.

Remember, for each inquiry circle team, learners will need a blank Inquiry Chart (**to be created by the teacher beforehand**) on a large piece of chart or butcher paper. Be sure the size is large enough for the children to record on (but not so large that they cannot be laid out in the classroom for the teams to work on) and manageable for storage when teams are not working on them.

MATERIALS

Teacher needs:

- chart paper
- marker(s)
- class Inquiry Chart (pond ecosystem)
- exploratory text about a pond ecosystem to model the strategy

SETUP

- Create a class Inquiry Chart for a pond ecosystem to model how learners will fill out their own team Inquiry Charts.
- Label a blank sheet of chart paper **“Questions We Have about Ecosystems.”**

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.

EXPLAIN THE STRATEGY

Tell what the strategy is (declarative knowledge)

1. *Yesterday we voted on the ecosystem we wanted to learn more about. Today, we will decide what we want to know. When scientists want to learn more about an ecosystem, they come up with questions that they can investigate. To investigate means that they make a careful search for facts or information that will help them answer their questions. In your teams you will focus on your chosen ecosystem, but as a class we will focus on a pond ecosystem.”* (Post the pond ecosystem Inquiry Chart you have constructed or project it on a large screen.)

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

1. *Let’s think about what we want to know about the ecosystems and make a list of questions.* (Encourage learners to think about their discussions yesterday when exploring all the texts. Record questions on the chart paper titled **“Questions We Have about Ecosystems.”** You may need to guide learners to think about open-ended questions rather than yes/no questions.)

Tell how to use the strategy (procedural knowledge)

1. *Now that we have a list of things that we want to know, we need to decide which are the most important questions we need to investigate about the ecosystem.* (Look for and emphasize any questions offered by the children about the ecosystem environment, organisms that live there, and life cycle and physical traits of the organisms. Explain that this is important information to know!)

2. (Post the class Inquiry Chart about a pond ecosystem.) *Like scientists, we will record answers to our questions in an organized manner using this chart called an Inquiry Chart.*
3. *Notice, I have already written some questions on the class Inquiry Chart that are important about the ecosystem. (Read each question out loud.) Where is the ecosystem located? (Desert, forest, ocean, etc.) How would you describe the environment where the ecosystem is found? (Temperature, weather, etc.) What other organisms live in that environment? What do the organisms look like in that environment? What do organisms need to survive in this ecosystem? What other interesting facts did we find? (Explicitly show children how the questions they came up with can be answered by the broad, open-ended questions on the chart. If they do not fit exactly, you can use the “other interesting facts” column as the inquiry progresses.)*
4. *Looking at the Inquiry Chart, I see that I will also need to record, or write down, my resources: the title and author of the books or other media I use. When we are ready, I will show you how to do that.*
5. *Now, let’s practice completing the “What we know” section by using our class Inquiry Chart about the pond ecosystem. (Model how to record answers to the questions. Point out that we will need to verify what we know using text or other media. Also, it is okay if we do not know many things just yet.)*
6. *During inquiry circle time today, your teams will begin by answering the “What we know” section about the ecosystem you chose!*

Note: For this first day of using the Inquiry Chart, learners will work together to complete only the “What we know” section. After this day, learners will use the Inquiry Chart to record their research data while in inquiry circles. This is what an Inquiry Chart on ecosystems might look like. **Each team needs its own Inquiry Chart that lists the team’s chosen ecosystem and the team members’ names.**

Name of Ecosystem and Team Members Here	Question:	Question	Question	Question	Question	Other Interesting Facts
What we know:						
Resource 1 <small>(Record book title and author name or video/website title and URL here)</small>						
Resource 2 <small>(Record book title and author name or video/website title and URL here)</small>						
Resource 3 <small>(Record book title and author name or video/website title and URL here)</small>						
Resource 4 <small>(Record book title and author name or video/website title and URL here)</small>						

Science Inquiry Circles (30 minutes)

OVERVIEW

Today inquiry circle teams will consider what they already know about their chosen ecosystems. Scientists work in teams when conducting research and investigations. Each day of this unit, learners will work in inquiry circle teams while assuming the roles of scientists. They will do so by taking on the roles of scientists engaged in research by speaking like a scientist (using new vocabulary), reading like a scientist (using strategies to find information), and writing like a scientist (using journals to organize important information and observations).

MATERIALS

Each team needs:

- pencils
- team Inquiry Chart (**to be created on chart paper by the teacher**)
- variety of exploratory texts (see “Ecosystem Resources” spreadsheet for ideas)

Teacher needs:

- marker(s)
- class Inquiry Chart (pond ecosystem)

SETUP

- For each team, create a team Inquiry Chart on chart paper; include the name of the assigned ecosystem and the names of each team member.

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.* (Ask the Equipment Directors to gather the team Inquiry Chart and writing utensils. Make sure the class Inquiry Chart is visible as a model).
2. *Notice that the team Inquiry Chart looks just like the class Inquiry Chart we discussed during the mini-lesson. Today we are going to start a guided inquiry. You can see that along the top of the Inquiry Chart, there are five inquiry questions as well as a column for other interesting facts.* (Point out each of the questions to your learners and provide a brief explanation.)

During Inquiry Circles (20 minutes)

1. *Take a few moments to **discuss what you already know** about your ecosystem. Perhaps you know something about where it is located, what the environment is like, or what kinds of organisms live there. Think about some of the things we knew about the pond ecosystem. Do you know similar things about your ecosystem? The Lab Director will lead the discussion. Be sure*

everyone has a chance to share. Do not write anything on your Inquiry Chart just yet. (While teams are working, walk around the room and assist learners as needed.)

2. Now everyone should assist the Data Scientist in recording what you already know in the correct column. For example, if you already know something about where your ecosystem is located, you record it in the first column. If you can describe something about the environment (temperature, weather, etc.) record it in the second column. If you know something that doesn't fit into these questions, record it in the "other interesting facts" column. (While teams are working, walk around the room and assist learners as needed.)

After Inquiry Circles (10 minutes)

1. As we conclude our inquiry circles for today, each team will have a chance to share what they already know about their ecosystem, as well as what they accomplished and learned today.
3. The Lab Director should lead the discussion with their inquiry circle team about today's results. For example, what did you learn about your ecosystem? What new information did other team members share that you did not already know? What new questions came up during the discussion? (While teams are working, walk around the room and assist learners as needed.)
2. The Data Scientist will now share with the entire class either something the team learned about their ecosystem or any new questions that came up." (After all learners have shared, thank them for their hard work, and point out any excellent behaviors that you observed. If you notice any problems in the teams during the lessons, take a moment to gently 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 on-going work so they can easily access them.)

Guided Science Investigation (30–45 minutes)

OVERVIEW

Learners are introduced to a jar containing an unknown green substance to make observations, stimulate discussion, and raise questions.

GUIDING QUESTIONS

What questions do you have about the green substance? What do you want to know?

BACKGROUND INFORMATION FOR THE TEACHER

Scientific work involves a variety of approaches and processes that include observations and research, asking questions, collecting and analyzing data, and explaining information. Allowing learners to carry out investigations they design teaches them about the processes that scientists use in their work. Generating their own questions based on their observations gives them ownership in the process.

MATERIALS

Each team member needs:

- science notebook
- pencil

Each team needs:

- access to the jar of the mystery “green substance”
- hand lenses and/or jeweler’s loupes
- 1 ziplock bag containing the “Green Substance” images

Teacher needs:

- 1 liter bottle of the green **substance**
- “Green Substance” images
- large ziplock bags
- the chart paper labeled “**Questions We Have about Ecosystems**”
- marker(s)

SETUP

- Place the 1 liter bottle of the green substance in a central location for observation. Remove any labels from the bottle that identify what it is!
- Place hand lenses and/or loupes next to it.
- Make copies of the **three** “Green Substance” images (one set per team) and place in ziplock bags. (Teacher has the option of making color copies of the “Green Substances” images or giving learners digital access to the images.)
- Label a blank sheet of chart paper “**What Is the Green Substance?**”

SAFETY

- Teacher should advise the learners not to lift the bottle of the green substance—it is heavy and may spill.
- Correct use of the jeweler’s loupes and/or hand lenses should be modeled by the teacher.

DAILY OBSERVATIONS

None at this time.

PROCEDURE

Engage

1. Ask, *Have you ever come across something you’ve never seen before, or something that looked “mysterious”? How did you react to it? Did you want a closer look? Did you have questions about it?* Accept and discuss all responses.
2. Tell the class that you have a jar with something in it for them to observe.
3. Remind them that they are now going to become scientists working in teams. Ask, *What do you think scientists do when they find something they don’t understand or know about?* (Research information? Make observations? Ask questions?) Accept all responses.
4. Show the class a science notebook and explain that now that they are working as scientists, it will be important for them to use the science notebook to record everything they observe, do, or have a question about during the science investigation. Emphasize that it is important to **write down the date of each day’s work!** Ask, *Why might that be important?* (This will provide important information that they can use at the end of their study.)
5. Explain that daily notes in the science notebooks should include text and/or drawings describing what they observe or do.

6. They should also write down any **new questions** they have about the day's work.
7. Point out the station you have set up with the jar of the green substance and the magnifiers.
8. Establish the rules for observation: (Teacher may copy and post for reference.)
 - Instruct them to not lift, shake, or in any way move the jar so that the green substance is not disturbed!
 - Use hand lenses (or loupes) for a closer look at the substance
 - Each team has 3 to 5 minutes for observations (depending on the number of teams).
 - Write notes about what you observe or have a question about in your notebooks.
 - The teacher will accompany teams to the station to ensure compliance.

Explore

1. Ask the Equipment Directors to distribute the science notebooks (1 per team member) to their team. (The teacher may choose to use a new designated notebook for this investigation, or simply continue work in an existing science notebook.)
2. On the first page for this unit, ask them to write the date of this first observation. Tell them that **each team member** will write about their own observations in their own notebooks.
3. Next, ask the Equipment Directors to pick up a bag of digital images (1 per team).
4. Explain, *As you are waiting for your turn to see the substance in the bottle, you will look at digital images of the same substance that were taken through a microscope. You will write down observations and questions about the images as well.*
5. Teams will rotate until all teams have made observations of the jar.

Explain

1. After all teams have had a chance to view the jar and the digital images, ask learners to share their observations and any questions they have about the substance.
2. Record their information on chart paper as they share and save for future reference. They will discuss and refine these questions in the next lesson. **Teacher note:** It's important to record the learners' ideas in their own words, without offering any help or guidance nor dismissing their ideas.
3. Ask, *What can this green substance be?* Record their ideas on the chart paper labeled "**What Is the Green Substance?**" but **refrain from disclosing what the substance is (Day 10 is the big reveal!)**. Explain that as they work through this unit, they will discover what it is on their own!

Elaborate

1. Tell the learners that as scientists now, they will plan and conduct an investigation over the next few weeks to find answers to their questions.
2. Remind them that they are working as a team where everyone has a role that contributes to the investigation.

Evaluate

1. Did learners record reasonable observations in the science notebooks?
2. Did they develop questions based on their observations?
3. Did they communicate using new science language in their responses or explanations?

Science Language

- **Observation** is carefully looking at something or someone to gather information.
- A **scientist** is a person who is an expert in or who studies aspects of the natural or physical world.
- A **team**, or **teamwork**, is two or more people who work together to accomplish a goal or task.

Expanded Standards

Reading TEKS

ELA.3.13A: Listening, speaking, reading, writing, and thinking using multiple texts. The student engages in both short-term and sustained recursive inquiry processes for a variety of purposes. The student is expected to: (A) generate questions on a topic for formal and informal inquiry.

CCSS

W.3.8: Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

NGSS

3-LS2-1: Science and Engineering Practices: construct an argument with evidence, data, and/or a model.

Science TEKS

2018–19: 3.2A: plan and implement descriptive investigations, including asking and answering questions, making inferences, and selecting and using equipment or technology needed, to solve a specific problem in the natural world. **3.2B:** collect and record data by observing and measuring using the metric system and recognize differences between observed and measured data. **3.4:** 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.

2024–25: 3.1D: use tools, including hand lenses; metric rulers; Celsius thermometers; wind vanes; rain gauges; graduated cylinders; beakers; digital scales; hot plates; meter sticks; magnets; notebooks; Sun, Earth, Moon system models; timing devices; materials to support observation of habitats of organisms such as terrariums, aquariums, and collecting nets; and materials to support digital data collection such as computers, tablets, and cameras, to observe, measure, test, and analyze information. **3.1E:** collect observations and measurements as evidence.