ALL for Science™
Authentic Literacy and Language for Science

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

Day 1: Why Do Scientists Work in Teams?

Mini-lesson	Children learn about the ecosystems they will be investigating and the roles they will have as part of a scientific team.
Inquiry Circles	Learners select an ecosystem to investigate.
Guided Science Investigation	Learners will work as a team to recreate a 3D model seen only in part from different perspectives.

Literacy Strategy: introduction to the team roles, research, and science inquiry circles.	**Reading TEKS** ELA.3.13	**CCSS** SL.3.1Bb
Science Concept: scientists ask questions before they begin gathering information from texts and the natural world, and they benefit from working collaboratively in teams.	**Science TEKS** **2018–19:** 3.2A, 3.3C **2024–25:** 3.3B, 3.3C	**NGSS** 3-LS2-1, 3-LS4-4
Science and Literacy Connection: scientists use different ways to observe the world, including reading scientific texts, conducting investigations, and writing reports while working collaboratively with others in the cycle of inquiry.		

Unit Overview for the Teacher

ORGANIZATION

Throughout this unit, learners will be organized into inquiry circles and science investigation teams that reflect the roles of practicing scientists. By taking on the roles of scientists as they engage in text-based and hands-on investigations, and by learning to read, write, speak, and listen like scientists, children develop deeper science learning and science-specific disciplinary literacies.

DAILY SCHEDULE

The sequence of instruction for the unit will be as follows (you may space the three components throughout the day in the way that best fits your usual schedule):

- mini-lesson on science-specific disciplinary literacy
- science inquiry circles
- guided science investigation

SUPPORTING MATERIALS

The **"Lessons at a Glance"** document (in the "Before the Unit Begins" section) lists the materials needed for each day's lesson. Any additional supporting documents referenced in a lesson (including anchor charts and printable or downloadable files) can be found in the "Supporting Files" section for that day's lesson.

MINI-LESSON

Each day, the teacher will lead a mini-lesson on a science-based disciplinary literacy before the children work in their inquiry circles. The mini-lessons are taught as whole-class lessons in which the teacher models and explains a literacy strategy relevant for use with exploratory texts or media. Mini-lessons are organized around teaching children various literacy strategies associated with science and scientists. They are designed to help learners become more strategic in their reading through intentional instruction. **The strategies children learn in the mini-lessons are practiced with texts during the inquiry circles.**

Our goal in these lessons is to give you (the teacher) **suggested language** to use when teaching these strategies and a set of materials that will support you in explaining those strategies to children. **We have not scripted the lessons for you.** Rather, we hope you take these suggestions as the starting points for working with children on constructing an understanding of what it is we do when we read and write like a scientist

SCIENCE INQUIRY CIRCLES

Throughout this unit, children will participate in inquiry circles—small teams that work together to investigate a topic. The exploratory texts and media learners will be using should guide them toward acquiring or building on information that leads to thinking about the topic and asking questions. You will recognize that the instructional model of inquiry circles is similar to that of literature circles in which learners build skills and develop strategies in reading. Inquiry circles in this unit will focus on topics related to the theme of the science investigation.

Each inquiry circle of learners will select a North American ecosystem to investigate throughout the unit, using exploratory texts. A list of suggested ecosystems (aquatic polar, desert, tundra, ocean, temperate forest, and grassland) and text resources are provided for you on the unit website. **Please be sure to gather or obtain access to these resources prior to beginning the unit**. You, the teacher, will model (using a pond ecosystem) inquiry and literacy practices for learners, who will work together to collect data about the ecosystem they select.

When creating inquiry circles, **we suggest no more than four children per team,** although the number of inquiry circles you have will depend on the size of your class and other considerations. Team roles (see below) will guide children's work in their inquiry circles, which will be based on the ecosystem they select (e.g., an inquiry circle investigating a desert).

SCIENCE LANGUAGE

The strategies related to science-specific reading and writing in the mini-lessons and inquiry circles enable deep science learning. Rather than simply memorizing *vocabulary words* without true understanding of their relationship to their scientific work, children develop fluency with the language of science **in context,** both in text-based inquiry and scientific inquiry. We encourage you to model using this language in context often to enhance children's learning.

We have provided science language picture cards suitable for building reference-word walls for children. **The teacher will need to print color copies of the picture cards before Day 1. Each day's science language is listed near the end of the lesson. The science language picture cards and a list of all the science language used can be found in the "Before the Unit Begins" section.**

GUIDED SCIENCE INVESTIGATIONS

Science investigations are teacher-facilitated science explorations, with children working in collaborative teams. Team roles will also guide children's work in their science investigation teams. You may choose to rotate team roles in any way that works for your class.

In this unit, learners will conduct investigations on a mystery "green substance" as they discover how organisms rely on the living and nonliving components in their environment, how producers and consumers interact in ecosystems, how energy is transferred through food chains, and how a change in one part of an ecosystem affects all the other parts.

Background information relevant to each day's lesson is included for the teacher. The information provided is not intended for the children, as it may contain terminology or concepts above their grade level. Rather, it is intended to enhance the teacher's understanding of the daily topic or concept.

TEAM ROLES

Typically, science teams have a leader, called the Lead Scientist, and various other scientific roles, such as Lab Director, Data Scientist, and Equipment Director. To provide variety, learners should rotate positions in different activities, allowing each learner to try each role.

The "Team Roles" anchor chart PDF in the Day 1 folder contains four 8.5" x 11" reproducible anchor charts that you will review with your learners and display as a reference.

You may use a variety of methods when assigning team roles or allow learners to choose their roles. Team roles will be the same for science investigations and inquiry circle time each day, with the opportunity to switch roles daily or throughout the unit. Team roles are given below (**be sure to form the teams or allow learners to form the teams during today's mini-lesson)**:

Lead Scientist

- Asks the questions.
- Guides the work of the team by reading directions.
- Keeps the team focused on the investigation and text-based inquiry.
- Checks the work.

Lab Director

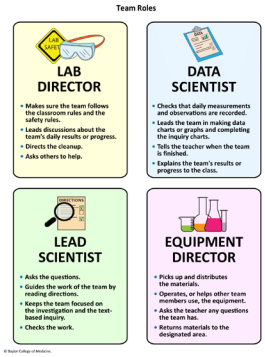
- Makes sure the team follows the classroom rules and the safety rules.
- Leads the discussion about the daily results and progress.
- Directs the cleanup.
- Asks others to help.

Data Scientist

- Checks that daily measurements and observations are recorded.
- Leads the team in making data charts or graphs and completing the Inquiry Charts.
- Tells the teacher when the team is finished.
- Explains the team's results or progress to the class.

Equipment Director

- Picks up and distributes the materials.
- Operates, or helps other team members operate, the equipment.
- Asks the teacher any questions the team has.
- Returns materials to the designated area.



Mini-Lesson (15 minutes)

OVERVIEW

Teacher instructions are provided for each day's mini-lesson. These instructions consist of **declarative knowledge** (statement of what children will do or learn), **conditional knowledge** (context or background related to what children will learn), and **procedural knowledge** (explicit instruction and practice).

Today's mini-lesson will simply explain what the children will be doing throughout the unit. **The teacher will need to print out and post the "Inquiry Toolbox" and "Team Roles" anchor charts to use in the discussion!**

MATERIALS

Teacher needs:

- chart paper
- marker(s)
- "Team Roles" anchor chart
- "Inquiry Toolbox" anchor 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.

EXPLAIN THE STRATEGY

Tell what the strategy is (declarative knowledge)

1. *Today, we will start a new unit in which we all will become scientists! We will be using exploratory texts to help us learn more about North American ecosystems. An ecosystem describes a group of organisms that live and interact with each other and the nonliving environment which includes things such as sunlight, air, water, weather, and rocks.*
2. *You will work together with a team in an inquiry circle to investigate one particular ecosystem that will help you understand more about producers and consumers that live there and the relationship between them. In your inquiry circles, you will explore texts (e.g., books and web pages) to find out more about your ecosystem.*
3. *The text-based inquiry you will experience as you learn more about your ecosystem involves asking questions and gathering information to answer questions. During inquiry circles, you can ask each other questions, discuss information you collected together, and think about other questions you might have about your ecosystem. In some ways, this is like the inquiry you experience in a science investigation. We have an inquiry toolbox that will help you in your work.* (Point to the "Inquiry Toolbox" anchor chart and **read aloud to the class**.)

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

1. *When we investigate our ecosystems, we will practice our roles as scientists. We will do this because scientists use different ways to observe the world, including reading scientific texts, writing reports, and conducting investigations. You will take on the role of a scientist conducting inquiry 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). There is no better way to learn about science than to become a scientist!*

Tell how to use the strategy (procedural knowledge)

1. *While in inquiry circles, you will take on different scientific roles within your team. Typically, science teams have a leader, called the Lead Scientist, and various other positions, such as Lab Director, Data Scientist, and Equipment Director. These roles are the same as the roles you will have during the science investigations.* **(Point out and read each job description on the "Team Roles" anchor chart.** At this point the teacher can assign roles or allow children to choose their roles, reminding them that they will have the opportunity to assume different roles later.)

2. *Every day we will have a mini-lesson that helps us know how to read like a scientist and record our information like a scientist. We will talk more about that tomorrow.*

Science Inquiry Circles (30 minutes)

OVERVIEW

During the first day of inquiry circles, teams pick an ecosystem (aquatic polar, desert, tundra, ocean, temperate forest, or grassland) to investigate. Teams will explore nonfiction texts about each to get them interested in the topic. (**Remember to have exploratory texts ready ahead of time. An "Ecosystem Resources" spreadsheet is available in the "Before the Unit Begins" section. You may choose to use the EPIC eBooks if the print texts are not available to you.)**

If you feel your learners may have difficulty reading the texts independently, you may choose to read the texts aloud to your learners prior to starting this unit. That option still allows the opportunity for learners to become interested when deciding which ecosystem to investigate.

MATERIALS

Each team needs:

- list of North American ecosystems
- exploratory texts (see the "Ecosystem Resources" spreadsheet for ideas)

Teacher needs:

- list of North American ecosystems
- "Ecosystem Resources" spreadsheet

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. *Today, we will begin working with our inquiry circles. Each team will pick an ecosystem to explore together. You may choose from several different ecosystems: aquatic polar, desert, tundra, ocean, temperate forest, or grassland. No matter which ecosystem you choose, you will explore what the environment is like and which organisms live there, and learn about producers and consumers that form important food chains in those ecosystems.*
2. *Before you decide which ecosystem to explore, you will have the opportunity to read some exploratory texts to see what interests your team the most.* (Be sure to have the books available. You may have the Equipment Director choose books for the team to read or you may distribute the books. You may also project images of the different ecosystem for the learners to see.)

During Inquiry Circles (20 minutes)

1. *Now that each team has some texts to explore, you need to decide how to read them together. You may want to take turns by paragraph or page, but decide before you start.* (You may decide if you want your learners to read the text closely or to browse the text and read only certain

sections. Encourage learners to look at the texts to spark conversations about what they discover. What do they see in the pictures? What questions do they have?)

2. *While each team is exploring the texts, I will be walking around to assist you as needed.* (Allow the class time to explore while you facilitate when necessary. Rotate the texts so that each team has a chance to explore a book about each of the ecosystems. If you are using the EPIC eBooks, you may want to set a timer and direct learners when to switch to the next book.)
3. *When all teams are finished exploring the texts, you will work together to briefly summarize what you read and decide which ecosystem you want to investigate. Rank them from favorite (1) to least favorite (4). The Data Scientist should be ready to share with the class.*

After Inquiry Circles (10 minutes)

1. *The Data Scientist from each team will share with the class anything interesting the team discovered today. What grabbed the team's attention?* (Be sure all members of the team assist the Data Scientist so that he/she is prepared to speak. Allow time for all inquiry circle teams to share.)
2. *I will assign the ecosystems for exploration tomorrow.* (Each team will investigate a different ecosystem. You will need to assign all teams their ecosystems by the next lesson.)

Guided Science Investigation (30–45 minutes)

OVERVIEW

Today learners will work as a team to recreate a 3D model seen only in part and from different perspectives.

GUIDING QUESTIONS

Why do scientists work in teams? What is the value of teamwork?

BACKGROUND INFORMATION FOR THE TEACHER

Over the course of the next three weeks, learners will plan and conduct investigations as members of scientific research teams. Working within assigned roles, they will each contribute to the overall team process of scientific inquiry. Developing an understanding of how scientists work collaboratively toward a shared goal enhances their understanding of the nature and methods of science.

For example, an oceanographic research expedition may include scientists who focus on different aspects of the ocean, such as the chemistry, plankton physiology, historical evidence from sediment cores, or microbial ecology. These different perspectives help scientists put together the big picture of what is happening in the part of the ocean they are studying.

Learner roles are the same as those used in the inquiry circles. To provide variety for learners, the positions can be rotated, allowing each learner to try each job. In practice, **members of each team will participate in all the tasks the team performs** during the investigation.

MATERIALS

Each team needs:

- enough air-dry clay to create a small model
- access to the shoebox with diatom model inside

Teacher needs:

- prepared shoebox with diatom model inside
- an object with 3 dimensions to model with

SETUP

- The teacher will have already created a 3D model of a diatom (see instructions in the **"Before the Unit Begins"** document).
- Before the first class, place the diatom model into the box and secure the box with tape so that it cannot be opened.
- Place the shoebox in a central location where all teams can access for viewing.

PROCEDURE

Engage

1. Ask, *What do you think of when you hear the word "teamwork"?* Learners may offer ideas and examples; accept all responses.
2. When all responses have been considered, ask, *What was a common factor in your responses?* (Teamwork involves **more than one person** working together to accomplish a goal or task.)
3. Tell the class that today they will work together in teams to complete a task. Teams will be the same as those during inquiry circle time.

Explore

1. Bring out the shoebox and place it in a central location where all can see it. *Notice that this box has windows on different sides. Inside of the box is a clay model.* **Do not reveal what the model is.**
2. *Your task will be to recreate the 3D clay model that is in the box. Can anyone describe what a 3D object is?* Accept responses.
3. Using a preselected object to model with, explain that a 3D object or shape has three dimensions. Point to and identify the length, width, and height of the object you are modeling with.
4. As you turn the 3D object, describe how the object looks different when seen from different perspectives. Alternatively, you may give each learner a 3D object to explore.
5. Using the shoebox, explain that each team member has 3 seconds to pick a different window to look through to see what the model looks like. Remind learners that the 3D clay model in the box will look different from different perspectives. Use a timer or count as each team member peeks through a window.
6. Say, *After you look through a window, go back to your table and construct the part you saw, using the small package of clay. You can discuss what you saw with your team as you work.*

7. Explain that when all the parts are complete, they will attach them together to attempt to form the model inside the box!
8. Let them know that they will have 10–15 minutes to complete the task.
9. Distribute the clay and begin allowing team members to look into the box. Depending on the size of the class, you may have two learners from different teams looking into different windows at the same time (or make two models).
10. Let learners know that you will be monitoring the time and observations.

Explain

1. When time is up, have teams stop constructing, regardless of their progress.
2. Allow each team to share their model and explain what their strategy was for constructing it. As they share, ask learners to reflect on the activity. *Did you have a plan for observing and constructing the object? What was the most difficult part? How did you work as a team to help each other? What do you think the object in the box is?*
3. Ask learners to explain why they think scientists work in teams. (Each one brings his or her own strengths or knowledge to the team; they can work together to answer complex questions; they can divide up the work among them; they can put their findings together to make sense of their investigations and data collected.)
4. Share, *Successfully completing the model was not the intended goal. Think, what was this challenge really about?* Accept all responses. Explain that the challenge was about "collaboration"—working together, learning from each other, and communicating with each other. Add that these are important skills they will be using throughout this unit.
5. If time permits, teams can help each other finish uncompleted constructions before the structure inside the box is revealed.
6. When all models have been shared and the construction completed, you may open the box and reveal the model inside! **If learners want to know what it is, explain that it will be identified in a later lesson.**
7. Tell them that the only clue you can offer them is that the actual size of the object in the box is MUCH smaller than the model.

Elaborate

1. Ask learners to think about how this teamwork activity can be applied to scientists working as a team to plan investigations.
2. Explain that scientists often collaborate with each other to share the results of their research and investigations to put the pieces of a bigger picture together.
3. Each member of a scientific team organizes their information to make connections to the work of others, maximizing the effectiveness of their research and investigations.

Evaluate

1. Did learners develop and use special strategies within the team?
2. Was everyone included in the planning?
3. Did learners demonstrate the ability to work cooperatively?
4. Did they communicate an understanding of why scientists work in teams?
5. Some teams may not work well together, and guidance or adjustments may become necessary.

6. Remember that the focus of this challenge is for learners to work as a team to solve a problem together. The process of planning and sharing their strategies is more important than constructing the object!

Science Language

- A **team,** or **teamwork, i**s a group of people who work together to accomplish a goal or task.
- **Collaboration** occurs when two or more people work together, learn from each other, and communicate with each other.
- A **scientist** is a person who is an expert in or who studies aspects of the natural or physical world.
- **Organisms are** living things that carry out the activities needed to live, grow, and survive.
- An **ecosystem** is a community of organisms that live and interact with each other and their nonliving environment.

Expanded Standards

Reading TEKS

ELA.3.13: 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.

CCSS

SL.3.1b: follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

NGSS

3-LS2-1: Science & Engineering Practices: Construct an argument with evidence, data, and/or a model; **3-LS4-4:** Crosscutting Concepts**:** A system can be described in terms of its components and their interactions.

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. **3.3C:** connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

2024–25: 3.3B: communicate explanations and solutions individually and collaboratively in a variety of settings and formats. **3.3C:** listen actively to others' explanations to identify relevant evidence and engage respectfully in scientific discussion.