ALL for Science™
Authentic Literacy and Language for Science

Baylor College of Medicine
CENTER FOR EDUCATIONAL OUTREACH

DAY 11: HOW DO BUTTERFLIES TRAVEL LONG DISTANCES?

MINI-LESSON

Teacher introduces the "Synthesizing" 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

Learners construct and fly paper butterflies to better understand how butterflies are able to travel great distances.

ABBREVIATED STANDARDS

- **Reading TEKS: 2(b)(6)(H)**
- **CCSS: W.2.2**
- **NGSS: K-2-ETS1-1, K-2-ETS1-3**
- **Science TEKS: 2.1(A)(B)(C)**

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Day 11: How Do Butterflies Travel Long Distances?

Literacy Strategy: Children synthesize they information they have learned to date about butterflies.

Science Concept: Butterflies can glide, or coast, on air currents to conserve energy on long migrations.

Science and Literacy Connection: As strategic readers, we synthesize information from many sources in order to create our own, new information. During an investigation, we must analyze information from multiple sources to produce evidence that supports our claims and explains our work.

Mini-Lesson (15 minutes)

OVERVIEW

Scientists make discoveries about the world every day. They take what they have read and what they already know and then make observations that lead to thinking about a topic in a new way.

For the three days dedicated to synthesis, it is suggested that you start with a whole-class synthesis statement about butterflies, followed by inquiry circles creating their own synthesis statement for their organism. Lastly, facilitate a discussion around all of the animals to create a synthesis statement for the class.

NOTE: You are encouraged to create the "Synthesizing" 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
- "Synthesizing" anchor chart
- butterfly text to model strategy (see "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.

Tell what the strategy is (declarative knowledge)

1. *Today we will practice synthesizing what we know about our topic (butterflies). Synthesizing means that we will combine information from all of our sources and create our own, new information.*

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

1. *As a strategic reader, I synthesize when I gather information from different books, online resources, experts, and videos. Synthesizing helps me to organize and see things in a new way.*

Tell how to employ the strategy (procedural knowledge)

1. (The teacher will model the mini-lesson and demonstrate how to create a synthesis statement using butterflies as an example. The class Inquiry Chart should be completely filled in by now.)
2. *Today we will work altogether as a class to develop a synthesis statement about butterflies. Remember, synthesizing means we are putting together information from all our sources to create our own new information.*
3. *We will use the information we have on our butterfly inquiry chart to practice so that you will understand how to make your own synthesis statement from the information on your team Inquiry Charts.*
4. *The first thing I will do is to look at the questions on my inquiry chart and the information that I have written from different sources.* (Ask for volunteers to read examples.)
5. *Next, I will compare and contrast the information. That means that I'll look to see if any of the information is the same or different from different sources. Can someone give me an example of information that is the same? Can someone give me an example of information that is different?* (Teacher can mark off responses on the class Inquiry Chart as they are given.)
6. *Now, I will think about what I already know about butterflies.* (Say what you know about butterflies to the class.)
7. *Finally, I will combine all the information together to write my synthesis statement*. (Write your synthesis statement on the board and read the statement aloud to the class. An example synthesis statement might be, *Butterflies all have similar body types and wings. Offspring look like their parents because adult butterflies pass down their physical traits. Butterflies change many times during their life cycle.*)
8. *As you write your own synthesis statements tomorrow, remember the concepts this unit has focused on:*
    - *Organisms have physical characteristics that help them survive. (What are the physical characteristics of your organism that helps it survive?)*
    - *Organisms go through life cycle stages.*
    - *Some organisms go through unique life cycle stages (What stages or changes does your organism go through as it grows?)*

    The synthesis statement you will write about your organism tomorrow during inquiry circles should incorporate all of these concepts.

Science Inquiry Circles (30 minutes)

OVERVIEW

Today learners will either continue research work to find answers to questions on the team Inquiry Charts or simply find more interesting facts about their animals. This will be dependent on each team's research progress.

MATERIALS

Each team needs:

- team Inquiry Charts
- 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 their team's Inquiry Chart). *Today we can continue to look for answers to the questions on your Inquiry Chart or look for some other interesting facts about your animal. Remember, you may add more questions or information to your inquiry chart as you continue to research.*

During Inquiry Circles (20 minutes)

1. *Remember, you may refer to the anchor charts to help guide your thinking.* (Point to the posted anchor charts, and remind students that they can use all the reading strategies taught, not just the one for that day.)
2. *The Lead Scientists will guide all research for the day by picking which questions will be answered, and 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 Director must help find the answers to the questions online and in texts.*
3. *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. (Once teams have finished, begin daily reflections As we conclude our inquiry circles for today, each team will have a chance to share what they accomplished and learned.
2. The Lab Director should lead the discussion with their inquiry circle team about today's results. For example, *Did your team use any reading strategies today? If so, which one(s)? What did your team learn about its animal? What problems did your team encounter? How did your team resolve those problems?* (Give teams time to discuss.)

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. (When 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 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 Equipment Directors put them in their normal classroom place for ongoing work so that learners can easily access them.)

Guided Science Investigation (30–45 minutes)

OVERVIEW

In this activity, learners construct and fly paper butterflies to better understand how butterflies are able to travel great distances during migrations.

GUIDING QUESTION

How are butterflies able to travel thousands of miles?

BACKGROUND INFORMATION FOR THE TEACHER

Butterflies are remarkable fliers, known for their vibrant wings and graceful movements. Their flight involves a combination of flapping and gliding. By flapping their wings up and down, butterflies are able to rise, steer, and change direction. By spreading their wings wide and catching the air currents, butterflies can glide long distances with less effort, which helps them on their long migration flights.

Today, learners will construct butterfly gliders and adjust them to make smooth flights. They will then try to aim for and land on large "flowers" on the classroom floor.

MATERIALS

Each team member needs:

- Butterfly Investigation Journal
- pencil
- 1 butterfly glider
- colored markers or crayons
- small paperclips, size #1
- scissors

Each team needs:

- 1 copy of the "Paperclip Placement" diagram
- space for testing their gliders

Teacher needs:

- black marker
- "Butterfly Glider" pattern page
- "Paperclip Placement" diagram
- several sheets of poster board in different colors

SETUP

- Before the activity, use a black marker to draw single large flowers outlines on different colors of poster board. Cut around the outer petals to make several large flowers.
- Make copies of the "Butterfly Glider" pattern page and cut along the dotted lines (there are 4 gliders per page) so that there are enough gliders for each team member (1 per learner) plus extras for scissor mistakes.
- Make copies of the "Paperclip Pattern" diagram (1 per team).
- Designate spaces for testing the gliders.

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 live organisms (whether they are in the larva, pupa, or adult stage), take measurements of the larvae (if applicable), and record their observations in their science notebooks. Facilitate team discussions by asking questions, such as, *What did you notice? What has changed since the last time you observed your organisms?*

PROCEDURE

Engage

1. Remind teams about the "Monarch Migration" game they played in a previous class. What did they learn about why monarchs migrate? Find out if the game prompted any new questions.
2. Ask for ideas about how the monarchs are able to travel such great distances.
3. Tell the class that today they will investigate how wind can help butterflies travel such long distances.

Explore

1. Distribute the butterfly gliders (1 per team member) and the "Paperclip Placement" diagram (1 per team). If time permits, have learners decorate their gliders before cutting them out. Encourage learners to carefully cut out the patterns without folding or crumpling the paper. **Have spares available for scissor mistakes.**
2. When the gliders are cut out, give learners 1 small paper clip per glider. Using the "Paperclip Placement" diagram, discuss the different ways to position the paper clip. Tell learners they will test their gliders to see which position works the best for flying. Have learners place their paper clips on the head of the butterfly as shown.
3. Demonstrate how to fly the butterfly. Stand up and raise the butterfly to eye level. Hold it horizontally and point the head (paper clip) in the direction you want it to fly. Release the butterfly. If the paper clip is positioned properly, the butterfly will glide smoothly to the floor in front of you.
4. If necessary, adjust the paper clip and try again. Refer to the diagram for fine-tuning of the paper clip. If the paper clip is too far forward, the butterfly will be nose-heavy and dive to the

floor. If the paper clip is too far back, the butterfly will follow wave-like upward arcs. Airplane pilots call this *stalling*, and it could lead to a hard, tail-first landing.

5. When learners have adjusted their butterfly gliders, place the flowers on open floor space and challenge learners to land their butterflies in the center of the flowers so the butterflies can drink nectar for energy. If learners miss the flowers, have them try again until they are successful. If you have several flowers, have learners start on one flower and go from flower to flower.

Explain

1. Ask for volunteers to explain the flight of their gliders:
    - How many adjustments did they make?
    - Which position was the most successful? Why?

Elaborate

1. Refer back to the "Monarch Migration" gameboard from the activity on Day 9. Ask if anyone has an idea about how wind helps monarchs make their long flights to Mexico.
2. Ask learners, "What other animals use the wind to help them in flight?"

Evaluate

1. Did learners share any interesting observations they made about the flight of their monarchs?
2. Were learners able to explain how butterflies can fly long distances?
3. Did learners use science language in their explanations?

Science Language

- When a butterfly is **gliding,** it flies smoothly without flapping its wings.
- **Migration** is the seasonal movement of animals from one region to another.

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: **(H)** synthesize information to create new understanding.

CCSS

W.2.2 Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.

NGSS

K-2-ETS1-1 Define a simple problem that can be solved through the development of a new or improved object or tool. **K-2-ETS1-3** Analyze data from tests of an object or tool to determine if it works as intended.

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; **(B)** use scientific practices to plan and conduct simple descriptive investigations and use engineering practices to design solutions to problems; **(C)** identify, describe, and demonstrate safe practices during classroom and field investigations as outlined in Texas Education Agency-approved safety standards.