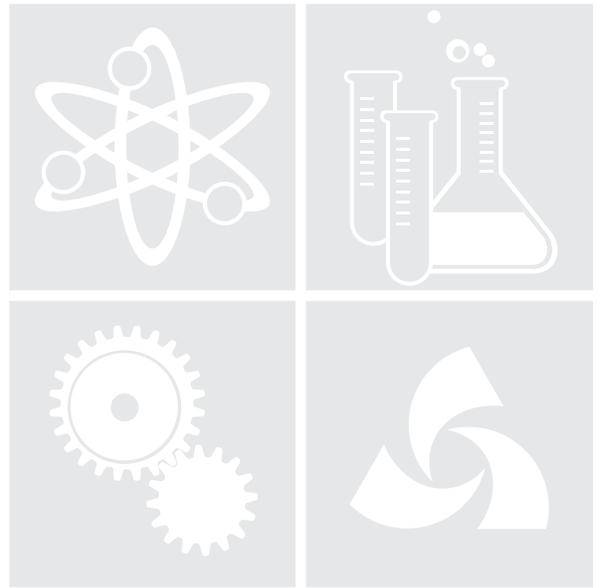


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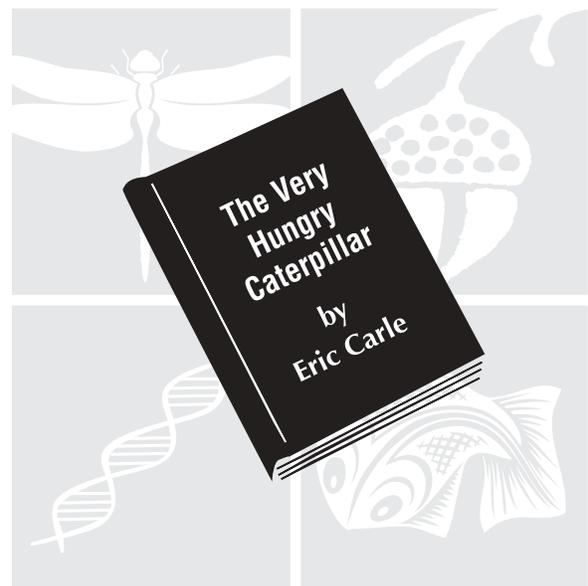
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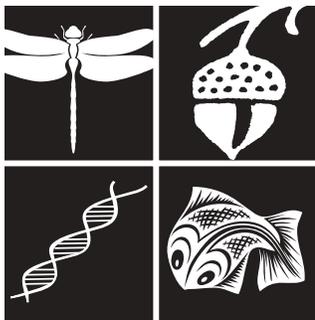


Strategic

Science

Teaching





Title of Lesson:

Caterpillar Capers

Essential Question:

How do the changes that occur in the life cycle of a butterfly compare with the changes in the life cycle of other living things?



Conceptual Statement:

All living things have a predictable life cycle that is characteristic of the species. Within a life cycle, all living things change as they grow.

Conceptual Learning Sequence:

This lesson is part of a conceptual unit on life cycles. It follows an introductory lesson that addresses the concepts that all living things reproduce their own kind and have offspring that either resemble their parents from birth, or through a series of body changes.

Student Outcomes:

- Students learn about the stages in a butterfly's life cycle and recognize the similarities/differences to the life cycle stages of other living things.
- Students observe the life cycle of a butterfly and compare this life cycle to those of other living things.
- Students use "Graphic Outlining" to illustrate information from a fictional story and compare this information to their observations.

Lesson Overview:

In this lesson, students review their prior knowledge that living things produce offspring that resembles their parents and extend their understanding that all living things have life cycles. Students observe the life cycle stages of a live butterfly over several weeks and use "Graphic Outlining" to record the butterfly's stages of metamorphosis. Reading *The Very Hungry Caterpillar*, students continue to use "Graphic Outlining" to sequence the stages of the life cycle. Students compare their observations with the story, and identify and explain the stages of the life cycle. Students then compare the changes they observed with the life cycle of a frog and two other living things.

English Language Learning:

English Language Development standards are referenced in the lesson where appropriate. The hand icon appears throughout the lesson when learning strategies and lesson components are identified as pathways for academic success and reflect critical developmental differences for students who are English learners.

Literature in the Science Learning Cycle:



The book, *The Very Hungry Caterpillar*, is used in the EXPLORE stage in the learning cycle. It is placed after the students make their first exploration with real butterflies so that students can compare information gained through their observation with information gained from their text.

Learning Strategy:

Students use the "Graphic Outlining" strategy in their first exploration as they observe the life cycle of a real butterfly. Students continue to use this strategy to record information after reading the literature selection. "Graphic Outlining" is a method for representing information from a text so that the organization and sequence of a text is highlighted. (See Appendix pages 162-163.)

Literature Selection:

Title: *The Very Hungry Caterpillar*

Author: Carle, Eric



Publisher, Year: Putnam Publishing Group, 1984 ISBN: 039921301S

Annotation: This award-winning book illustrates the changes that occur as a caterpillar becomes a butterfly. The activities of the caterpillar in the story include factual information and illustrations of the stages in the butterfly life cycle. The caterpillar in the story exhibits some fictionalized attributes which allow for discussion of how stories sometimes give plants and/or animals attributes which they do not have.

Genre: Fiction

California Science Content Standards:*

Science: Grade 2, Life Science

2. Plants and animals have predictable life cycles. As a basis for understanding this concept:
- a. Students know that organisms reproduce offspring of their own kind and that the offspring resemble their parents and each other.
 - b. Students know the sequential stages of life cycles are different for different animals, for example butterflies, frogs, and mice.



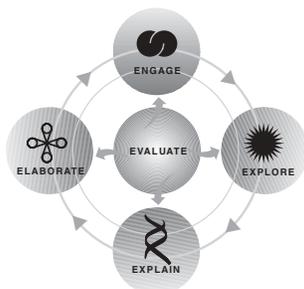
4. Investigation and Experimentation

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

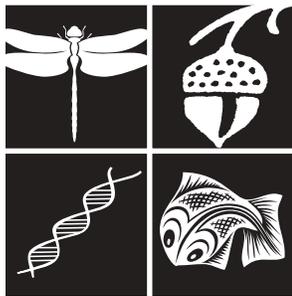
- d. Write or draw descriptions of a sequence of steps, events, and observations.
- f. Use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects.

*Selected standards addressed within this lesson.

Lesson at a Glance



Science Learning Cycle	Objective Science Thinking Process	Suggested Time
ENGAGE	Students observe pictures of animals at various stages in their life cycle and discuss the differences between the stages (newborn, young, adult). Observing, Comparing, Communicating	15 minutes
EXPLORE	Part 1. Students use their senses and hand lenses to observe the various stages of a live butterfly's life cycle. They record and sequence their observations and share their information with other students. 1-2 hours set-up; 30 minute instruction for observations and recording; brief observations for 30-60 days Part 2. Students graphically outline stages as they read (or listen to) <i>The Very Hungry Caterpillar</i> . Students identify what is real and not real about the story based on their observations of the live butterfly. Students confirm the names of each stage. Observing, Comparing, Communicating	Extended over time
EXPLAIN	Part 1. Students share their observations of the live butterfly and discuss similarities and differences. Part 2. Students compare their observations and sequences from the live butterfly life cycle with the pictures and sequences from the book and note similarities and differences. Observing, Comparing, Ordering, Communicating	15 minutes 25 minutes
ELABORATE	Students observe and sequence pictures of a frog's life cycle. They make comparisons with the stages of a butterfly's life cycle. Observing, Comparing, Communicating, Applying	30 minutes
EVALUATE	Students research, through books and/or the internet, information about the life cycle of two other living things. Students evaluate their understanding by creating illustrations and sequences for the life cycle stages of each animal. Teacher evaluates student understanding of the student outcomes in this activity as well as throughout the lesson. Observing, Ordering, Communicating, Applying	60 minutes several sessions with adult or older student assistance



Caterpillar Capers

Teacher Background:

Plants and animals have life cycles that are characteristic of their species. In the cycles, living organisms reproduce offspring of their own kind that either resemble the parents from birth or go through distinct stages and eventually resemble the parent. This latter process is known as metamorphosis or change in body shape. Animals such as butterflies, moths and frogs undergo metamorphosis.

In the case of the butterfly or moth, the change is called complete metamorphosis in which the animal changes from an egg to a larva (caterpillar), to a pupa (cocoon/moth; chrysalis/butterfly) and to an adult. The larval stage is a feeding stage; the adult stage is a reproducing stage. In the case of a frog, the animal undergoes incomplete metamorphosis (less than four stages) in which the body changes from an egg to a tadpole to a frog.

Related California Content Standards

Math: Grade 2

Statistics, Data analysis, and Probability

1.1 Record numerical data.

Measurement and Geometry

1.3 Measure an object to the nearest inch and/or centimeter.

Language Arts: Grade 2

Reading Comprehension

2.5 - Restate facts and details in text to clarify and organize ideas.

Writing

2.1.a - Move through a logical sequence of events.

Listening and Speaking

1.7 - Recount experiences in a logical sequence.

English Language Development:

Reading Comprehension

Use the content of a story to draw logical inferences.

Writing Strategies and Applications

Write simple sentences about events and characters from familiar stories read by the teacher.

Grouping: Whole class, partner, individual

Materials:

Per Class

The Very Hungry Caterpillar (big book if possible) or one book per student if they can read the material

Butterfly or other insect (e.g., silkworm) metamorphosis/life cycle kit, live specimens

Terrarium and other items listed in the kit for the butterfly habitat

Pictures of adult and young animals (e.g., whale, human, frog)

Per Partner

Hand lens

Per Student

4 or more copies of Student Page 1.0 (see Teacher Tips)

1 blank sheet of paper (8 1/2" x 11")

Copy of picture cards from Teacher Page 1.0



Advanced Preparation:

1. Order a butterfly/moth kit from a biological (e.g., Carolina Biological, Niles Biological) or local supply company.
2. Use the Internet or other sources to locate real pictures of the stages in the butterfly's life cycle. Duplicate enough picture sets so that each partner has one.
3. Duplicate Student Page 1.0 (see Teacher Tips).
4. Duplicate Teacher Page 1.0 (enough for each student) and cut the butterfly pictures to use in EXPLAIN and the frog pictures to use in ELABORATE.
5. Check websites, books, or magazines for pictures of life cycles of other animals for ENGAGE. Cut out for display (See Teacher Tips).

Teacher Resources:

California Science Framework (pages 128; 144-152) CDE, 1990

Carolina Biological Supply Company, www.carolina.com

Insects, Full Option Science System Module, Lawrence Hall of Science, 1995

Kid Pix Studio, www.kidpix.com

Niles Biological, www.nilesbio.com

Teacher Tips:

- Plan the activity and the learning unit for spring when visible changes in life cycles occur in many species.
- Allow several weeks for the complete butterfly life cycle observation.
- Use the following web sites for additional pictures to use in this lesson:
 - Zoom Butterflies, Enchanted Learning Web Site
<http://www.enchantedlearning.com/subjects/butterfly>
 - Life Cycle Master
<http://www.enchantedlearning.com/subjects/butterfly/activities/printouts/lifecycle.shtml>
 - London Butterfly House Life Cycle Illustrated page
http://www.butterflies.org.uk/lbh_home/cycle/lifecycl.htm
 - Butterfly and Moth Printouts
<http://www.enchantedlearning.com/subjects/butterfly/activities/printouts/index.shtml>
 - Frog Pictures
<http://www.ccsd.k12.wy.us/Science/04/0403lifecycle.html>
- Duplicate at least four Student Pages 1.0 for each student so they can make observations on the four stages (egg, larva, pupa and adult). You might also want to make additional pages so that students can make multiple observations within a stage (e.g., larva as it changes from first appearance to forming the pupa).

Common Misconceptions:

Student may think that:

- Animals and plants have the same form throughout their life cycles.
- Moths and butterflies are the same animal.
- A cocoon and chrysalis is the same item.
- The pupa is a resting stage.

VOCABULARY

adult – a plant, animal, or person that is fully grown or developed

egg – the reproductive cell made by a female animal

fertilized egg – the developing cell formed by the union of the male and female nuclei that begins the life cycle

insect – a small invertebrate animal with a head, thorax, and abdomen

larva – the immature stage of a developing animal between the egg and the pupae stage; often the “feeding” stage (plural: larvae)

life cycle – the complete series of stages or forms that a living thing passes through in its lifetime

metamorphosis – changes in body form that some animals go through as they develop through their lifetime

pupa – an insect in the stage of development between larvae and adult (plural: pupae or pupas)

The Science Learning Cycle:

Caterpillar Capers



Engage:

1. Explain to students that they will be learning about the changes a living thing goes through during its life cycle. Hold up a picture of an adult animal (e.g., whale). Ask students what they think this animal looked like when it was born. When it was young? How is the adult animal like or different than the young animal? Chart the student responses and post the young and adult pictures on the wall. Continue the process in step #1 with two other sets of pictures (human and frog).
2. Ask students how the frog is different from the human or the whale. Chart responses. Summarize that all living things change in their life cycle, some are like their parents when they are born and just grow bigger. Others do not look like their parents when born, but go through body changes as they grow until they look like their parents.
3. Explain to students that they will be observing the life cycle of a living thing - a butterfly over the next several weeks.



Explore:

Part 1

4. Set up the butterfly or moth habitat in an appropriate container (e.g., terrarium) for student observation.
5. Distribute Student Page 1.0 to each student. Provide a hand lens to each student and ask students to make observations of the insect's egg. Ask students to draw and write about their observation on their Student Page ("Graphic Outlining") on the left side of the page.
6. Continue to provide observation time over several weeks for students as the butterfly/moth goes through its different stages. Ask students to continue to draw and write about their observations and record their information on the left side of additional Student Pages 1.0.



Explain:

Part 1

7. At each stage, ask students to share their observations with the class. Facilitate a discussion on the similarities or differences of their observations.
8. Help students label each of their drawings with the appropriate name for the stage: egg, larva/caterpillar, pupa/chrysalis, adult/butterfly. Add these words to a class word wall.



Explore:

Part 2



9. Show the cover of *The Very Hungry Caterpillar* to students. Ask students to predict what the story is about. Chart student responses.



10. Ask students to pay attention to the changes that happen to the caterpillar in the story as you read aloud or have students read. After reading, ask students to tell what they observed about the butterfly and chart their responses. (Example - It doesn't look like a butterfly until the end of the story. It started as an egg. It eats a lot of food. A caterpillar turns into a butterfly, etc.). This is an opportunity for EL to use the content of a story to draw logical inferences.
11. Ask students what they thought was real in the story. What did they think was not real or accurate? Chart their responses. (Example - The stages of the cycle are real, but the food the caterpillar eats is not.) Explain to students that sometimes an author mixes real information with parts that are not real. It is important to realize what parts are "make-believe" and what parts are factual when reading books about living things.
12. Explain to students that they will review the story by just looking at the pictures. Slowly turn the pages and ask students to tell you to stop every time the butterfly changes. As a group, ask students to name the stage in the picture, beginning with the egg.

The Science Learning Cycle: Caterpillar Capers



Explain:

Part 2

13. Distribute picture cards from *The Very Hungry Caterpillar*. Ask students to glue on the right side of Student Page 1.0 the correct picture card that corresponds to the stage that they recorded from their observations.



14. Have students compare their observations with the pictures from *The Very Hungry Caterpillar*. How are they alike? How are they different? Ask students to write their ideas on the right hand side of Student Page 1.0. This is an opportunity for EL to write simple sentences comparing information.



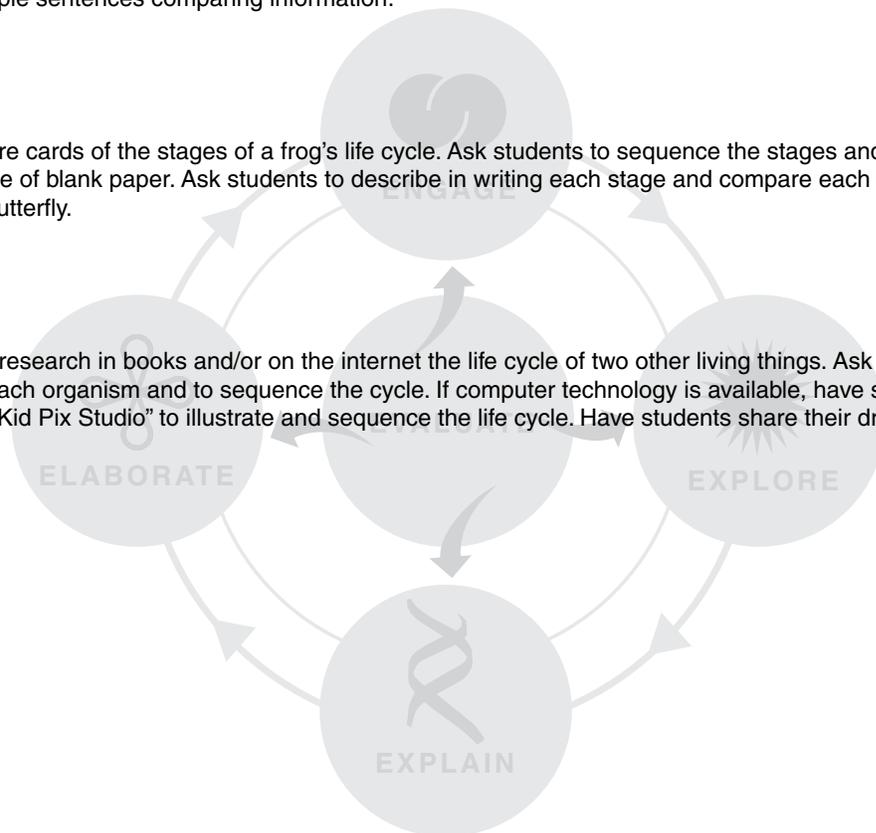
Elaborate:

15. Distribute picture cards of the stages of a frog's life cycle. Ask students to sequence the stages and glue pictures in order on a piece of blank paper. Ask students to describe in writing each stage and compare each of the stages with the stages of the butterfly.



Evaluate:

16. Have students research in books and/or on the internet the life cycle of two other living things. Ask students to illustrate the stages of each organism and to sequence the cycle. If computer technology is available, have students use a program such as "Kid Pix Studio" to illustrate and sequence the life cycle. Have students share their drawings.

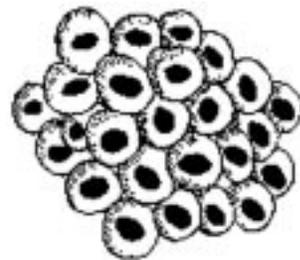


Teacher Reflection:

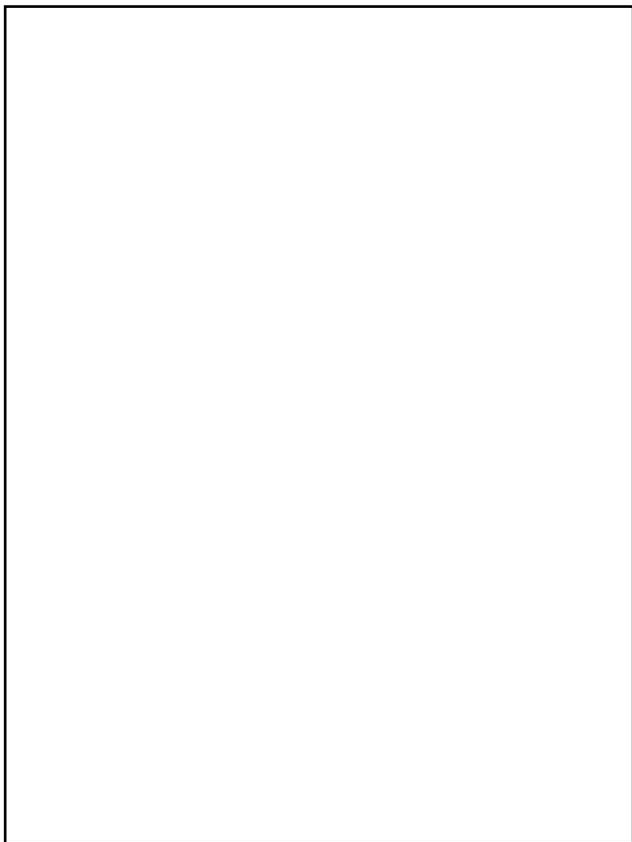
1. How does the student work provide evidence that they learned that all organisms have a life cycle with identifiable stages and can explain the four stages in the butterfly's life cycle?
2. What instructional strategies used in this lesson promote student understanding? How do you know?
3. How does the literature selection support student understanding of the science concepts?
4. How would you modify instruction to ensure understanding of student outcomes by all students?

TEACHER NOTE:

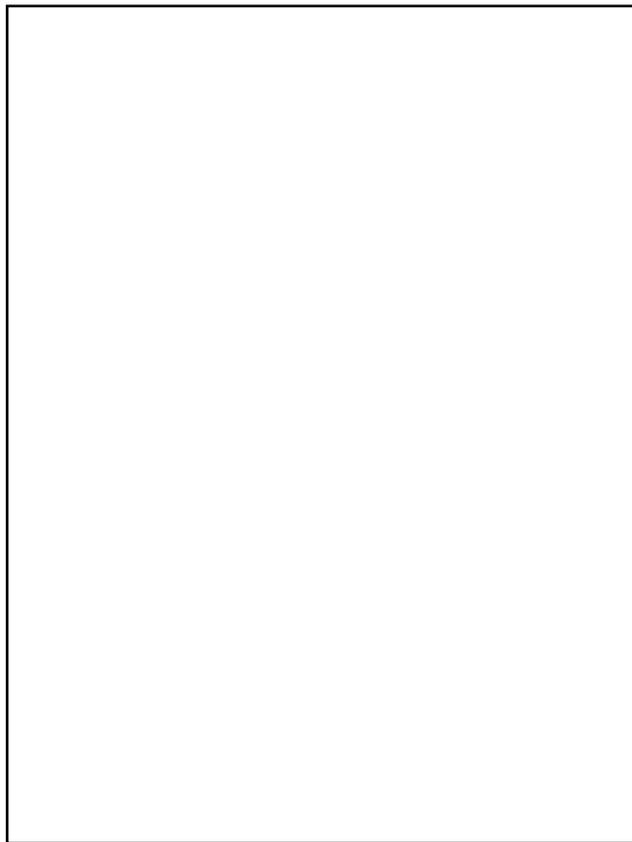
Place similar pictures of life cycle from “Very Hungry Caterpillar.”



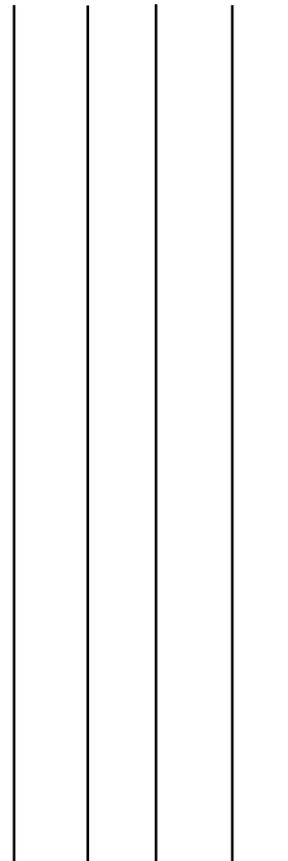
Observations From the Live Butterfly



Picture from *The Very Hungry Caterpillar*



My Observations



Alike

Different

