

Life Cycle of a Butterfly

by Kathy Knudson

Grade level 5

Time required

Eight 50 minute class periods

Materials/Technology

Butterfly larvae
Student science journals
Magnifying glasses
Butterfly container
Handouts of butterfly parts
Drawing paper
Markers
Internet access (optional)
Microscopes (optional)
Reference books on butterflies and moths
How the Butterflies Came to Be from Joseph Bruchac's *Keepers of the Animals*

Summary

Students will learn about the life cycle of the butterfly by observing the metamorphosis of a larva into an adult. They will do research to gather information about butterflies and utilize journaling to write down their information and thoughts. Students will also examine math concepts such as symmetry and pairs and how these concepts relate to Native American beadwork and butterflies.

Objectives

The student will:

- 1) learn the lifecycle of the butterfly and the vocabulary associated with it.
- 2) be able to label all parts of the caterpillar and butterfly.
- 3) understand metamorphosis.
- 4) gain knowledge of and practice in applying the mathematical concepts of pairs, fractions, and symmetry.

Montana Science standards addressed

- 1) Students design, conduct evaluate and communicate scientific investigations.
- 2) Students demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

Montana Math standards addressed

- 1) Number sense: Reads, writes, orders, and compares whole numbers, fractions, and decimals.
- 2) Spatial sense: Identifies, represents, and describes attributes of figures: edges, faces, bases, vertices, parallel and perpendicular lines, symmetry, and angles.
- 3) Collects, organizes, interprets and describes information using a variety of graphs and tables.

Assessment

- 1) Assess students as they progress through the activities. Especially evaluate their journal entries.
- 2) Students should self assess and groups assess each other within the group.

3) Finally, evaluate students using a final test prepared by the teacher.

Background notes

The butterfly undergoes complete metamorphosis, which occurs in four stages: egg, larva, pupa and adult. The egg hatches into a small worm-like organism, the larva, also known as the caterpillar. During the larval stage, caterpillars are active, eat a lot, and grow rapidly. Several times during this stage, the caterpillar *molts* its skin, revealing more elastic skin that gives it room to grow. The larva also needs oxygen to grow, but they don't have lungs. Instead, air is taken into the air passageway through small holes called *spiracles* on the side of the body. They have a nervous system and a primitive brain, or *cerebral ganglion*, in the head. Also part of this system are the sense organs found on the head that tell the larva about the world around them. The short antennae are one of the sense organs, as are the light-sensitive eyes called ocelli. There are six of these simple eyes on each side. The head also has massive jaws, which are used to eat plants. There is a gland that produces silk that is forced out through the spinneret. This is used to create the *chrysalis*, the case in which the pupa will change into an adult butterfly. The larval body has 14 segments, four pairs of false legs, called *prolegs*, three pairs of jointed legs, and at the end of the caterpillar is a spine or horn at the tip of the abdomen.

The pupal stage occurs inside the chrysalis and is when the organism is most vulnerable. For protection from predators, the chrysalis may camouflage itself by adapting to the color of its surroundings. Some pupae spend their whole winter in the chrysalis.

When metamorphosis is complete and the butterfly is preparing to emerge, it pumps body fluid into its head and thorax to help crack the chrysalis open. The adult head and antennae emerge first. The butterfly is again vulnerable at this time, while it waits for its wings to dry. The adult nourishes itself by sipping nectar with a drinking tube called a *proboscis*. Their wings are covered with thousands of delicate scales.

Moths and butterflies are distinct organisms and there are many ways to distinguish between them. Moths have fat bodies, feathery antennae, fly at night, and fold their wings flat over their bodies. Butterflies, on the other hand, have thinner bodies, knobbed antennae, fly during the day, and hold their wings upright over their body.

Please note that it takes two to three weeks to complete the metamorphosis from egg to adult, therefore, the lessons described below should be timed to coincide with the stage they address and thus may not occur on eight consecutive days.

Procedure

Day 1

Tell the story *How the Butterflies Came to Be* and then discuss with students what they know about metamorphosis, caterpillars, and butterflies, while the teacher records their comments on the board. Next, the teacher distributes small containers to each student with butterfly larvae in it. Students record in their journal what they see in the container.

Day 2

Prior to starting class, the teacher should draw a caterpillar on the board and label the parts. Students then use the magnifying lenses and look for the body parts of the caterpillar. Let students work in groups and discuss and compare what they see. If a microscope is available, this would be very helpful to see the head parts better. Students should record their observations in their journals. Some might notice little pieces in their containers; this is the result of molting, a process undergone several times before the caterpillars enter the pupal stage. (see background notes)

As a math tie-in, reinforce pairs with the students, using the pairs in the 14 segments. Introduce fractions by relating different body segments and in which fraction of the body are the false legs found, etc. This can lead to discussing factors of fourteen and division using the same idea as the fractions. Fractions can be used throughout this unit.

Day 3

Students should write the information in their journal about what they have learned about body parts. Then, on a piece of white construction paper, ask students to draw, label, and color the caterpillar.

As a math tie-in, students will multiply, using the number of legs and eyes on each caterpillar, then multiply this by the class number (since each student has a caterpillar) to calculate the total number of caterpillar legs and eyes in the class.

Day 4

Students should draw pictures of the development of the caterpillar in their journals, discuss the parts, and then write their thoughts. This should be done on a daily basis. This site on the World Wide Web is a good one for students to see:

<http://www.mesc.usgs.gov/butterfly/Butterfly.html>

Day 5

Students will start looking at the differences between moths and butterflies using books, the Internet and other tools for research. As a class, discuss the differences that the students discovered.

Soon, the caterpillars will be starting to spin their chrysalis. Students need to be aware of the changes and be watching. If the timing is right, they will see the chrysalis being formed.

Day 6

Introduce pictures of items that are symmetrical. Show a picture of a butterfly and discuss its symmetry. Next discuss Native American beadwork, relating the symmetry and colors of many beadwork designs to those of butterflies. Show examples of native beadwork, or pictures of it. This could lead into a discussion of the beadwork traditions, of different tribes, their designs, and colors. Symmetry could take two to three days. Students, in a group, should write the similarities they observe between butterflies and beadwork. Have the groups each come to the front and discuss what their observations were. The information discussed could also lead to making a chart, using the information from each group. This World Wide Web site has good information on Native American geometrical figures. <http://www.earthmeasure.com/>

As a tie-in to literature, students could write symmetry poems using Native American legends, or characters.

Days 7-8

The pupa emerges from the chrysalis as an adult. They will need sugar water for nourishment soon after emergence. This is a good opportunity for students to observe them drinking using their proboscis. Students should observe the butterfly's unique body, draw it and label the parts. Review pairs and talk about the butterfly and pairs, e.g., pairs of wings, legs, antennae, etc. Make a graph of the length of each butterfly emerging in comparison to the others in the classroom, the time spent in the chrysalis, or the percentage of butterflies that have trouble emerging. Have students present their findings to the class.

Extensions

- If the class is adept at raising butterflies, they may be able to observe butterflies mating, laying eggs and going through the rest of the metamorphic cycle again.
- Draw the life cycle of the butterfly on a poster.
- Discover the dangers that face butterflies. Write a convincing article of how to save them.
- Have students pick different kinds of butterflies to study and report.
- Have students write stories with open endings, such as:
 - If I was a caterpillar I would (or would not)...
 - When I see a butterfly I feel...
 - When I saw the chrysalis open I...
 - If I was a butterfly I would...
- Have an entomologist visit your classroom and discuss butterflies.
- Compare the flying processes and maneuverability between butterflies, birds, and airplanes.
- Discuss colors on butterflies concerning camouflage, mimicry, startle markings, and warning colors.
- Discuss the benefits of having butterflies in our environment.
- Have students find sites on the Internet that trace the migration route of the Monarch butterfly; they can chart this on a map.

Further information

For further information about these activities, contact Kathy Knudson via electronic mail at Knudson@digisys.net.