Day 01 We Are Paleobotanists!			
Literacy Strategy: learning to think, read, write, and speak like a scientist.		**Science Concept:** scientists ask questions based on observations before they begin gathering information from texts and the natural world, and they benefit from working in teams to find answers.	
Reading TEKS: 3.13	**CCSS:** SL.3.1b	**NGSS**: 3-LS4 -1	**Science TEKS:** 3(b)(1)(A), 3(b)(3)(C)
Materials for Mini-lesson on Science-Based Disciplinary Literacies (referred to as Mini-lesson): prepared selection of portal texts from website, Team Roles anchor chart, Inquiry Toolbox anchor chart.			
Materials for Science Inquiry Circles: Plant Images for Inquiry Circles PPT (printed or projected) and a variety of nonfiction texts. (Go to project website for suggestions.)			
Materials for Guided Science Investigation: see instructions beginning on page 6. **NOTE: Teachers will need to make "fossils" (fossil models) ahead of time for use on Day 1. Instructions for how to make them are found in the Before the Unit Begins folder.**			
Content Vocabulary: **Observation**—the action or process of looking at something or someone carefully to gather information. **Scientist**—person who is an expert in, or who studies aspects (parts) of, the natural or physical world. **Team**—group of people who work together to accomplish a goal. **Teamwork**—a collaborative effort by more than one person to accomplish a goal or complete a task in the most effective or efficient way (team members usually have assigned roles and responsibilities). **Collaboration**—two or more people working together to accomplish a goal or task. **Organisms**—living things that are able to carry on the functions (actions) needed to live, grow, and survive. **Fossil**—the preserved remains or traces of organisms found in the layers of the earth. **Paleontology**—the branch of science that studies life on Earth based on plant and animal fossils. **Paleontologists**—scientists who study fossils to learn about different aspects of extinct and living organisms. **Paleobotany**—the study of the fossils of ancient plants. **Paleobotanists**—scientists who specialize in studying fossil plants and ancient vegetation.			
Science and Literacy Connection: scientists use different ways to observe the world, including reading scientific texts, conducting investigations, writing reports, and working collaboratively with others in the cycle of inquiry.			

Unit Overview for the Teacher

ORGANIZATION

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

DAILY SCHEDULE

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

- mini-lesson on science-specific disciplinary literacies (referred to as mini-lesson)
- science inquiry circles
- guided science investigation

MINI-LESSON

Each day the teacher will lead a mini-lesson on science-based disciplinary literacies before the children work in their inquiry circles. The mini-lesson is designed to help children become more strategic in their reading through intentional instruction. Suggested wording and teacher actions will be provided for each day's mini lesson.

SCIENCE INQUIRY CIRCLES

Throughout this unit, children will participate in inquiry circles (small teams that work together to investigate a topic). The informational 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 will select one of four plant groups to investigate: mosses, ferns, conifers, and flowering plants. These groups are intended to be representative examples of the much broader groups of plants (nonvascular plants, vascular plants, gymnosperms, and angiosperms) that have existed on Earth. We selected these subgroups to highlight examples that children are likely to have encountered in their lives. For example, conifers are a large subgroup of gymnosperms that are common in South Texas and across the United States. Although we have selected groups rather than specific species of plants, children will still encounter a lot of diversity within the group they are learning about. To deal with this diversity, the children can record findings about their plant group as a whole (e.g., conifers produce cones) as well as findings about a specific species in their plant group (e.g., some conifers, including Loblolly pines, have scaly bark). The exception to this is the "flowering plants" group, which includes all angiosperms. This choice of terminology was to ensure access to appropriate texts. A list of informational text and media resources titled Plant Resources is available in the Day 1 folder. **Please be sure to have texts and media resources prepared prior to beginning the unit**. Learners will need ready access to these resources when they begin their investigations in their inquiry circles.

You, the teacher, will model inquiry and literacy practices for learners, who will work together to collect data about the plant group they select to investigate.

When creating inquiry circles, **we suggest no more than four children per group,** 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 plant group they select (e.g., an inquiry circle investigating ferns). As children in the inquiry circles gain expertise in their chosen plant group, they will serve as "experts" of this plant group when the science investigation teams (see below) are formed.

GUIDED SCIENCE INVESTIGATIONS

Guided science investigations are teacher-facilitated science explorations, with children working in collaborative teams. For the science investigation on Day 1 of this unit, you can group teams in any way that suits your classroom needs. After Day 1, children will work in jigsaw teams (each group containing a representative or "expert" from each of the four plant groups). 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; however, it is important that the experts serve as Lead Scientist on the day their plant is being investigated. For example, the fern expert in each team should be the Lead Scientist on the day the science investigation teams investigate ferns.

In this unit, children will investigate different groups of plants, their adaptations to environments, and plant fossils.

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.

These roles are outlined on four separate 8.5" x 11" reproducible anchor charts that you will review with your learners and display as a reference. Additionally, the smaller role cards can be worn as badges on lanyards and may be used on a class chart to easily change out roles for the day or.

You may use a variety of methods when assigning team roles or allow the learners to choose their role. 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.

Be sure to form the teams (or enable learners to form the teams) during today's mini-lesson.

Team roles are given below:

Lead Scientist

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

Lab Director

- Makes sure the team follows the classroom and 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 team in making data charts or graphs and completing the inquiry charts.
- Tells the teacher when the team is finished.
- Explains the team 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 the materials to designated area.

Mini-lesson—15 minutes

PROCEDURE

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 **practical 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!**

NOTE: each statement in quotation marks below contains suggested wording the teacher may choose to use for the lesson; teacher actions are in parentheses.

EXPLAIN THE STRATEGY:

Tell what the strategy is (declarative knowledge)

- "Today, you will learn about paleobotanists excavating fossils to learn about what plants looked like across time and where different types of plants can be found. Throughout our unit you will learn more about the different groups of plants that have existed (and still exist) on Earth and the relationship between plants and the environments in which they live. Paleobotanists can learn a lot by studying fossils but they can also learn from texts written by other scientists."
- "You will work together with a team in an inquiry circle to investigate one particular group of plants that will help you understand more about the relationship between plants and the environments they live in. In your inquiry circles, you will explore texts (e.g., books and web pages) to find out more about your plant group. During inquiry circles, you can ask questions, discuss information you collected, and think about other questions you might have about your plant group. The text-based inquiry you will experience as you learn more about your group of plants involves asking questions and gathering information to answer questions. 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)

- "When we investigate our plant groups, 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 employ the strategy (procedural knowledge)

- "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 of the roles on the Team Roles anchor chart. At this point teacher can assign roles or allow children to choose their roles, reminding them that they will have the opportunity to assume different roles later.)

Practice in text (print, video, or interview)

Post the Team Roles and Inquiry Toolbox anchor charts in your classroom so children can refer to them while in their inquiry circles. Encourage student scientists to use them while in their inquiry circles.

Science Inquiry Circles—30 minutes

OVERVIEW

During the first day of inquiry circles, teams pick a plant group (mosses, ferns, conifers, or flowering plants) to investigate. Teams will explore texts about each plant group. These portal texts are meant to grab the attention of learners and get them interested in the topic. (**Remember to have portal texts ready ahead of time. A list of suggested texts and websites is available in the Plant Resources document in the Day 1 folder. 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 portal texts independently, you may choose to read the portal texts aloud to your learners prior to starting this unit. That option still allows the opportunity for learners to become interested when deciding which plant group to investigate.

PROCEDURE

Each statement in quotation marks below contains suggested wording the teacher may choose to use for the lessen; teacher actions are in parentheses.

Before Inquiry Circles

1. "In your inquiry circles, you will become experts on the plant group of your choice. Your expertise will be needed to lead other members of your class in an investigation of a representative plant that can be classified in your chosen group. Since it is not possible to observe all of the members of a large group of plants firsthand, scientists must turn to text resources to expand their knowledge. As a scientist, you will also explore texts (e.g., books, web pages) to answer your questions about a plant group and build your expertise."
2. "Today during our inquiry circles, teams will pick a plant group to investigate together."
3. "You can choose from four groups of plants: mosses, ferns, conifers, and flowering plants. No matter which plant group you choose, you will investigate that particular plant group's life cycle, habitat, structures and adaptations, and how it is classified." Before you decide which plant group

to investigate, you will have the opportunity to read some portal texts to see what may interest your group the most." (Be sure to have the books available to display. You may have the Equipment Director choose a book for the team or you may distribute the books. You may also want to project images of mosses, ferns, conifers, and flowering plants for the learners to see. The Plant Images for Inquiry Circles document in the Day 1 folder is provided for this purpose.)

During Inquiry Circles—20 minutes

4. "Now that each group has the first portal text, you need to decide how to read it 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 browse the text and read only certain sections.)
5. "While you are reading, I will be walking around to assist you as needed." (Allow the class time to read while you facilitate when necessary.)
6. (Rotate the texts so that each group had a chance to explore a book about each of the plant groups. If you are using the EPIC ebooks, you may want to set a timer and let learners know when it is time to switch to the next book.)
7. "When all inquiry circles teams are finished reading the portal texts, you will work together to briefly summarize what you read and make a decision about which plant group you want to learn more about. The Data Scientist should be ready to share this decision with the class."
8. (After learning about each plant group from the portal text, each team will discuss them together and make a list of which plant groups they would like to investigate, ranking them from favorite [1] to least favorite [4].)

After Inquiry Circles—10 minutes

9. "The Data Scientist from each inquiry circle will now share your team's top plant-group choices with the class." (Allow time for all inquiry circles to share.)
10. "I will assign all plant groups for investigation tomorrow." (Each team will investigate a different plant group. You will need to assign each team its plant group by the next lesson.)

Guided Science Investigation—30 to 45 minutes

OVERVIEW

In this lesson, children are introduced to fossils and the scientists who study them. As teams of paleobotanists, they observe the surface of a simulated fossil "dig" and then make a plan for excavation. It is important throughout this unit to reiterate the importance of teamwork in science.

GUIDED QUESTIONS

What are paleobotanists? How do paleobotanists work in teams to plan an excavation?

BACKGROUND INFORMATION

Over the course of the next three weeks, children will plan and conduct investigations as members of science investigation 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 also enhances their understanding of the nature and methods of science.

The team roles used during the science investigations are the same roles as those used in the inquiry circles. To provide variety for children, the positions can be rotated, allowing each team member to try each team role.

In practice, members of each science team will participate in all tasks the team performs during the investigation. For example, making observations, recording information, etc.

MATERIALS

Each team member will need:

- science notebook
- 4 different-colored straws (a different color for each team member)
- 1 sheet of 11" x 14" copy paper
- 4 ft. of masking tape
- 1 premade fossil site in an aluminum pan (see Teacher Fossil-Dig Instructions in the Day 1 folder)

Teacher will need:

- Taped Dig image in the Day 1 folder
- Paper-Folding video clip in the Day 1 folder
- 1 sheet of 11" x 14" copy paper
- 1 straw
- 1 marker pen

SETUP

- **Before Day 1,** make a fossil-dig site inside an aluminum tray for each group of students. The tray will contain soil and buried fragments of a plaster cast of a leaf. See Teacher Fossil-Dig Instructions in the Day 1 folder.
- For each team, prepare a bag of materials that includes 1 sheet of 11" x 14" copy paper, 4 different-colored straws, and 4 ft. of tape.
- Place the premade fossil digs and the bags of materials in a central location for distribution.

DAILY OBSERVATIONS

Team members will observe the surface of the fossil "digs."

PROCEDURE

Engage

1. Ask, *What do you think of when you hear the word fossil?* Accept all responses (children will likely refer to dinosaurs or similar animals). After children share their ideas, explain that dinosaurs and prehistoric animals usually come to mind first when people think of fossils. But, while dinosaurs or similar animals may be the most well-known examples of fossils, both plants and animals are important in helping us understand what Earth's environments were like millions and even billions of years ago!
2. Explain that the word "fossil" comes from the Latin *fossus,* which means "having been dug up." Excavation sites where scientists look for fossils are referred to as "digs" because they are literally digging (excavating) for fossils!
3. Add that scientists who study fossils and the history of life on Earth are called paleontologists and that within that group, scientists who specialize in fossil plants and ancient vegetation are called paleobotanists.

4. Announce to the class that beginning today, they will become paleobotanists!
5. Tell the class their first task as paleobotanists will be to work in teams to explore the surface of a simulated excavation site, a "dig." Then, like scientists, they will make a plan for digging based on their observations.
6. Clarify that the team roles they will use during the science investigation today are the same roles they used during the science inquiry circles. However, remind them that the assigned team roles can rotate from day to day.

Explore

7. As you, the teacher, bring out the first prepared fossil "dig," ask, *What do you think is buried in here?* Accept and discuss all responses.
8. Explain that each team will have their own "dig" model to examine. Caution the children not to touch nor disturb the contents of the pan. **Explain that today is only for observing and planning—the actual digging will be done tomorrow!**
9. Distribute one prepared pan to each team of four children.
10. Instruct the class to observe the surface of the "dig" carefully. Ask, *How would you describe what it looks like (color, type of soil)? What interesting features do you see (flat, hilly, etc.)?*
11. Ask students to write today's date on a page in their science notebooks and record any information about what they see on the surface. Add that they should include a quick sketch of what the surface looks like.
12. Then ask, *How will you decide where to begin to dig?* Accept responses. Share that scientists always make a plan for an investigation before they begin. They, too, will first make a plan based on their observations before digging!
13. Ask the Equipment Directors to collect one bag of materials for their team from the distribution area.
14. Tell the class that the first thing they will do is divide the dig site into a grid of equal parts. Using the Taped Dig image in the Day 1 folder, show them how to place the tape on the edge of the pan (not directly on the surface).
15. After the pan is taped, explain that they will now make a paper grid map to record excavation information.
16. Demonstrate this using a sheet of the copy paper (alternatively, the teacher may use the Paper-Folding video clip in the Day 1 folder): take the sheet of copy paper and fold it in half vertically (hot dog–style) to make three equal parts, then fold it in half (hamburger style).
17. Open the paper to show a grid of six equal parts.
18. Then, each team member will choose a part of the grid they want to excavate. Remind them that they are working as a team and will share whatever they find with the others.
19. Once they have chosen their dig sites, tell the team members that they will each get a chance to "probe" a part of their grid. Ask, *Why do you think it's necessary to probe the soil first?* (Answers will vary but may include finding something "hard" under the soil, like a fossil!)
20. The teacher will model how to insert the straw straight in and out of the soil without digging.
21. Instruct each team member to probe two different places within their grid area to decide which one they will dig tomorrow. They will mark their dig site by leaving their colored straw inserted in the place they choose.
22. Then, each team member will mark their dig site on the paper grid map and label it with their name.

23. After you have reviewed the instructions, ask if there are any questions. Tell the class they have 15 minutes to complete their observations and exploration.
24. Let them know that you will be monitoring them and making observations while they work to ensure compliance and to observe how they work as a team.
25. Tell them you will give a 2-minute warning to ensure they have all marked their dig sites on the surface of the pan with a colored straw and have recorded it on the paper grid before time is up.

Explain

26. When time is up, allow each team to explain their discoveries. If needed, prompt them with questions such as *What observations did you make about the excavation site? Was there anything unusual? Was there anything familiar?* Accept all responses.
27. Ask for volunteers to describe their dig sites. Ask, *What made you choose those particular sites?*

Elaborate

28. Ask, *Who would like to share what it was like to work as a member of a team of paleo-botanists? Can you describe any examples of how you worked as a team to make your plan for digging up a fossil?*
29. Explain that working in teams just as real scientists do will be very important in the days to come as they each contribute to learning about plant fossils and what we can learn from them.

Evaluate

30. Did children develop or use special strategies to plan their "digs"?
31. Was everyone included in the planning or work?
32. Did they demonstrate the ability to work cooperatively? Note: some teams may not work well together and guidance or adjustments may become necessary.
33. Did children raise any questions about fossils or paleontology?
34. Did learners include new science vocabulary in their responses or explanations?

Expanded Standards
Reading TEKS: 3.13 Inquiry and research: listening, speaking, reading, writing, and thinking using multiple texts. The learner 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-LS4-1 Science & Engineering Practices: Construct an argument with evidence, data, and/or a model. Connections to the Nature of Science: Science is a human endeavor. Most scientists and engineers work in teams.
Science TEKS: 3(b)(1) Scientific investigation and reasoning: The learner conducts classroom and outdoor investigations following home and school safety procedures and environmentally appropriate practices. The learner is expected to (A) demonstrate safe practices as described in Texas Education Agency–approved safety standards during classroom and outdoor investigations using safety equipment as appropriate, including safety goggles or chemical splash goggles, as appropriate, and gloves. 3(b)(3) Scientific investigation and reasoning: The learner knows that information, critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The learner is expected to (C) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.