ALL for Science™
Authentic Literacy and Language for Science

Baylor College of Medicine
CENTER FOR EDUCATIONAL OUTREACH

DAY 6: ARE THE CATERPILLARS CHANGING?

MINI-LESSON

Teacher introduces the "Main Idea" anchor chart and models the strategy.

SCIENCE INQUIRY CIRCLES

Teams continue to research questions about their animals and record the informaton on their Inquiry Charts.

GUIDED SCIENCE INVESTIGATIONS

Teams report on their observations to date and learner about "instars" in the life cycle of butterflies.

ABBREVIATED STANDARDS

- **Reading TEKS: 2(b)(6)(G)**
- **CCSS: RI.2.1, RI.2.2**
- **NGSS: 2-LS2-1**
- **Science TEKS: 2.1(A)(E), 2.2(B), 2.3(B), 2.5(G)**

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Day 6: Are the Caterpillars Changing?

Literacy Strategy: Determining the main idea.

Science Concept: Butterflies undergo metamorphosis to become adults during their life cycle.

Science and Literacy Connection: When authors don't tell us what the main idea of the text is, we must determine the most important information. During an investigation, we need to figure out the most important information from our observations.

Mini-Lesson (15 minutes)

OVERVIEW

When scientists are researching a topic, they must decide what is the most important part of what they read. When we do this, we are determining what the main idea is.

NOTE: You are encouraged to create the "Main Idea" 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)
- class Inquiry Chart
- "Main Idea" anchor chart
- butterfly text to model the strategy

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 practice determining the main idea of a section as we read about butterflies.*
2. *The main idea is important because it helps me remember important things the author wants me to know.*

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

1. *Usually, we can find the big idea that authors are writing about in the first or last sentence of a section or paragraph, but they don't always do that.*
2. *As a strategic reader, if I cannot find the main idea in a sentence, I know that I will need to decide what it is myself.*

Tell how to employ the strategy (procedural knowledge)

1. (Teacher will model the strategy using a text.) *The first thing I need to do is think about the topic I am reading about (butterflies) and what I already know about them.*
2. *Next, I will draw a conclusion about what the author wants me to know about the topic (butterflies).*
3. *Using what I have learned about drawing conclusions, I'll take what I already know about the topic (butterflies) and combine that with the most important details the author is giving me.*
4. *Now, I have to put these things together to get the main idea. I will think, "What would the author tell me was the most important idea from the reading if she or he were standing here next to me?"*
5. *When I put these two things together in my own words, I will have the main idea!*

Science Inquiry Circles (30 minutes)

OVERVIEW

Today, teams will continue research on questions about their animals.

MATERIALS

Each team needs:

- team Inquiry Chart
- pencils
- access to informational texts/media

Teacher needs:

- "Animal 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.* (Have the Equipment Directors gather the Inquiry Chart for their team). *Today we will continue to look for answers to the questions on your Inquiry Charts.*

During Inquiry Circle Groups (20 minutes)

1. *While working in your teams, you may refer to the posted anchor chart to help guide your thinking.*
2. *The Lead Scientists will guide all research for the day by picking which questions will be answered. The Data Scientists will record all source information and the answers to your*

research questions on the team Inquiry Chart. The Lab Directors and Equipment Directors must help find the answers to the questions online and in texts.

3. *My role is to assist you during 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 what they accomplished and learned.*
2. *The Lab Directors should lead the discussion about their team's results. For example, Did your team use any reading strategies today? If so, which one(s)? What did your team learn about its organism? What problems did your team encounter? How did your team resolve those problems?*
3. (After you have allowed the teams to gather their thoughts, have the Data Scientists share with the class. Try to encourage teams to share a variety of things—you do not want just facts about animals, just reading strategies, or just cooperative learning strategies.)
4. (After all teams have shared, thank them for their hard work, and point out any excellent behaviors that you observed. If you noticed any problems in the teams, take a moment to point them out and explain your expectations for all future inquiry circles. Collect the team Inquiry Charts or have Equipment Directors put them in their normal classroom place for ongoing work so learners can easily access them.)

Guided Science Investigation (30–45 minutes)

OVERVIEW

In today's activity, children will report on their observations to date and learn about "instars" in the life cycle of butterflies.

GUIDING QUESTIONS

Why do caterpillars eat so much? Are they growing? What changes do we see in what they look like or how they are behaving? What are instars?

BACKGROUND INFORMATION FOR THE TEACHER

Eating and growing is important to caterpillars as they go through metamorphosis (the changes in their life cycle) to eventually emerge as adult butterflies.

Caterpillars' eating and growing process goes through four stages called "instars." When larvae get too fat for their skin, the skin splits so that it can continue growing. This happens four times during the growth process.

In nature, painted lady larvae will form nests made of silk strands that can be seen under leaves with careful observation. The purpose of the silk nests is to protect the larvae from predators.

Eventually, the larvae will leave the nests and find a place to attach themselves in a downward hanging position. As they hang, they will resemble the letter "J." Their skin will split one more time, revealing the chrysalises inside.

Learners may observe this molting of the caterpillars' skin in their habitats, as well as silk strands on the leaves. **It is hoped that learners will observe the formation of the chrysalises and eventual emergence of the adult butterflies. However, this may not occur during this 3-week unit. We encourage you to continue to allow the children to monitor the habitats until metamorphosis is complete.**

MATERIALS

Each team member needs:

- Butterfly Investigation Journal
- pencil

Each team needs:

- team habitat
- Team Caterpillar Growth Chart
- yarn
- scissors
- glue

Teacher needs:

- "Painted Lady Butterfly" images
- projector or white board
- yarn
- scissors
- glue

SETUP

- Be prepared to project the "Painted Lady Butterfly" images.
- Precut a piece of yarn (1 cm, or .39 inches long)

SAFETY

- Remind teams daily to be gentle with the growth habitats during handling to prevent disturbing the larvae, especially once the chrysalis forms. **Ideally, the growth habitats should be placed where teams can do daily observations without moving them**.
- Please follow all district and school science laboratory safety procedures.
- It is good laboratory practice to have teams wash hands before and after any laboratory activity.

DAILY OBSERVATIONS

Give learners time to observe their organisms (whether they are in the larva, pupa, or adult stage), take measurements of the larvae (if applicable), and record their observations in their Butterfly Investigation Journals. Facilitate discussions with learners by asking questions, such as, *What do you notice? What has changed since the last time you observed your caterpillars?*

PROCEDURE

Engage

1. Begin with, *Did you know that caterpillars make nests?* Accept responses.

2. Share that caterpillars in nature will make nests out of silk strands to protect themselves from predators. The nests are usually found on or under leaves. The silk is produced through a tubelike structure (a "spinneret") under the caterpillar's mouth.
3. When you make your observations, look for evidence of any silky, hairlike strands in the habitats.

Explore/Explain

1. Announce to the class that today they will share observations they have made and recorded in their journals. Tell them you are interested in any changes they have noticed in how the caterpillars look and behave. Ask, W*hat are the caterpillars doing inside the habitat? Do they move about? Have you noticed any changes in what the caterpillars look like now?*
2. Randomly pick members from each team to describe any behaviors or changes they have observed. Make a list of their responses on the whiteboard.
3. Refer to the list and point out responses that describe behaviors, such as eating a lot or changes in size or color.
4. Explain that these behaviors and changes are part of the life cycle of the painted lady butterflies they are investigating. Remind them of the life cycle of the frog they learned about in the last activities and the different changes that occurred.
5. Project **image 1** of the painted lady butterfly egg. Explain, *Although you didn't see them, the larvae you began your investigation with started their life cycle as very tiny egg. This picture of the egg looks big, but the egg is only as big as the tip of your pencil!*
6. Project **image** 2 of the painted lady larva. *When we received the larvae in class, they were about 1 cm (.39 inches) long.* Show the class the precut piece of yarn (1 cm long). *If you look at your caterpillar growth charts, you will see that they are bigger now.*
7. *Are your caterpillars eating a lot? That's because they are changing and growing fast. When larvae get too fat for their skin, the skin splits so that it can continue growing. This happens four times during the growth process. The stage between each time the skin splits, or molts, is called an "instar."*
8. If learners have not yet observed this molting, remind them to look for it during their observations.

Elaborate

1. Ask learners if any of the animals they are investigating in inquiry circles go through a molting process. If so, which ones?

Evaluate

1. Are learners demonstrating progressive skill in communicating observations?
2. Are learners using science language in their explanations (written or oral)?

Science Language

- The stages between an insect larva's molts are called **instars.**
- When animals or insects go through a dramatic change in a life cycle, it is called **metamorphosis**.
- A **spinneret** is the tubelike structure on a caterpillar's mouth that produces liquid silk.

Expanded Standards

Reading TEKS

2(b)(6) Comprehension skills: listening, speaking, reading, writing, and thinking using multiple texts. The student uses metacognitive skills to both develop and deepen comprehension of increasingly complex texts. The student is expected to: **(G)** evaluate details read to determine key ideas.

CCSS

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text**. RI.2.2.** Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text.

NGSS

2-LS2-1 Science & Engineering Practices: Planning & Carrying Out Investigations Make observations (firsthand or from media) to collect data that can be used to make comparisons

Science TEKS

2.1 Scientific and engineering practices. The student asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to: **(A)** ask questions and define problems based on observations or information from text, phenomena, models, or investigations; **(E)** collect observations and measurements as evidence **2.2** Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to: **(B)** analyze data by identifying significant features and patterns; **2.3** Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to: **(B)** communicate explanations and solutions individually and collaboratively in a variety of settings and formats. **2.5** Recurring themes and concepts. The student uses recurring themes and concepts to make connections across disciplines. The student is expected to: **(G)** describe how factors or conditions can cause objects, organisms, and systems to either change or stay the same.