FAIRCHILD Discovery PROGRAM

Symbiosis: Butterflies and Plants
Pre- and Post-Visit Activities
Grades 3-5

FTBG Fairchild Tropical Botanic Garden

Welcome!

Dear Teacher:

Thank you for planning a field study at Fairchild Tropical Botanic Garden. The tour you have selected, **Symbiosis: Butterflies and Plants**, is designed to teach students about butterflies and their symbiotic relationship with plants. This multi-disciplinary unit features activities that incorporate art, science, and language arts to provide teachers and students a foundation in ecology and raise environmental awareness. An introduction to mapping and GPS is also included, as students will be using maps, compasses, and GPS units to navigate the garden during their visit.

Included in this document is a packet of activities. It can also be found online at: http://www.fairchildgarden.org/education/schoolprograms/discoveryprogram/. **This packet contains pre and post-visit resource materials to support and strengthen the learning experience. We encourage you to implement pre-visit activities as they will enhance and prepare students for the field study.**

Using pre-visit activities allows students to learn the vocabulary and key concepts. It also gives students time to think about what they will be learning during their field study and to start to formulate questions. Post-visit activities allow students to integrate, reflect, process and deepen their learning experience. The lesson plans correlate with the Next Generation Sunshine State Standards. **Please be sure that each teacher attending the field study receives an activity packet**. Feel free to make additional copies of this packet as needed.

The word list provided is especially important for students to study prior to their visit. An understanding of the vocabulary will be a great asset in comprehending the concepts discussed during the field study.

We look forward to your visit to Fairchild Tropical Botanic Garden and hope that you and your students will have an exciting and educational adventure.

Kind Regards,

Laura Tellez
Discovery Program Coordinator
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Introduction

There are more than 115,000 different species of butterflies and moths in the world. Sixty species of butterflies have been sighted at Fairchild Tropical Botanic Garden. You can expect to see some of the following species in our garden: Zebra Longwing, Monarch, Swallowtails, Cloudless Sulphur, Gulf Fritillary, Julia, and Atala. Butterfly life spans vary greatly according to species and are dependent on weather patterns and predators; however most butterflies live between 2 days and 11 months after emerging from the chrysalis. It is more common to see butterflies on warm, sunny days, as they are cold-blooded and need warmth and sun to fly.

Butterflies and plants have co-evolved over time and depend on each other for survival. Flowering plants provide butterflies food and shelter: butterflies lay their eggs on the underside of leaves, caterpillars eat the foliage, leaves provide camouflage and protection to butterflies during the pupal stage, and butterflies drink nectar and sometimes pollen from flowers. In return, butterflies help flowering plants to reproduce through pollination. As butterflies drink nectar from flowers, the pollen of one flower brushes onto the butterflies and is then carried to another flower of the same species during the butterflies' visits to various flowers. Once the pollen from one flower is brushed off onto another flower, it is caught on the female part of the flower. The pollen then grows down the pistil to fertilize the ovule, located at the end of the pistil. A fertilized ovule becomes a seed, and the ovary swells up to produce a fruit.

Each species of butterfly has a particular host plant and nectar plant, the former being the plant on which it lays its eggs and caterpillars eat, and the latter being the plant from which butterflies drink nectar. This is why it is extremely important to conserve the native biodiversity of each ecosystem; if a butterfly species loses either its host or nectar plant, it can no longer survive and vice versa.

The native Atala butterfly, once on the brink of extinction, has made a comeback thanks to conservation efforts that preserved its host plant, the Coontie.

Words for a Day at Fairchild

Anther: the pollen-bearing part of the stamen.

Chrysalis: the hard shelled pupa of a butterfly.

GPS: Global Positioning System; a system of satellites, computers, and receivers that is able to determine locations on Earth.

Host Plant: the plant on which a certain species of butterfly lays its eggs, as well as the plant that the caterpillar feeds on.

Landmark: a prominent or well-known object that serves as a guide for navigation.

Life Cycle: the various life stages through which an organism passes in its development.

Metamorphosis: transformation; an abrupt physical change in an animal's body structure from one stage or form to another.

Migration: movement of a group of people or animals from one location to another.

Navigation: the act or science of directing the course of a traveling object.

Nectar Plant: the plant from which a certain species of butterfly drinks nectar of flowers.

Pistil: the ovule-bearing or seed-bearing female organ of a flower, consisting of ovary, style, and stigma.

Pollination: the transfer of pollen from the flower of one plant to the flower of another plant of the same species.

Proboscis: the elongate, protruding mouth parts of certain insects, adapted for sucking or piercing.

Pupa: an insect in the non-feeding, usually immobile, transformation stage between the larva and the adult.

Satellite: a device launched to orbit the Earth that collects scientific information.

Stamen: the pollen-bearing organ of a flower, consisting of the filament and the anther.

Stigma: the part of a pistil that receives the pollen.

Pre-visit Activity 1:
The Life Cycle of the Butterfly

Objectives
Students can list and describe the 4 stages of the butterfly life cycle.

Next Generation Sunshine State Standards:
SC.3.N.1.1, SC.3.N.1.6, LA.3.1.6.1, LA.3.5.2.1, SC.4.N.1.1, SC.4.L.16.4, LA.4.5.2.1, LA.4.5.2.4, SC.5.L.17.1, LA.5.5.2.1

Materials
- Life Cycle Coloring Worksheet

Procedure
1. Explain to the students that butterflies go through a "life cycle", which consists of four life stages: egg, caterpillar, chrysalis, and butterfly.
2. Using a visual depiction of the life cycle, ask students to explain what happens at each stage.
3. Make sure students understand that butterflies lay their eggs on a specific host plant which is the plant the caterpillar will eat once it hatches from the egg. Caterpillars simply eat and store energy, while butterflies drink nectar, mate, and reproduce. Once full grown, a caterpillar will turn into a chrysalis to undergo a metamorphosis to change into a butterfly.
4. Hand out Life cycle Worksheets and have students label the different life stages of the butterfly and color in the pictures.
5. Proceed to the second part of this activity titled: **Butterfly Life Cycle Mobile Craft Activity.**

Vocabulary

Adult - the winged adult which will mate and reproduce. Adults do not eat, they only sip liquids through a straw-like proboscis.

Caterpillar - (also called larva) this stage hatches from the egg. The caterpillar spends its time eating, growing and molting (shedding its outgrown exoskeleton).

Chrysalis- (also called pupa) the stage in a butterfly's life when it is in an enclosing case and undergoes **metamorphosis** into the adult, winged form.

Egg - laid by a female butterfly, usually on the underside of leaves; they hatch into caterpillars (larvae).

Name _____ Date _____

Butterfly Life Cycle

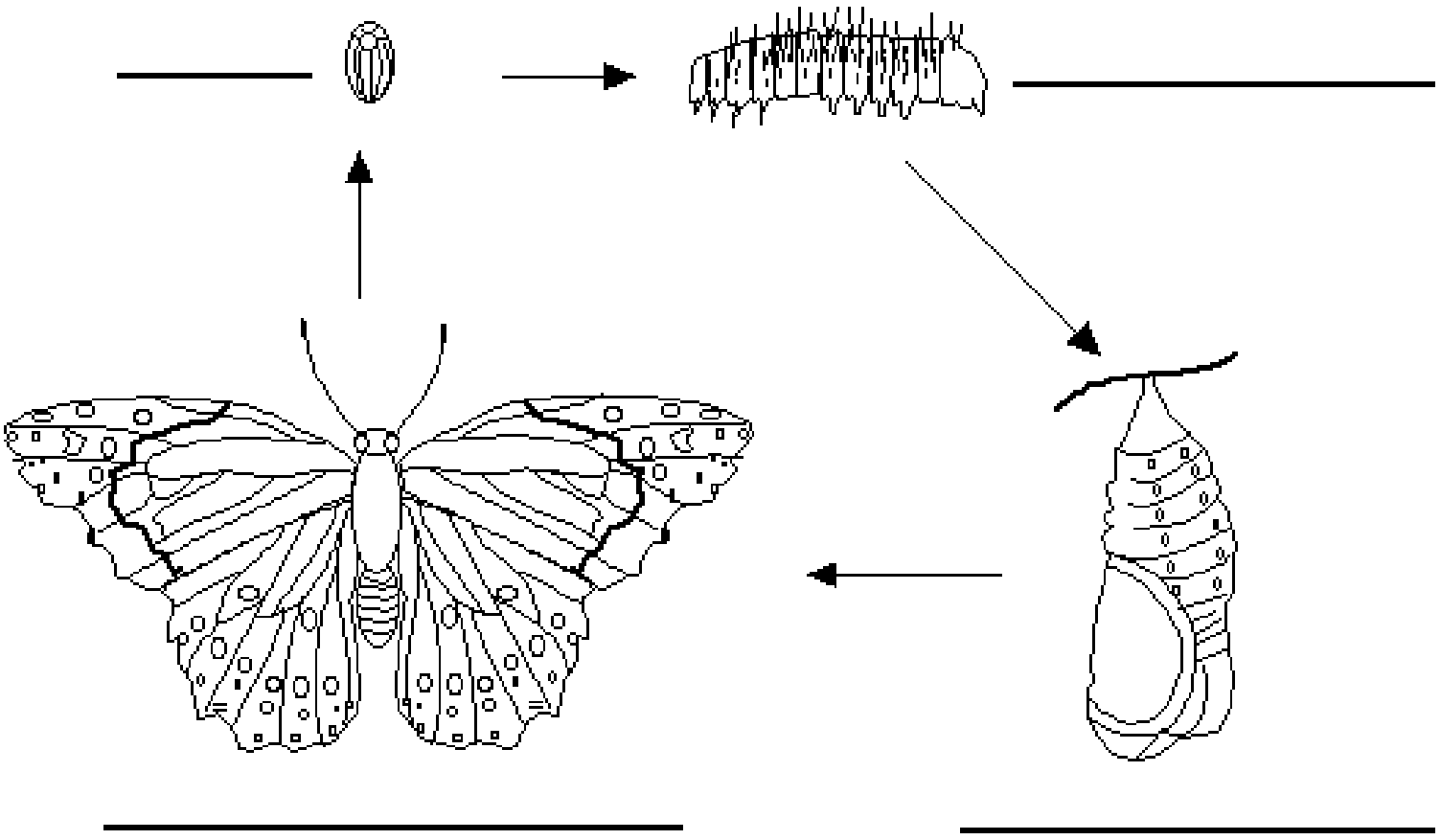
Label each life stage of a butterfly's life cycle using the words below. When you are finished, color in the images.

Adult - the winged adult which will mate and reproduce. Most adults do not eat, they only sip liquids through a straw-like proboscis.

Caterpillar - (also called larva) this stage hatches from the egg. The larva spends its time eating, growing and molting (shedding its outgrown exoskeleton).

Chrysalis - (also called pupa) the stage in a butterfly's life when it is in an enclosing case and undergoes metamorphosis into the adult, winged form.

Egg - laid by a female butterfly, usually laid on the underside of leaves; they hatch into caterpillar (larvae).



Source: Enchanted Learning, Label Butterfly Life Cycle, www.enchantedlearning.com

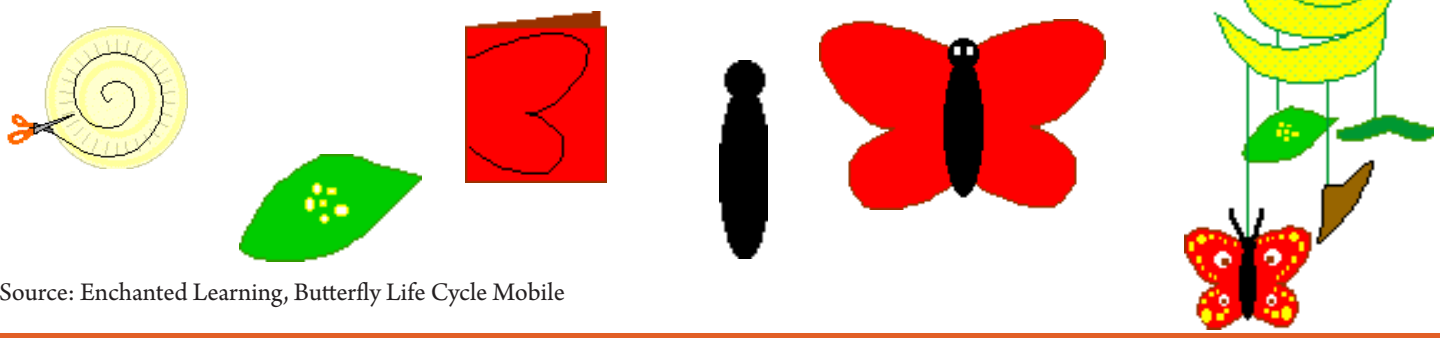
Butterfly Life Cycle Mobile Craft Activity

Materials

- Many colors of construction paper
- Pencils, markers, crayons, or paint
- Scissors
- Yarn or string
- Glue stick
- Sturdy paper plate
- Stapler or tape

Procedure

1. Explain to the students that they will create a mobile that will illustrate the butterfly life cycle. Explain that the egg hatches into a caterpillar, which spends its life stage eating leaves and storing energy. The caterpillar then creates a protective case around itself and attaches itself to the underside of a leaf to turn into a chrysalis. During that time, it undergoes metamorphosis. It hatches from the chrysalis and turns into a butterfly.
2. Draw a spiral on a paper plate. Cut along the line.
3. Decorate the paper plate using markers, crayons, or paint.
4. Using green construction paper, draw a leaf and cut it out. Either draw tiny butterfly eggs on it or glue on tiny paper circles. A cluster of butterfly eggs is usually laid on the underside of a leaf. Most eggs are white, yellow or greenish, and have a circular to oval shape.
5. Draw, decorate and cut out a caterpillar.
6. Draw, decorate and cut out a pupa.
7. To make butterfly wings, fold a small piece of paper in half, and draw half a butterfly along the fold line.
8. Using dark paper, make a long oval with a circular head for the body for your butterfly.
9. Glue the body to the wings and decorate your butterfly.
10. Staple or tape the stages in the butterfly's life cycle to string and then to the paper plate.
11. Attach another short length of string to the plate; it will be used to hang the mobile up.



Source: Enchanted Learning, Butterfly Life Cycle Mobile

Pre-visit Activity 2:
Anatomy of Butterflies & Caterpillars

Objectives
Students can identify the various anatomical parts of a butterfly. Students understand the function of each anatomical part.

Next Generation Sunshine State Standards: SC.3.N.1.1, SC.3.N.1.6, LA.3.1.6.1, LA.3.5.2.1, SC.4.N.1.1, SC.4.L.16.4, LA.4.5.2.1, SC.5.L.17.1, LA.5.5.2.1

Materials
- Anatomy of a Butterfly Worksheet

Procedure
Hand out the Anatomy of a Butterfly and the Anatomy of a Caterpillar Worksheets to students and have them label the anatomical parts of the butterfly and caterpillar, using the definitions as a resource.

Microscopic View of a Monarch Butterfly

Did You Know?
- Butterflies taste with their feet.
- Butterflies can see UV light that humans cannot see, and some flowers have "honey guides", or bull's eye-type patterns that show the butterfly the path to the flower's nectar, which are only visible to butterflies.
- Some caterpillars grow to about 27,000 times the size they were when they hatched from the egg.
- Butterfly wings are composed of scales, which are stacked in a way to reflect light to portray color and iridescence.

Images clockwise from top: Monarch Butterfly, taken under electron microscope; flower, taken under UV light to illustrate honey guide; butterfly wing scales, taken under electron microscope.

Name _____ Date _____

Anatomy of a Butterfly

Read the definitions and label the diagram below.

Abdomen - The abdomen is the segmented tail area of an insect that contains the heart, trachea (breathing tubes), reproductive organs, and most of the digestive system.

Antenna - An antenna is a sensory appendage that is attached to the head of adult insects. Antennae are used for the sense of smell and balance. Butterflies have two antennae with small clubs at the end.

Compound Eye - Insect compound eyes are made up of many hexagonal lenses.

Forewing - The forewings are the two upper wings.

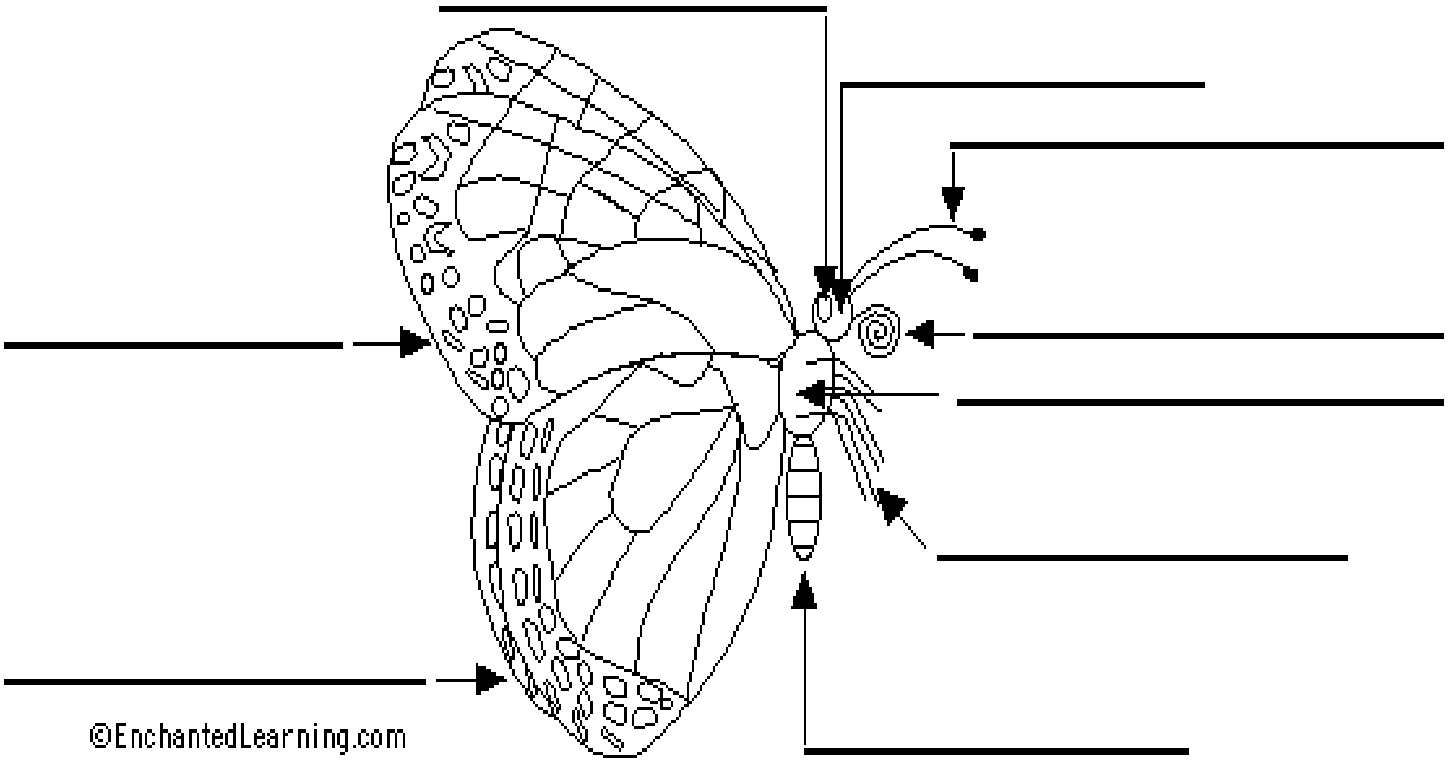
Hindwing - The hindwings are the two lower wings.

Head - The head is the part of the insect that contains the brain, two compound eyes, the proboscis, and the pharynx (the start of the digestive system). The two antennae are attached to the head.

Leg - Adult butterflies and moths have six legs. The two forelegs of some butterfly species are tiny.

Proboscis - Adult butterflies sip nectar using a spiral, straw-like proboscis located on their head.

Thorax - The thorax is the body section between the head and the abdomen to which legs and wings attach.



Source: Enchanted Learning, Label the Butterfly, www.enchantedlearning.com

Name _____ Date _____

Anatomy of a Caterpillar

Read the definitions and label the diagram below.

Abdomen - the tail area of a caterpillar that contains the heart, circulatory, reproductive organs, and most of the digestive system.

Abdominal Prolegs - stumpy legs located on the abdomen.

Anal Prolegs - stumpy legs located at the end of the abdomen.

Head - the part of the caterpillar that contains the brain, eyes, mouthparts.

Mandibles - the jaws, located on the head.

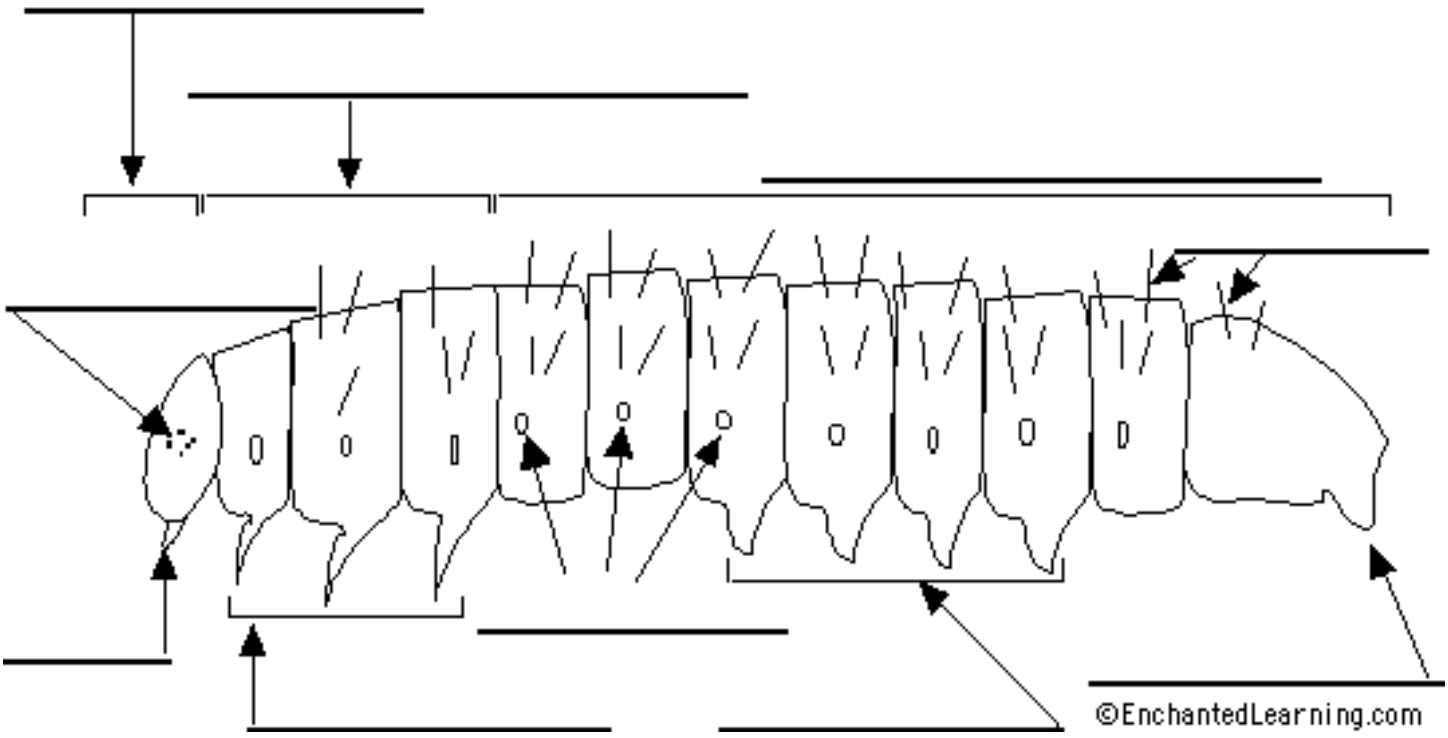
Setae - hairs along the caterpillar's body that sense touch.

Simple Eyes - organs on the head that can detect light and dark.

Spiracles - tiny holes along the caterpillar's body that it uses to breathe.

Thoracic Legs - six jointed legs on the caterpillar's thorax.

Thorax - the body section between the head and the abdomen.



Source: Enchanted Learning, Label the Caterpillar, www.enchantedlearning.com

Post-visit Activity 1:
Scent Trails

Objectives

Students understand how butterflies and moths use their sense of smell to find and recognize each other.

Next Generation Sunshine State Standards: SC.3.N.1.1, SC.3.N.1.6, LA.3.1.6.1, LA.3.5.2.1, SC.4.N.1.1, SC.4.L.16.4, LA.4.5.2.1, LA.4.5.2.4, SC.5.L.17.1, LA.5.5.2.1

Materials

Cotton balls; 5 blindfolds; one or more essential oils (mint, orange, sage, etc.)

Introduction

1. Ask your students, "How do you think butterflies and moths find mates?" Keep in mind that butterflies are active during the day and moths are active during the night. Listen to their responses.
2. Ask them to tell you the main differences between butterflies and moths. We learned that most butterflies have club-shaped antennae, are often brightly colored, and active during the day. We also learned that most moths have feathery antennae, are often duller in color, and active at night. Many butterflies rely on bright display colors for mating rituals and courtship.
3. Ask your class what body part butterflies and moths use to smell.
4. Ask them how they think moths fly at night and butterflies that live in dimly lit forests find mates. It is too dark to see colors well so how do you think they find each other? Female moths and some species of butterflies produce large amounts of pheromones, a kind of chemical perfume. Males use their antennae to detect the pheromones of potential mates from great distances.
5. Ask your class if they think it would be hard to find something or someone using only smell.
6. Tell the class that they are going to see if they can follow a "pheromone" trail as well as a moth.

Procedure

1. Clear a large space in the classroom.
2. Break the class into groups of five.
3. Have the first group form a line at one edge of the clearing.
4. Place a blindfold on each of the children in the first group.
5. Tell them that you are going to put down a trail of scented cotton balls and that they will have to follow the scent to the end of the trail.
6. Place the cotton balls down about a foot or two apart in a winding trail to the other side of the room. Make sure to spray each cotton ball with the scented spray.
7. Tell the group of five that they will go one at a time and when they think that they have reached the end of the trail they can take off their blindfold.
8. Begin the game.
9. When the first group of five is done place blindfolds on the second group of five.
10. While the next group is blindfolded rearrange the trail so that the next group will not know what it looks like.
11. Repeat steps 6-10 until all the children have had a turn.

Adapted from "Following a Scent Trail," Florida Museum of Natural History, www.flmnh.ufl.edu

Post-visit Activity 2:
Design Your Own Flower

Objectives
Students understand the symbiotic relationship between pollinators and plants. Students understand adaptations among plants and animals. Students can articulately describe their ideas.

Next Generation Sunshine State Standards: SC.3.N.1.1, SC.3.N.1.6, LA.3.1.6.1, LA.3.5.2.1, SC.4.N.1.1, SC.4.L.16.4, LA.4.5.2.1, LA.4.5.2.4, SC.5.L.17.1, LA.5.5.2.1

Materials
- Colored pencils, crayons, or markers
- Paper

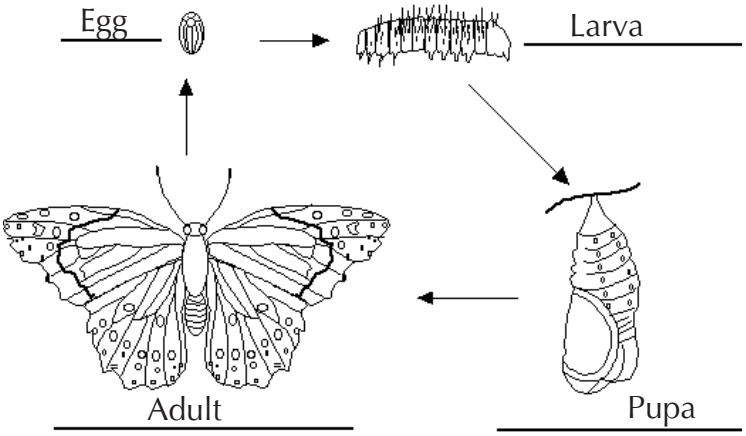
Procedure
1. Break students into pairs.
2. Write the following questions on the board:
   - What is your favorite color?
   - What is your favorite shape?
   - What smells good to you?
   - What is your favorite snack?
3. Have pairs of students interview each other using these questions.
4. When finished, ask students to imagine that they are flowers, adapting to their partner's preferences.
5. Tell students that they will create a designer flower that suits their partner's preferences using art materials.
6. Have students draw their flowers and explain their adaptations.

Images: Top: Bird of Paradise
Left: purple passionflower

Adapted from "Plants and Animals: Partners in Pollination," *Smithsonian in the Classroom*

Answer Key

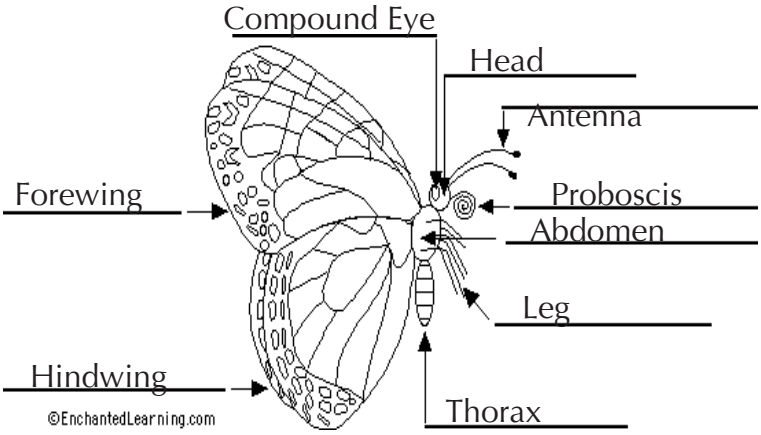
Butterfly Life Cycle Worksheet:



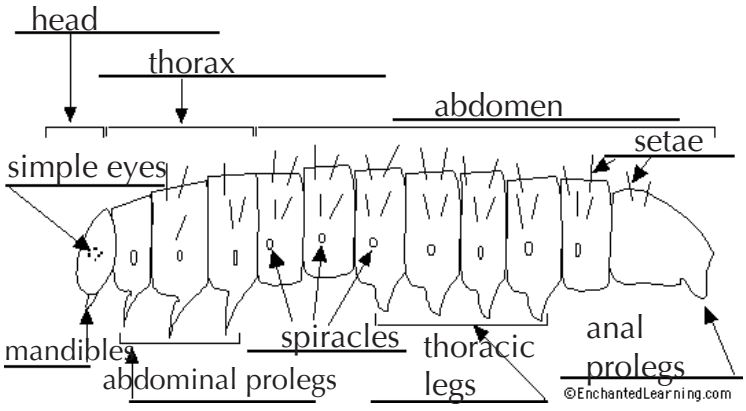
Butterfly vs. Moth Worksheet:

1. butterfly
2. moth
3. moth
4. butterfly
5. moth
6. moth

Anatomy of a Butterfly Worksheet:



Anatomy of a Caterpillar Worksheet:



Anatomy of a Flower Worksheet:

1. stigma
2. ovary
3. petal
4. anther