

THE MONARCH BUTTERFLY (A Life Cycle Exercise)



Students Will Discover

1. The typical characteristics and life cycle of an insect
2. Special adaptations of the monarch butterfly for survival
3. The importance of habitat preservation in species survival.

Science Objectives

1. Observe common characteristics in familiar organisms and classify them into sub-groups.
2. Describe the common life cycles of selected common animals in sequential order.
3. Recognize the interrelationship between an organism and its environment.
4. Record and interpret data.
5. Draw conclusions based on observations.



BACKGROUND INFORMATION

The monarch butterfly is a natural for the classroom. It is one of our most common and easily recognized insects in all stages of its life cycle. The larvae are most abundant in the Midwest in August and early September, just in time for the beginning of school! They feed on several species of milkweed including common milkweed, a plant abundant in most waste areas, parks, vacant lots and road sides in both urban and rural areas.

The monarch undergoes complete metamorphosis. Its life cycle, which it completes in about a month; includes egg, larva (called a caterpillar), pupa (called a chrysalis) and adult. Since most larvae collected just prior to the beginning of the school year will be at least half grown, students will be able to see the transformation from larvae to adult in as little as two weeks.

Most butterflies and moths over-winter in the pupa stage, while a few species survive as eggs, larvae or even adults. The monarch survives in the adult stage by migrating from hundreds to thousands of miles each fall. Most of those east of the Rocky Mountains winter in Mexico, while those west of the Rockies over-winter in Southern California. In the mountains of Mexico the temperature hovers just above freezing. There the adults pass the winter in a near dormant state, clinging by the millions to the branches of trees and shrubs.

In spring, the adults leave their wintering grounds and begin the long journey north. Few actually make the entire trip, but offspring from eggs laid along the way continue the migration northward, arriving in the Midwest in late May or early June. There are usually three generations produced over the summer. Only the last generation makes the migration to Mexico in the fall.

THE MONARCH LIFE CYCLE

The monarch butterfly undergoes complete metamorphosis, which includes the following stages:

1. **Egg:** Monarch eggs are pale, green and shaped like tiny grooved footballs. They are usually laid singly on the undersides of milkweed leaves, but occasionally on the top surface or even on the blossoms. Even though they are about the size of the head of a pin, they are relatively easy to find, once you know what to look for.
2. **Larva:** When first hatched, the tiny larva is largely colorless, and very tiny. Fortunately it grows rapidly and soon becomes larger and more colorful covered with alternating bands of yellow, black and white and stands out dramatically against the green background of the milkweed leaf. It molts (sheds its skin) four times as it grows. Two weeks after hatching, it is about three inches long and as big around as a pencil. It is now ready to become a chrysalis.
3. **Pupa:** The larva stops feeding and often wanders some distance from the food plant before it finds a suitable attachment to form its chrysalis. It attaches itself to the underside of its chosen perch with a pedicel of silk. It then hangs upside down in a classic “J” formation. Within 24 hrs. it sheds its larval skin and becomes an emerald green chrysalis adorned with a necklace of black and gold beads.
4. **Adult:** In ten to twelve days the chrysalis becomes transparent. Then within 24 hours the adult emerges, usually in the morning. It quickly expands its wings by pumping fluid from its abdomen through the wing veins. The wings will have hardened by mid-afternoon, and the butterfly can be released.



Newly laid egg (above) and an egg about to hatch (below). Note the dark head of the caterpillar showing through the egg shell.



Recently hatched larva (above)
Older larva, (below)



Green chrysalis (above left) and a transparent chrysalis (above right)



Newly emerged adult monarch (above left) and adult with wings partially expanded (above right)

SETTING UP YOUR CLASSROOM PROJECT

Suggested Equipment

1. Knife or scissors (to cut milkweed)
2. One large plastic margarine tub or equivalent to collect caterpillars.
3. One small plastic margarine tub for display
4. One cup of fine pea gravel or aquarium gravel
5. An aquarium or large container.
6. One empty gallon milk jug (for collecting milkweed).
7. A small stick or dowel to glue chrysalides to (optional)
8. Compass to record direction of flight of released adults.



Completed Monarch Display

Finding Caterpillars

The first step in a successful monarch caterpillar hunt is to find a patch of milkweed. Small isolated patches are often more productive than large ones as passing monarchs have fewer choices. An isolated plant growing along a roadside may host several eggs or caterpillars. Monarchs will usually lay their eggs on new lush, green shoots as opposed to older less healthy looking plants. The caterpillars are usually easy to see as their bright colors contrast boldly with the green leaves.



Common Milkweed in Bloom

Collecting Caterpillars

Your large plastic tub will be used to house your caterpillars for the journey from the milkweed patch to the classroom. Cut some small holes in the lid for ventilation. Cut a short section of milkweed and place it in the tub. **Do Not Add Water**, as caterpillars are poor swimmers!

Pluck the caterpillars from the plants by hand, or take the leaf the caterpillar is feeding on. Place the caterpillars in the large tub and secure the lid. One or two will be enough for the children to observe the life cycle. A dozen will enable the class to collect some useful data and draw some conclusions.

NOTE: If you need more, show the ones you have to your students and encourage them to look for more after school. A compliment from the teacher or a free sticker is usually the only motivation they need. I knew one teacher who paid a quarter for each monarch caterpillar students brought it. It cost her a few dollars every year, but she always had enough!

Setting Up Your Display

Cut several X shaped slits in the top of your small margarine tub. Fill the tub with pea gravel or aquarium gravel. Fill the tub with water and put the lid on tight. Take several fresh milkweed plants and cut them to the correct size for your container and force the cut ends through the X slits in the top of the margarine tub. Place the tub in your aquarium, place the caterpillars on the milkweed and put a lid on the container. The display shown at the upper right corner of this page works well for a classroom.

NOTE: The milkweed plants have to be replaced every two or three days or when they have been eaten.

Milkweed plants collected in the morning on the way to school are less likely to wilt. To collect the milkweed, take a gallon milk jug and cut out the top to create a large opening. Put a couple of inches of water in the bottom. Cut the milkweed stems and thrust them immediately into the container making sure the ends of the stems are submerged. When you arrive at school re-cut the stems to fit your container, put fresh water into the tub and insert the stems as before. Each time you add fresh milkweed, clean the aquarium to remove old caterpillar droppings.

Displaying Pupae (chrysalides)

The caterpillars will often, but not always wander from the food plant before they pupate. In a display container they usually attach themselves to the top where they are sometimes difficult to observe. If this happens, they can be moved. Allow the emerged chrysalis to remain in its original location for 24 hours to harden. Then with a pair of tweezers carefully tease the silk attachment away from the surface to which it is attached. Place a stick or dowel onto a flat surface. Dab a drop or two of rubber cement onto the stick. Press the silk of the chrysalis into the glue and allow it to harden for several minutes. Once the glue is set the stick can be picked up and suspended horizontally in the display. Identify each individual chrysalis by gluing an identifying number or letter next to it

Chrysalis on right showing silk attachment



Recording Data

The class can record the dates the caterpillars pupate, the dates the adults emerge, and the sex of each. Flight direction of the released butterflies can be recorded to see if they tend to fly to the south or southwest.

Releasing the Adults

Most adults emerge from their chrysalides in the morning, so the class will be able to witness the entire event. They should be ready to fly by the end of the school day. They usually rest with their wing folded together above the body. Grasp the closed wings between your thumb and first finger. Place the butterfly outside on a leaf or tree branch or a piece playground equipment. Wait for them to fly (which will probably occur in a minute or two unless the weather is cold or wet). Or you may want to have the students stand in a circle to represent the points of the compass. Stand in the middle and release the butterfly and record the direction of flight.

Other Interesting Facts

Males are identified by a raised, black spot on the third vein of the upper side of the hind wing. Females lack the spot and tend to have wider dark veins. Monarch adults and caterpillars are brightly colored to advertise their poisonous nature. Toxic substances they absorb from the milkweed plant make them equally toxic to most vertebrates. They sicken but do not kill predators. From this bad experience they are avoided in the future.



This is a great first of the year project for the elementary classroom, providing something alive and exciting in the room for the first day of class. This initial excitement and interest will carry over to other science projects throughout the school year and beyond.

The monarch picture in the lower left corner of this page is courtesy of **“Monarchs in the Classroom,”** a program sponsored by the University of Minnesota. Contact them for more information.