Day 09 What Are Angiosperms?			
Literacy Strategy: practice identifying the main idea by drawing conclusions; synthesizing information.		**Science Concept:** When the environment changes either suddenly or over time, some organisms that live in the environment may change and survive, and some may die. The development of flowers in plants was a key factor in successful reproduction that made angiosperms the dominant form of land plant.	
Reading TEKS: 3.6(C, F, G, & H) 3.9(D)(I)	**CCSS:** RI.3.2, SL 3.2, RI.3.9	**NGSS:** 3-LS2-1, 3-LS4-1, 3-LS4-3	**Science TEKS:** (3)(b)(2)(B) (3)(b)(3)(A) (3)(b)(10)(A)
Materials for Mini-lesson on Science-Based Disciplinary Literacies (referred to as Mini-lesson): chart paper, markers, sample inquiry chart.			
Materials for Inquiry Circles: team inquiry charts, pencils, variety of nonfiction texts for each group, access to websites and online books, access to anchor charts already introduced.			
Materials for Guided Science Investigation: see instructions beginning on page 3.			
Content Vocabulary: **Angiosperms**—a large and diverse group of vascular plants with roots, stems, leaves, and enclosed seeds; angiosperms produce flowers, seeds, and fruits and are called "flowering plants." **Cotyledon**—a seed leaf, or a leaf stored in a seed; cotyledons are the first leaves to sprout from a seed. **Gymnosperms**—a group of vascular seed plants that have uncovered seeds; gymnosperms have roots, stems, and leaves. **Specimen**—an organism, or part of an organism, used in scientific research or scientific investigations. **Evidence**—data collected from an investigation that can be used to support explanations and answers. **Data**—facts or information collected during an investigation (e.g., images, measurements, or words). **Extinction**—the dying out or disappearance of a particular species of plants or animals on Earth. **Species**—a classification of organisms that share characteristics and are alike in some manner			
Science and Literacy Connection: Scientists synthesize what they already know about a topic with new information that comes from observations and investigations.			

Mini-lesson—15 minutes

OVERVIEW

Today's mini-lesson should be used as a time to review and practice the reading strategies introduced over the past two days: extrapolating the main idea by drawing conclusions, and synthesizing. Teachers are encouraged to use this time to best meet the needs of their learners.

Teachers can determine if the mini-lesson will be facilitated with the whole class or a particular inquiry circle team that needs additional support. If you are working with a specific team, we suggest your other learners spend additional time working in inquiry circles.

You may want to return to the information in the mini-lessons from Days 7 and 8 with some or all of your teams.

Science Inquiry Circles—30 minutes

OVERVIEW

Scientists often work in teams when conducting inquiry and investigations. Today, students will work in inquiry circles teams to investigate different questions about plant groups.

Prior to starting the inquiry circle work, be sure to have texts and technology available for your learners. You have been provided with a list of suggested books and websites titled Plant Resources in the Day 9 folder. These are suggestions, and you may 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 in your learning management system (Google Classroom, Schoology, etc.). As teams begin working, you may have some groups working online while others are working with traditional texts. This will depend on your access to technology and texts.

PROCEDURE

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

Before Inquiry Circles

1. "It is time to get into our inquiry circle groups. You will be with the same team as yesterday, but we will rotate the scientific roles." (Assign roles at your discretion and have the equipment directors gather the inquiry chart for their team).
2. "You are already familiar with the inquiry chart and the inquiry questions. Today we will continue to look for answers to all of your questions."
3. "As you look for answers to your questions, you will practice your roles as scientists. You will do this because scientists have a special way of looking for answers. One way to look for answers is to do investigations. This means that they look at text (in books and on the computer) that might help them find information they can use."

During Inquiry Circles—20 minutes

4. "Today you will continue to investigate your plant group by using preselected websites on the computer (or tablet) and preselected texts." (The websites and texts are available in the Plant Resources document.)
5. "We have anchor charts to help guide your thinking. Do not forget to use them while working." (Refer to the anchor charts already introduced. Remind learners that each day they will practice the 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.)
6. "The Lead Scientist will guide all inquiries 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 questions on the inquiry chart. Remember, it is important to record on the inquiry chart where you found the information (source) so that you do not plagiarize." (Point out to learners where sources are located on the inquiry chart and how one source may answer various questions. Remind your learners to record the title and author for texts and the URL for websites.) "The Lab

Director and the Equipment Director must help find the answers to the questions online and in texts." (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.)

7. "My role is to help guide the inquiry circles, but I expect you to work as a scientific team to solve your problems together." (While teams are working together, walk around the room to facilitate as needed.)

After Inquiry Circles—10 minutes

1. "As we conclude our inquiry circles for today, each team will have a chance to share the questions they answered, what they accomplished, and what literacy strategies they used. The Lab Director will lead the discussion about today's results, and the Data Scientist will share your responses with the class. Discuss with your team, considering what you learned about your plant group. What problems did you encounter? How did you resolve those problems? Did you use a reading strategy? Which one, and how did it help you? What new questions do you have?" (After you have allowed the teams to gather their thoughts, have the Data Scientist share with the class.)
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 to 45 minutes

OVERVIEW

Today learners are introduced to angiosperms, the final group of plants to investigate. They will make observations on a live representative plant and use images of other plants from this group to compare.

GUIDING QUESTIONS

What are angiosperms? How are they different from gymnosperms?

BACKGROUND INFORMATION

About 135 million years ago, angiosperm pollen appears in the fossil record. However, exactly when flowering plants actually appeared on Earth is still a mystery. Scientists believe that angiosperms became widespread during the past 130 million years and have diversified into 300,000 species of flowering plants that can live in just about every habitat on Earth. There are species of flowering plants in tropical forests and other remote locations that have yet to be identified or named.

The word " angiosperm" comes from a Greek word meaning "hidden seeds"; this means their seeds are covered or enclosed. Angiosperms are divided into 2 major groups: monocots and dicots. All monocots and dicots are flowering plants, but not all of them have noticeable flowers. Examples of monocots include orchids, lilies, palms, grains, banana trees, and grasses. Examples of dicots include most trees that are not conifers, shrubs, and many food crops, such as cabbage, beans, and peaches. Angiosperms produce the majority of the crops needed for sustaining life and can be found in many commercial products.

The development of flowers in plants was a key factor in reproduction that allowed animals to aid in the dispersal of pollen and seeds produced in fruit. Successful reproduction has made angiosperms the dominant form of land plant.

The fossil record from approximately 146 million years ago to the present gives evidence of Earth's climate cooling down, warming up again, and several ice ages occurring. There are many species of plants and animals on Earth. New habitats appear. A mass extinction occurred 65 million years ago, and dinosaurs and other organisms died off from land and in the sea. Over the last 10,000 years the climate has been warmer and more stable. Today, temperatures on Earth appear to be going up, changing Earth's climate. Extinction of some species continues.

SAFETY

- Instruct children not to tear off or cut any part of the plants! They may gently lift leaves for inspection if needed.
- Children should avoid touching their faces while handling the plants and should wash their hands after their work.
- Children should wear safety goggles during plant observations.

MATERIALS

Each team member will need:

- science notebook
- goggles

Each team will need:

- Day 9 Images (paper copies or electronic access)
- Plant Observations chart
- Leaf Morphology chart (paper copies or electronic access)
- live representative angiosperm plant
- hand lenses
- rulers or measuring tapes

Teacher will need:

- Day 9 Images PPT
- gallon zip-top bag

SETUP

- **Before class,** make color copies of the Day 9 Images PPT (or allow electronic access). If using paper copies, cut out 1 set of images for each team and place in a zip-top bag labeled *Day* 8.
- **NOTE: it is important not to identify the specimens as representatives of "angiosperms" until after the children have completed their observations.**
- Place sample bags and material bags (containing hand lenses, ruler or measuring tape, and Leaf Morphology chart) in a designated area for distribution.

DAILY OBSERVATIONS

Learners conduct daily observations of different live plants/images.

PROCEDURE

Engage

1. Direct the attention of the class to the live plant specimen you are holding up for them to see. Ask, *What do you see?* (Accept responses.) *What do you want to know about this plant?*
2. Explain that they will conduct their investigation on these samples in the same way they did in the previous class with the pine cones, pine needles, and other plant images. Because of the size of these plants, they will use these parts of the plant (tree) to investigate.
3. Instruct the children to always record in their science notebooks any additional information that does not fit into the Plant Observations chart but that is important to remember (e.g., information they learn from discussions with the teacher or each other, or additional questions to investigate during inquiry circles).
4. When ready, each Equipment Director should collect one bag of samples and one bag of materials for their team.

Explore

5. Once again, instruct the class to take a close look at the specimen using only their eyes to begin with.
6. As a team, they should come up with a question they want to answer; if they come up with multiple questions, ask them to choose one to investigate.
7. After they formulate their question, they should write it on their Plant Observation chart, along with today's date.
8. As before, they should record all the information from their observations on the chart. Remind them to identify the evidence that supports the answer to their question.
9. Inform them that if they can't find answers to their questions, they need to use science inquiry circle time to look for the answers!
10. Let them know they have 20 minutes for their investigation. Remind them to work as a team, with each one of them doing a part of the work. They can decide as a team who does what.
11. As teams work, navigate between them to ask open-ended questions, such as, *What question are you trying to answer? Are you finding the information you need? What do you notice about these plant parts compared to the plants you have already investigated?*

Explain

12. When time is up, ask the Data Scientist from each team to give a brief report on the question their team was investigating, an explanation of what they discovered, and whether or not they found the answer to their question. Ask, "*What evidence supports your answer?"* Accept their responses.
13. Remind the class that they are working with limited information. If they did not find the answer to their question, that is perfectly OK. Scientists don't always find the answers they need right away either! This is why they need to record all the questions and continue their search for answers during science inquiry circle time.
14. After each team has shared, ask, *How was the live plant different from plants in the images? How were they the same?* Accept and discuss responses.

15. Share that the group of plants they explored today are called angiosperms. Ask, *What did you notice about all the plants in this group? Can you describe the differences between them?* Accept all responses and discuss.
16. Explain that the oldest known fossil record of angiosperm pollen dates back approximately 135–134 million years ago. But scientists are still not exactly sure when flowering plants appeared on Earth. The word "angiosperm" comes from a Greek word that means "hidden seeds"; the seeds of angiosperms are enclosed. *How is that different from gymnosperms?*
17. Angiosperm seeds can be spread by water, wind, and animals.The development of flowers attracted animals that helped spread the pollen and seeds in fruits and made the angiosperms the dominant form of land plant, with over 300,000 species. Flowering plants can be found in many different environments on Earth, from hot deserts to very cold polar regions.
18. During this fossil time period lasting over millions of years, Earth's climate went from periods of warm temperatures to ice ages and back to warm again. Throughout this same time period, many species of plants and animals continued to survive well, while others become extinct.

Elaborate

19. Ask the "experts" on angiosperms to share with the class any other information they have found in their inquiry circles.
20. Tell the teams that in the next class period they will look over all of the information from their observations to synthesize what they have learned about the different plant groups.
21. Instruct the Lab Directors to collect and store all of the materials used today.

Evaluate

22. In their communications (verbal or written), is there evidence that learners are making sense of how plants changed over time?
23. In their responses (verbal or written) is there evidence learners are digging deeper to make sense of how changes in the environment and changes in organisms are related? Were any questions raised about this relationship?
24. Did teams develop a reasonable question to begin the investigation with?
25. Are learners using evidence to back up their answers?
26. Was any information from the science inquiry circle work included?

Expanded Standards
Are learners using science language in their communications, either written or verbal? **Reading TEKS:** 3.6G Comprehension skills: listening, speaking, reading, writing, and thinking using multiple texts. The learner uses metacognitive skills to both develop and deepen comprehension of increasingly complex texts. The learner is expected to (C) make and correct or confirm predictions using text features, characteristics of genre, and structures; (F) make inferences and use evidence to support understanding; (G) evaluate details read to determine key ideas; and (H) synthesize information to create new understanding. 3.9 Multiple genres: listening, speaking, reading, writing, and thinking using multiple texts—genres. The learner recognizes and analyzes genre-specific characteristics, structures, and purposes within and across increasingly complex traditional, contemporary, classical, and diverse texts. The learner is expected to (D) recognize characteristics and structures of informational text, including (i) recognize the central idea with supporting evidence.
CCSS: RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. SL.3.2 Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally. RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.
NGSS: 3-LS2-1 Science and Engineering Practices: Construct an argument with evidence, data, and/or a model. 3-LS4-1 Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. 3-LS4-3 Disciplinary Core Ideas: For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
Science TEKS: 3(b)(2): Scientific investigation and reasoning. The learner uses scientific practices during laboratory and outdoor investigations. The learner is expected to (B)collect and record data by observing and measuring using the metric system and recognize differences between observed and measured data. (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 (A) analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing. (3)(b)(10): Organisms and environments. The learner knows that organisms undergo similar life processes and have structures that help them survive within their environments. The learner is expected (A)to explore how structures and functions of plants and animals allow them to survive in a particular environment.