



FIELD TRIP

Life Cycles

Theme

Plants and animals respond to changes in the seasons in unique and fascinating ways

Utah State Core Curriculum Topics

Standard Four- Life Science: Students will gain an understanding of Life Science through the study of changes in organisms over time and the nature of living things.

Objective Two: Observe how living things change and depend upon their environment to satisfy their basic needs.

Suggested Field Trip Location

Moonflower Canyon, Courthouse Wash

Times

All lessons are 30 minutes

Science Language Students Should Use

Egg, larva, pupa, adult, antennae, proboscis, metamorphosis, amphibian, insect

Background

Plants sprout from seeds, grow, and produce flowers, which, if pollinated, produce more seeds. Plants need sun, soil, and water in order to make their own food and grow. Insects, hummingbirds, and bats inadvertently pollinate flowers while seeking nectar. Some plants, such as coniferous trees, rely on wind to distribute pollen.

Insects are an extremely diverse group of animals. They have exoskeletons, six legs, and three body parts. Although most insects have two pairs of wings, flies have only one pair and some have no wings at all. Wings are only found in adult insects. Most insects have a pair of some type of antennae. These and the tiny hairs sticking out of insect exoskeletons help the insects to feel, smell, and in some cases, hear. A simple heart pumps insect blood through its body cavities, distributing dissolved food and removing wastes. Because the blood does not carry oxygen, it is not red.

Insects undergo either complete or incomplete metamorphosis throughout their life cycles. Insects going through incomplete metamorphosis have three stages: egg, nymph, and adult. Nymphs often look like miniature adults, such as in grasshoppers, cockroaches, and aphids. However, some nymphs live in the water and look different than the adults. Examples include damselflies, dragonflies, and mayflies. Insects going through complete metamorphosis have four life cycle stages: egg, larva, pupa, and adult. Examples are butterflies, moths, flies, ants, wasps, and beetles. Larvae look completely different than their adult forms. Some larvae are aquatic and others are land-dwellers. A cocoon is a pupal case for a moth. A chrysalis is a pupal case for a butterfly.

Butterflies and moths experience complete metamorphosis. All of the parts of a butterfly are adapted for survival. The abdomen of the

butterfly is large when it first emerges from its chrysalis. It becomes smaller when it starts pumping fluids into its wings. In all its stages the butterfly breathes through tiny holes called spiracles. Wings are covered with millions of colored scales that camouflage the butterfly. The butterfly's proboscis (i.e. tongue) is used to sip nectar from flowers. The butterfly's compound eyes are made up of thousands of tiny lenses that help it see in all directions at once. Moths have different features than butterflies. Both butterflies and moths have both a fore and an aft wing on each side of their bodies. Among most moths, the aftwing is attached to the forewing by a hook, called a *frenulum*. Butterflies lack a frenulum and only hook their wings together in flight. Moths are nocturnal; butterflies are diurnal. Most moths rest with their wings flat; most butterflies rest with their wings upright. Moths have feathered antennae; butterflies have straight plain antennae. While a moth's abdomen is fat, the butterfly's is thin. Moths form cocoons; butterflies form chrysalises.

Galls are temporary homes for some insects. They form when an insect chews on and injects a chemical into a plant, causing a swelling. Each species of gall-making insect has its own special species of plant that it must choose, or its specific gall will not form. The variety of sizes and shapes that galls take is impressive. Oak apples, bumps and lumps on hackberries, swellings on cottonwoods, cottony balls on rabbitbrush, and cone-like growths on Utah juniper are all types of galls, each created by one insect species.

Each type of gall has its own story, but many house and feed the larva and pupa of a certain insect. The larva is commonly legless and blind, as its stage of the life cycle is contained within its food source, the gall's interior. Most gall-forming insects are small flies or wasps, but certain aphids, moths, beetles, and psyllids are also gall-formers.

Amphibians are animals that lead two lives. When they are young, amphibians are specifically adapted to living in the water. They use gills to breathe and use their tails to help them swim. As adults they walk or hop on land and use lungs to breathe. In the spring, frogs and toads lay a mass of eggs and attach this mass to rocks or sticks. The hatched tadpoles eat mostly bacteria and algae. The length of time an amphibian spends in this larval stage depends on the species. A bullfrog can take over a year to undergo metamorphosis; a spadefoot toad can change in less than two weeks. Eventually, however, most amphibians grow legs, lose their tail, grow lungs, and lose their gills. They begin to eat insects rather than plants and spend their time on land. Frogs and toads are not scientific distinctions. Rather, they are common terms used to describe either adult amphibians that have smooth skin and spend most of their time near water (frogs) or fatter adults with bumpy skin that spend most of their time away from water (toads). Other amphibians include salamanders and caecilians.

Red-spotted toad



Wow! Things Change

Objectives

Students will be able to:

- a. Name at least one example of changes that plants go through during their life cycles.
- b. Name one example of a change that animals go through during their life cycles.
- c. Identify the purpose of seeds in the plant life cycle.

Materials

Butterfly puppet; *The Tiny Seed* (Carle, 1987); *What Did I Look Like When I Was a Baby?* (Willis, 2000); bullfrog song lyrics for projector.

PROCEDURE

1) Write “Changes in Plants and Animals” on the board. Have the whole class help you read what is written and tell students that they are going to be learning about these changes. Bring out the butterfly puppet and have the puppet ask students what they know about changes that animals go through during their lives. Then, ask how plants change. Ask students what might prompt an animal or plant to change (temperature, seasons, life stages).

2) Read the book *What Did I Look Like When I Was a Baby?*

Ask the students if they would like to sing the bullfrog song. Place the words under the document camera and hand out copies to the students. Have the students sing along as you point to the words. Or you can sing the song as a call and a response song.

3) Set the stage for reading a book about how plants change during the course of their lives. Remind students that illustrations often add to the information in a book. Show the book, and ask students to “read” the illustrations. Pose questions while reading:

- What season is it? How do you know?
- Is it Windy? What is happening to the leaves on the trees?
- Is it hot or cold? How do you know?

Summarize or wrap-up the book by discussing the purpose of seeds.

4) Ask students what season it is. Stress field trip expectations and that weather can change quickly this time of year. Then go through what students need to bring on their field trip.

Moth in Devils Garden



Season Suite

Objectives

Students will be able to:

- a. Describe the parts of a wildflower life cycle.
- b. Name the four seasons, and describe their influence on a wildflower life cycle.

Materials

“Spring Defeats Winter” (Caduto & Bruchac, 1988, 129-132); “Season Suite” (Caduto & Bruchac, 1988, 132-133); name tags (sun, bee, wind, raincloud, flowers); one-quart squirt bottle; pollen shaker; fan; small flashlight.

EXTENSION

Have students interview each other to discover the details of the wildflower cycle and the effect seasons have on the cycle

Coordinate students in creating a classroom wildflower cycle display using construction paper or other materials.

PROCEDURE

- 1) Read “Spring Defeats Winter” to students. Discuss the story, asking students if Young Man Spring defeats Old Man Winter every year. Ask students to identify the four seasons and what their favorite season is. Discuss the changes that occur during the seasons including: changes in temperature, day length, animals and plants.
- 2) Ask students what season they think it is now and go on a brief search for signs of spring in the plants. Look at wildflowers or, if it is earlier, young sprouts and leaf buds. Relate these discoveries to the season.
- 3) Tell the students that they will be acting out a story of the changes that a wildflower goes through during the different seasons. Assign and explain parts, and set limits on the use of props. The *Sun* will radiate energy and shine light with the flashlight onto the plant. *Raincloud* gives each flower three squirts on their roots with the spray bottle when it rains. The *Bee* will have a pollen shaker (flour) to pollinate the flowers. The *wind* will use the fan to blow the raincloud around the stage and to shake the seeds of the flower loose. The rest of the students are *wildflowers*.
- 4) Rehearse the play at least once. You may choose to rehearse it several times and then perform a final show for a parent or teacher, or you may choose to repeat the play a few times with students switching roles. Prompt students about what comes next as you narrate the play.

Swim, Swim and Hop a Lot

Objectives

Students will be able to:

- a. Describe the stages of the amphibian life cycle.
- b. Describe why frogs sing in the night.

Materials

Frog puppet; *Merry Metamorphosis Poem*; poster of frog stages; pictures of frogs at various stages; pictures of local frogs and toads with interesting information; frog call identifier; frog vs. toad poster.

PROCEDURE

- 1) Tell the students that you have a friend who is going to help you teach this station. Bring out the frog puppet. Ask if students know what type of animal Freddy is? Briefly discuss difference between frogs and toads. Tell the students that they are going to be learning about frogs. Have the puppet ask the students what else they might know about frogs. Ask the students if they can tell you what an amphibian is. Tell the students that amphibians are animals that go through big changes in their lives. Use the frog stage poster to describe the stages and emphasize the environmental needs for each stage.
- 2) Ask the students to gather in the center of the circle in a clump. Tell the students that they are going to act out the frog life cycle (adapted from Lingelbach, 1986, 63-65). Give students the specific boundaries of their pond. Have the students listen carefully, as you will be reading a poem and giving directions. Read and act out *Merry Metamorphosis*.
- 3) Have the students sit in a circle. Show the students a picture of a frog at some point in its life cycle. Have the students name the life stage of the frog in the picture you are showing; i/e egg, tadpole, adult. Repeat 5-10 times with various pictures.

4) Ask students what stage frogs and toads might be in at this time of year. Ask them where they might find frogs at this stage? Investigate their answers by exploring the stream bank for signs of frogs or toads.

5) Show students pictures of local frogs and toads, tell the group one or two cool facts about each frog, and play the sound they make. Have students imitate that sound. Give a picture to each student to hold so that they can be that frog and make that sound.

6) Ask students if they have ever heard frogs singing at night. Ask the students why they think the frogs might be singing. Discuss how calls help frogs find each other and tell students that often after it rains all the frogs come out and sing so loud that it sounds like a frog chorus. Tell the students they are going to form a frog chorus and perform for their parents. Arrange students in a line and play each one a unique frog noise to practice. Once everyone has a noise, have the adults gather around and have the students perform their songs all at once (Adapted from *Let's Hear it for Herps*, 1987, 26).

Flutter By

Objectives

Students will be able to:

- a. Describe the life cycle of a butterfly.
- b. Name two differences between butterflies and moths.

Materials

The Hungry Caterpillar (Carle, 1969); complete metamorphosis puzzle; lifecycle obstacle course signs; butterfly model; moth model, pictures of butterflies, compound eye scopes.

PROCEDURE

1) Tell students that lots of insects grow into adults by going through complete metamorphosis. Give each student a puzzle piece and ask the students to put together the complete metamorphosis puzzle. Act out each of the stages with the students.

2) Have students get comfortable and read them *The Hungry Caterpillar* by Eric Carle. If time, you can have the whole group read the story together. Many of the students will be familiar with the book, so rather than focusing on the story, concentrate on discussing the stages of the caterpillar's metamorphosis.

3) Tell students they are going to go through a butterfly lifecycle obstacle course (adapted from earthsbirthday.org). Tell students they are going to travel in a single-file line and follow the instructions on the signs through the course. At each sign, read the instructions aloud and have all students act out the instructions as they travel to the next sign.

4) Use pictures, butterfly and moth models and compound eye scopes to discuss several body parts and how the parts help the butterfly/moth to survive in different environments. Show students pictures of some moths and butterflies they might see around Moab.

Legs- Butterflies can taste flower petals with their feet so they know where to lay eggs

Antennae- Used to smell the air and help them find flowers or other butterflies

Compound eyes- Made of lots of small lenses so they can see in all directions

Proboscis- Acts like a straw, butterflies use it to reach into flowers and suck out nectar

Wings- Design can camouflage and even scare away predator (e.g. eye spots)

5) Explain the four things butterflies spend their lives doing and the actions that they are going to use to act them out. Play a few rounds of Butterfly Says (similar to Simon Says adapted from Clover Kids).

Bask in the Sun- Because butterflies are cold blooded they must spend time absorbing heat from the sun. Have students stand with their arms outstretched.

Sip Nectar- Butterflies eat by sipping nectar or other liquids through their proboscis. Have students hold their hands to their hand to their mouth with one finger outstretched and make a slurping sound.

Drink Water- Male butterflies sip water and salts from puddles. Have students hold hands to mouth like a proboscis and kneel down to the ground.

Dance- Butterflies perform a mating dance to attract a mate. Have students dance.

Life Cycle Obstacle Course Signs

Sign 1: Place in a sandy area underneath trees. “Egg- curl up small like an egg. Pretend to hatch and crawl to the next sign.”

Sign 2: Place in the shrubs. “Creep and Crawl- Crawl like a caterpillar through the plants. Pretend to eat the leaves.”

Sign 3: Place in an area with high branches. “Just Hanging- 1. Stand and clasp one of the branches like a pupa 2. Count to 20 3. Hatch and fly away.

Sign 4: Place in an open area. “Flower Power- Flap your wings and fly around sipping nectar.

What Gall!

Objectives

Students will be able to:

- a. Identify galls and see differences between different types of galls.
- b. Describe the different stages of complete metamorphosis.

Materials

Complete Metamorphosis poster; variety of galls; adult gall insect posters; bug boxes; "Gall Fantasy" (Lingelbach, 1986, 87); volleygall; gall poem.

Note

Before the station, cut open one fresh rabbit brush gall and put in bug box so students can view larva inside.

PROCEDURE

- 1) Tell students that you are going to be discussing insects. Have them name some insects. Ask students if insects look the same throughout their lives. Using the poster, review complete metamorphosis stages emphasizing how different insects look different at every stage.
- 2) Tell students that you are going to be talking about some special insects that use plants to help them in their pupa stage. Use the volleygall to tell them the story of galls including the following points:

*Galls are temporary homes for some insects

*A gall forms when an insect chews on and injects a chemical into the plant, causing a swelling.

*Gall-making insects each have their own special species of plant that they must choose or the gall will not form

*Each kind of gall insect causes its own specific type of gall to form. Show students cards with specific plant galls and corresponding insects.

*A gall is a source of food, usually for the larval stage of an insect. In your explanation of a gall's purpose, use the analogy of a child stuck in a gingerbread house in a very cold, snowy place for the winter, eating the inside of the house for food and keeping warm in the house.

3) Have students examine the galls in the gall box, noticing color, shape, size, texture, where it grows, and if and where there are holes in the galls. Then, have students examine the pre-cut gall, with an insect in its grub-like larval stage. Have them look, too, for how much of the gall's interior has been eaten by the host larva. Students may see insect invaders or invasion holes in the gall. Show students corresponding pictures of adult insects.

4) Go on a gall hike and look for galls growing on different plants. Hike back by having students hike silently and count how many galls they saw.

5) Read "Gall Fantasy" and have students follow/act out the guided imagery.

6) Read Gall poem and review the life stages emphasizing which stage an insect is inside the gall.

EXTENSION

In small groups, have students create soil that they think would both filter and hold water as well as wetlands soil does. Have each student in a group bring an element (i.e. dead plants, sand, and mud) to mix together. Compare a jug test on the mixture to the wetlands soil jug test. Discuss results and what they could add or take out to make the soil more like wetlands soil.

POST-TRIP ACTIVITY

Cycles, Cycles, Cycles

Objectives

Students will be able to:

- a. Describe the life cycle of a flower.
- b. Name the four insect stages of complete metamorphosis.
- c. Describe the cycle stages of frogs

Materials

Moab wetlands water cycle poster (or draw on board);
unlined paper.

PROCEDURE

- 1) Discuss the field trip with students, emphasizing the various life cycles explored.
- 2) Review the stages in the life cycle of a flower. Show students a picture of each stage of the plant life cycle and have them help you figure out which order they should go in on the board.
- 3) Ask students to stand up, push their chairs in, and stand behind their desks. Tell them that they are going to act out the life cycle of a flower. Have students crunch into a ball to represent seeds. Grow a stem, by standing up. Stretch out and wave their hands to represent leaves. Cup their hands together to form a flower. Form a fist for a fruit, which has seeds that drop to the ground. Have students return to the seed position. Repeat several times getting faster and faster till everyone is laughing.
- 4) Using the butterfly stage cards, review the stages of insect complete metamorphosis by having students act out each stage as you review; egg – small ball, larvae – wiggle like a worm, pupa – hands above their head forming a cone; adult – flap their wings. Then randomly say each stage one at a time. When you say Zap they should all freeze and shout out which stage would come next. Vary the order, and increase your speed.
- 5) Play the Song Metamorphosis in C Major and tell students to pay special attention to which stage the character is in throughout the song. Pause song after each verse and ask which stage they think he is in.
- 5) Using the Frog stage cards, review the stages in the life cycle for an amphibian. Again, ask the students to act them out; egg - curled up in a small ball; tadpole – hands behind like a tail; adult – leaping like a frog. Then, hold up stage cards, one at a time, asking students to act out each card. When you say Zap they should all freeze and shout out which stage would come next. Vary the order, and increase your speed.

EXTENSION

Have students return to their desk and split the class in half. Tell one side that they are tadpoles and the other side that they are adult frogs. When you hold up a description of a body part or environment that their side uses (i.e. a long tail = tadpoles, dry land = adult) everyone on that side should raise their hand. Vary between pictures and descriptions for tadpoles, adult frogs and examples that neither has/needs.

References and Resources

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