ALL for Science™
Authentic Literacy and Language for Science

Baylor College of Medicine
CENTER FOR EDUCATIONAL OUTREACH

DAY 3: PLANNING AN INVESTIGATION

MINI-LESSON

Teacher introduces the "Reading for Specific Information" anchor chart and models the strategy for the class.

SCIENCE INQUIRY CIRCLES

Teams use a different resource to answer another inquiry question or add information to a question already answered.

GUIDED SCIENCE INVESTIGATIONS

Teams plan an investigation to observe how different amounts of rainfall may affect plants.

ABBREVIATED STANDARDS

- Reading TEKS: 4.13A, 4.13C
- CCSS: W.4.7
- NGSS: 3-LS3-2
- Science TEKS: 2018–19: 4.10B; 2024–25: 4.13B

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Day 3: Planning an Investigation

Literacy Strategy: Reading for specific information (reading to answer inquiry questions).

Science Concept: Inherited traits are passed down from parent to offspring. Acquired traits may be the result of environmental factors such as rainfall amounts, that effect inherited traits.

Science and Literacy Connection: Scientists do a lot of reading as they expand their knowledge about a topic they are investigating. Being able to quickly and efficiently find the specific information they need is important.

Mini-Lesson (15 minutes)

OVERVIEW

As a general rule, scientists engage in a lot of reading, including reports that others have written and articles about the topic they are studying. With this volume of reading comes the need to be able to locate and read for specific information in a way that is quick and efficient. Most of the time, scientists read with a purpose in mind: answering specific questions. Scientists know what they are looking for when they read, which helps them sift through lots of text to find the information they need to answer their inquiry question. Today, learners will practice reading to answer their specific inquiry questions.

Complex literacy strategies appropriate for upper elementary readers often include subroutines. Today's complex literacy strategy (*reading for specific information*) is made up of subroutines that learners may have learned or used before. For example, *skimming and scanning* is a subroutine included in *reading for specific information*. (If your learners need support with this subroutine, an optional sample mini-lesson on skimming and scanning can be found in the supporting files for Day 3.)

NOTE: You are encouraged to create the "Reading for Specific Information" 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)
- "Reading for Specific Information" anchor chart as a model

- informational text about plants in the Gulf Coast salt marsh to model the strategy (options below)

Model eBooks (on EPIC)	**Model Books**
A Wetland Habitat by Bobbie Kalman, Molly Aloian *Marshes and Swamps* by J.K. O'Sullivan	*Marshes and Swamps: A Wetland Web of Life* (Part of the Wonderful Water Biomes Series) by Philip Johansson *About Habitats: Wetlands* by Cathryn Sill (Author), John Sill (Illustrator)

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 learn a strategy that will help us locate information in texts related to our specific inquiry questions. That strategy is called "reading for specific information." Reading for specific information means that I think about what kind of information I need to answer my questions before I start reading. Then I skim and scan the text to locate useful information and skip over information that does not help me answer my question. Skimming and scanning means I quickly look across the text, searching for key words. When I find those keywords, I slow down and start reading more carefully.*
2. *Reading for specific information is a lot like shopping for cereal in the grocery store. My favorite cereal comes in an orange box. When I get to the cereal aisle, I already know one thing to look for—boxes that are orange. I don't read every name of every single box of cereal. Rather, I skim and scan across the boxes, looking for orange boxes. When I see an orange box, I stop and read the name of the cereal to be sure I have the right one.*

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

1. *This strategy is important to scientists (as readers) because they often have lots and lots of materials to read. They read these materials to see what other scientists have said about their topic and to find answers to some of the questions they are asking. Sometimes scientists use different words to talk about the same thing, so it is important to consider this while reading. As a reader, I know to use this strategy when I'm looking for specific answers to the questions on my Inquiry Chart. When I read just to answer my questions, I don't need to read every single word on every single page of a text. I can use this strategy with books or when reading online.*

Tell how to use the strategy (procedural knowledge)

1. *I first read the question I am trying to answer.*
2. *I make a note of key words related to my question that I expect to find in the text.*
3. *I then make a note of more keywords the author of the text might use. I ask myself, "What words are similar to my key words?"*

4. *Next, I skim and scan the text, looking for any of my key words. I don't read everything along the way, I just move my finger across the text, looking for those words. Sometimes the words appear in the pictures and captions or graphs, so I have to look at those too.*
5. *Once I find the key words, I then slow down and read, paying attention to whether the text answers my question or not.*
6. *If the text does answer my question, I jot notes on my Inquiry Chart. If it doesn't, I either continue skimming and scanning or get a different text.*

Model the strategy

1. *I know that one of my inquiry questions is, "What physical traits do plants in the Gulf Coast salt marsh have?"*
2. *I know that **traits** are sometimes called **characteristics**, **attributes**, **properties**, **structures,** and **parts**.*
3. *I can keep all of these keywords in mind (traits, characteristics, attributes, properties, structures, and parts) when I skim and scan the text. If I see one of these words or a word that seems similar to one of my key words, I slow down and start reading.*

You also might model the following:

- identifying a piece of information from one of the texts that helps answer an example research question (e.g., What physical traits do plants in the salt marsh have?)
- recording a piece of information on a model Inquiry Chart
- recording the title, author, publisher, and publication year of a source on a model Inquiry Chart

Science Inquiry Circles (30 minutes)

OVERVIEW

Scientists often work in teams when conducting inquiry and investigations. Today, learners will work in inquiry circles to investigate different questions about their ecosystems and the traits of plants that live there. Prior to starting the inquiry circle work, be sure to have texts and technology available for your learners. Remember, the "Ecosystem Resources" spreadsheet contains a list of suggested books and media—feel free to use other resources.

You may need to provide learners with specific instructions on how to access websites within your school district, or you may want to create a click sheet of approved websites for learners to be distributed through your learning management system (Google Classroom, Schoology, etc.). As the children begin investigating, you may have some teams working online while others are working with traditional texts. This will depend on your access to technology and texts.

MATERIALS

Each team needs:

- team Inquiry Chart
- pencils
- preselected informational texts/media

Teacher needs:

- "Ecosystemt Resources" spreadsheet for ideas

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. I will remind you which inquiry team you'll be working in.*
2. *You will be with the same team as yesterday, but we will rotate the science roles. Remember that each team member has a role or a job within a team.* (Assign roles at your discretion and have the Equipment Directors gather the Inquiry Chart for their teams).
3. *Yesterday you began generating questions to guide your inquiry. Before we begin our work today we will take a moment for the Lab Director from each team to share the questions we generated. As you listen to the Lab Directors, take note of any questions that are interesting to you.* (Invite Lab Directors to share their team's questions.)
4. *Take a few moments to look at the questions on your Inquiry Chart. If you came up with any new questions while you were working yesterday, now is a good time to add them. Also, if other teams had questions that interested you, you might borrow these questions for your own inquiry, although you might need to change the wording of a question to fit your ecosystem. Remember: Questions should be about your ecosystems and the traits of plants that live there. If your team develops a new question, add it to your Inquiry Chart as a new column.*
5. *Today you will start by choosing one question about your ecosystem and looking for answers to that question. As you look for answers, you will practice your roles as scientists. You will do this because scientists have a special way in which they look for answers. One way scientists look for answers is to do investigations. This means they look at text (in books and online) that might help them find information they can use.*
6. *Scientists also record their findings in an organized way. You will record your findings on your team Inquiry Chart. (*You may want to show or project a blank sample Inquiry Chart or your model Inquiry Chart.)

During Inquiry Circles (20 minutes)

1. *Today and for the next few days, you will investigate your ecosystem and the traits of plants that live there by using books, eBook, websites, and videos. I have provided a list to sources you can use.*
2. *We have anchor charts to help guide your thinking. Do not forget to use them while working.* (Refer to the "Inquiry Toolbox" anchor chart and the "Generating Inquiry Questions" anchor chart. Remind learners that they will practice each day's literacy mini-lesson during this inquiry circle time. Once you have taught several mini-lessons, they can use any of the reading strategies taught, not just the one for that day.)
3. *The Lead Scientist will guide the inquiry for the day by picking which question(s) will be answered. The Data Scientist will record all source information and the answers to your inquiry question on the Inquiry Chart.* (You may want to explicitly show learners which square to write in for their first question using their first resource.)
4. *Remember, it is important to record on your Inquiry Chart where you found the information (source). You will need to keep track of your sources carefully because you will create a list of your sources at the end of your inquiry.* (Point out to learners where sources are located on the Inquiry Chart and how one source may answer multiple questions. Remind learners to record

the title, author, publisher, and year of publication for all sources and to include the URL for websites and videos.)

5. *Everyone should help find the answers to the questions in texts and online. Remember to work as a team, helping each other listen for the answers to your question.* (Be sure to model for learners where to record their source and where to record answers to specific questions. Explicitly show them how the Inquiry Chart will organize their progress.)
6. *My role is to help guide the inquiry circles, but I expect you to work as a science team to solve your problems together.* (While teams are working, walk around the room to facilitate as needed.)

After Inquiry Circles (5 minutes)

1. *As we conclude our inquiry circles for today, each team will have a chance to share the information they found related to their questions, what they accomplished, and what literacy strategies they used. The Lab Director will lead the discussion about today's results. What has the team learned about its ecosystem and the traits of plants that live there? What problems did the team encounter? How did the team resolve those problems? Did the team use a reading strategy? Which one and how did it help? What new questions does the team have?* (After you have allowed the teams to gather their thoughts, have the Data Scientist share with the class. Try to encourage teams to share a variety of things—you do not want just facts about plants, just reading strategies, or just cooperative learning strategies.)
2. (After all learners have shared, thank them for their hard work, and point out any excellent behaviors that you observed. If you saw an outstanding example of using a reading strategy or collaborative work, explicitly point it out. If you notice any problems in the teams during the lessons, take a moment to 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 ongoing work so they can easily access them.)

Guided Science Investigation (30–45 minutes)

OVERVIEW

Learners plan an investigation to observe how different amounts of rainfall may affect plants.

GUIDING QUESTIONS

Where do plants get their water from? How does the amount of water a plant receives affect it?

BACKGROUND INFORMATION FOR THE TEACHER

Plants in the natural world get their water from precipitation (such as rainfall, snow, sleet or hail), soil water, runoff, and groundwater. The amount of water they receive depends on locale, seasonal variations or extreme weather events.

For this investigation we've chosen Wisconsin Fast Plants (*Brassica rapa), which* are members of the Brassicaceae family and closely related to turnips. Wisconsin Fast Plants have a fast growth rate, and learners will be able to see the necessary growth for their investigations within the short 5-day time period. Professor Emeritus Paul H. Williams at the University of Wisconsin-Madison is the plant pathologist who produced Wisconsin Fast Plants through selective breeding without using any genetic

engineering. Fast Plants were developed to be a model organism grown under indoor conditions for research and education; they are not likely to survive in the wild.

In this investigation, we're using authentic Texas rainfall data for the month of March (in Texas, March is a "typical" growing month for turnips) in 2003, 2013, and 2023 to observe how different amounts of rainfall over time impact plants.

The investigation will use hydroponic sponges instead of soil to allow learners to observe changes during seed germination easier. We've provided written instructions and a short video detailing how to set up the investigations (see the Day 4 lesson).

To determine the volume of water to use in the investigation, we multiplied the linear rainfall amount (inches) x the area (square inches) to get cubic inches. The hydroponic sponge squares are each 1 cubic inch. We then converted the cubic inches to milliliters. The table below shows the amounts of water to be added to the cups. **Please note that water is only added once at the beginning of the investigation**. **Also, if your learners have not used graduated cylinders before, you may want them to practice measuring water before they set up their investigations.**

Month/Year	Monthly Rainfall	Amount of Water to Add to Cups
March 2003	1.17"	19mL
March 2013	2.56"	42mL
March 2023	4.20"	69mL

MATERIALS

Each team member needs:

- science notebook
- pencil

Each team needs:

- copy of the "Investigation Data" page
- access to Setup Video

Teacher needs:

- a copy of the "Investigation Data" page
- access to "Planting the Seeds" video
- access to Texas A&M Monthly Rainfall History webpage (https://etweather.tamu.edu/monthly-rainfall-1968-2021/)
- 3 hydroponic sponges (each measuring 1-in^3)
- clear solo cups
- Wisconsin Fast Plant seeds
- 1 graduated cylinder
- 1 plastic measuring cup
- water
- sticky notes
- Trait Cards

SETUP

- Make copies of the “Investigation Data” page (1 per team).
- Arrange 1 tray of materials for modeling how the investigation will be set up, 3 hydroponic sponges (each measuring 1-in^3), 3 clear solo cups, 1 graduated cylinder, 1 measuring cup, Fast Plant seeds, water, sticky note).
- Be prepared to project/share both the "Planting the Seeds” video and the Texas A&M Monthly Rainfall History webpage.

SAFETY

There are no safety concerns today.

DAILY OBSERVATIONS

There are no observations made today.

PROCEDURE

Engage

1. Hold up or project **Trait Cards 1, 3, 4, and 7**. Remind teams that in the previous class they learned that acquired traits in plants can be caused by environmental conditions or external factors. These conditions or factors can be the result of natural occurrences such as weather events or intentional acts such as insect, animal, or human activity.
2. *What do we already know about what plants need to survive?* Accept responses and list on whiteboard. (Responses should include water, air, and the “just right” temperature. They can also include space to grow.)
3. Children may also include *light* as a need for making food; explain that while that is correct for some plants, not all plants require light.)
4. Hold up or project **Trait Card 4** (dried plant leaves) and review some of the ideas learners had about what may have caused this change in the plant. If not mentioned, remind them that one possibility was that the plant got too much or not enough water. Add that there may be other causes, such as temperature changes (too hot or too cold).
5. Ask, *Where do plants in the natural world get water from?* Accept responses. Share that plants (and animals) get their water from precipitation such as rainfall, snow, sleet, and hail, and also from soil water, runoff and groundwater.
6. Announce that today they will plan an investigation that focuses on the response of a plant seed to the amount of water it receives. Explain that the question of how this environmental factor (water in the form of rainfall) may affect the inherited traits of a plant is a testable question.
7. Explain that a testable question is one that is connected to a specific science concept (in this case how the amount of rainfall affects seeds) and is testable through a science investigation.

Explore/Explain

1. *But first, I will show you the seeds you will be using*. Pour several seeds into the palm of your hand and walk around to show learners the tiny size of the seeds. Inform them that the seeds are from plants called Wisconsin Fast Plants. These Fast Plants are used in research and in education because they have a very short growth period. This is important because the unit they are working in is only 10 days long, and they need results quickly.
2. Disclose that the amount of water they will use was calculated using actual annual rainfall amounts for the month of March in Texas. Project the image of the Texas A&M monthly rainfall history: https://etweather.tamu.edu/monthly-rainfall-1968-2021/

3. Point out that the data represent monthly averages all the way back to 1968. We are using the data for the month of March because it is a typical growing month for turnips, which are a close relative of the Fast Plants.
4. Add that the amounts of water used in their investigations reflect annual monthly rainfall for 2003, 2013, and 2023. These 10-year time periods were chosen to give us an idea of how different amounts of rainfall over time might affect plants.
5. The three different amounts of water represent the only variable learners will change—everything else will remain the same. Remind them that a variable is a factor or condition that can change in an experiment or investigation.
6. Tell the class you will share the "Planting the Seeds" video to demonstrate how they will set up their investigations**.**
7. Caution them to pay close attention to the instructions in the video so they won't lose any of the tiny seeds.
8. Project the video, stopping as needed to emphasize points. After the video, let them know you will also provide them with written instructions to follow tomorrow, and you will be available to help as needed. Ask if there are any questions about the set up. **(**T**he teacher may also choose to run the video in the next class as the children set up their investigations, allowing them to follow along.**)
9. Ask the Equipment Directors to collect 1 "Investigation Data" page for their team. Tell the class that they will observe their seeds for 5 days and will use the "Investigation Data" page to record in words and drawings what they see.
10. Let them know you will set up a designated place for them to set their investigations under a light source.
11. As time permits, ask them to begin planning what each team member will do when they set up their investigations and when they conduct and record daily observations.

Elaborate

1. Remind the children that inherited traits are passed down from parent to offspring. They should expect to see similar traits in their seedlings since all the seeds are Wisconsin Fast Plants.
2. Ask them to consider how their different rainfall amounts might affect the plants, then turn and share their ideas with a partner on their team.

Evaluate

1. Do learners communicate a basic understanding of how to setup their investigations?
2. Were questions raised and addressed for clarification?

Science Language

- A **trait** is physical attribute of an organism such as eye color, feathers, or the shape of leaves. Traits can be inherited or acquired.
- **Inherited traits** are passed down from parent to offspring.
- **Acquired traits** are not passed down but are the result of environmental or external factors.
- A **testable question** is connected to a specific science concept and can be answered through an investigation or experiment.
- A scientific **variable** is something (a factor or condition) that can change or potentially change in a scientific investigation.

Expanded Standards

Reading TEKS

4.13A: Generate and clarify questions on a topic for formal and informal inquiry. **4.13C:** Identify and gather relevant information from a variety of sources.

CCSS

W.4.7: Conduct short research projects that build knowledge through investigation of different aspects of a topic.

NGSS

3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment**.**

Science TEKS

2018–19: 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: 4.13B: Differentiate between inherited and acquired physical traits of organisms.