



FIELD TRIP

Changes in Plants and Animals

Theme

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

Utah State Science Core Curriculum Topic

Standard Three: Students will develop an understanding of their environment.

Objective One: Investigate relationships between plants and animals and how living things change during their lives.

Field Trip Location

Courthouse Wash in Arches National Park, or anywhere with early to mid-spring growth, pond or stream, and some insect galls (for Station #4). If one of these elements is missing, the corresponding station can be omitted or altered. This is a spring field trip.

Times

All lessons are 30 minutes

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. The wings of a moth are not attached, whereas wings of a butterfly are hooked 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.

Wow! Things Change

Objectives

Students will be able to:

- Name one change that plants go through during their life cycles.
- Name one change that animals go through during their life cycles.
- 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* poster (showing the words to the bullfrog song so kids can sing along. The song is found in the back of the book *What Did I Look Like When I Was a Baby?*)

Procedure

1) Introduce the field trip location, and see if any students have been there before. Write “Changes in Plants and Animals” on the board. Ask for a volunteer to read what is written, and tell students that they are going to be learning about these changes on their field trip. Tell students that you have a friend who is going to help them learn about these changes. Bring out the butterfly puppet. 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, and life stages).

2) 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 raise their hands if they’ve read it before. Read the book *The Tiny Seed*. Encourage students to “read” the illustrations, and 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 warm or cool? How do you know?

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

3) 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. Bring out the *bullfrog song* poster. Have the students sing along as you point to the words.

4) Ask students what season it is. Stress that weather can change quickly this time of year, and then go through what students need to bring on their field trip, drawing the list out from them and adding to it as needed.

EXTENSION

Have students create seed collages from seed catalogs, other sources of seed pictures, or wild seeds collected on a hike.

STATION #1

Season Suite

(Caduto & Bruchac, 1988, 129-133)

Objectives

Students will be able to:

- Describe the parts of a wildflower life cycle
- Name the four seasons, and describe how they influence the 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*); one-quart squirt bottle; extra water bottle; small plastic tub of flour

PROCEDURE

1) Read *Spring Defeats Winter* to students. Discuss the story, asking students if they wanted Old Man Winter to melt the warmth of Young Man Spring, which seasons are their favorites, and what causes the seasons. Ask students to identify the four seasons, and discuss the changes that occur during the seasons. Include discussion of temperature and day length changes, and launch into the subject of how plants change through the seasons. Be sure students know what stage the plants are currently in and what season it is now.

2) Go on a brief search for signs of spring in the plants. Look at wildflowers or, if it's earlier, young, green sprouts of grasses, wildflowers, or shrubs. Relate these discoveries to the season.

3) Tell students 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 materials. The *sun* will radiate energy. *Raincloud* gives each flower two or three squirts with the spray bottle when it rains in the story. The *bee* will have a container of pollen (flour) to pollinate the flowers (with just a small *pinch* of flour). The rest of the students are annual wildflowers. Explain that annuals are plants that grow from a seed each year and make new seeds by the end of the year. Discuss a few examples of plants that are annuals and plants that are not.

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 assuming different roles. Prompt students about what comes next as they perform.

EXTENSIONS

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.

Seedling in biological soil crust



STATION #2

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; pictures of frogs at various stages; pictures of local frogs and toads with interesting information; frog call identifier.

PROCEDURE

1) Tell the students that you have a friend who is going to help you teach this station. Bring out the frog puppet. Tell the students that they are going to be learning about frogs and toads. Ask if any of the students know the difference. Have the puppet tell the students that there is no scientific difference, but that we describe frogs as amphibians with smooth skin that live near water and toads as amphibians that have bumpy skin and live mostly away from water. Have the puppet ask the students what else they might know about frogs and toads. 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. Describe the stages.

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). Have the students listen carefully, as you will be reading a poem and giving directions. Read and act out *Merry Metamorphosis*.

3) Divide the students into two groups. Tell them that students in one group are going to be tadpoles and those in the other group are going to be adults. Show the students a picture of a frog at some point in its life cycle. Tell the students that if they think the picture matches their group, they should raise their hand. If the group is correct, have the group leap frog to a nearby bush and back. This should be repeated 6-10 times with various pictures. When all the pictures have been claimed, have the students arrange them in order on the ground.

4) Show students pictures of local frogs and toads. Describe interesting information about them. Ask the students if they have ever heard frogs singing at night. Discuss how calls attract mates. Ask the students why they think the frogs might be singing. Play a recording from a frog, and ask the group to try and mimic it. Repeat with several different calls. Have each student pick a different call, and play the call for that child to remember. Have everyone make their calls at the same time. Ask for a volunteer who thinks they have good hearing. Pull the volunteer aside, and play one of the calls for him/her. Tell the volunteer he/she needs to find his/her mate by finding the student making the same call (adapted from *Let's Hear it for Herps*, 1987, 26).

5) If there is extra time, scan the stream banks for egg sacks.

Leopard frog



MERRY METAMORPHOSIS

(adapted from Lingelbach, 1986, 65)

(Students stand huddled together hands at their sides swaying slightly.)

If you look closely in a pond
By chance you just may see
A mighty mass of frog eggs
Floating in the water free

Moving with the water
As it ripples here and there
How nice to be a frog egg
Not a worry or a care

As days go on, those frog eggs
Will start to look quite strange
If you look closely in that pond
You're sure to see the change

(Students begin to move apart.)

Coming from that mass of eggs
Are not a bunch of frogs
But rather little tadpoles
Also known as polliwogs

They have no legs to hop with
Or lungs to breathe the air
For they stay under the water
Eating plants that grow down there

(Students move about with their feet together and their hands behind them like a tail.)

They're sort of round up front
Their backs have wiggling tails
They don't look a bit like frog
But more like tiny whales

If you look closely in that pond
And watch them every day
You'll see the tadpoles start to change
In yet, a different way

On each side of that wagging tail
Legs will start to grow
The tadpoles start to use them
For swimming to and fro

(Students move with feet apart, hands still behind them.)

Soon some front legs will appear
And that's not even all
For as they do, you'll notice
The tail will get quite small

(Students wiggle arms in front of them with elbows at their sides.)

The body shapes begin to change
Both inside and out
They breathe with lungs and start to eat
The bugs that swim about

With big hind legs to hop with
And a tail that's gone for good
Those tiny little frog eggs
Now look like they should

(Students assume frog position. take big gulps of air, hop around, and pretend to catch insects.)

For as you look closely in that pond
Or on some nearby logs
You'll see more than eggs and tadpoles
You'll see some baby frogs!

STATION #3

Flutter by

Objectives

Students will be able to:

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

Materials

The Hungry Caterpillar (Carle, 1969); incomplete metamorphosis puzzle; complete metamorphosis puzzle; pictures of different butterflies; *life cycle obstacle course signs*; butterfly model; moth model; pictures of butterflies and moths with their name and information on the back

Note

Set up life cycle obstacle course ahead of time.

PROCEDURE

1) Have students get comfortable and read them *The Hungry Caterpillar* by Eric Carle. Many of the students will be familiar with this book, so rather than focusing on the story, concentrate on discussing the stages of the caterpillar's metamorphosis. Tell the students that there are two ways insects grow into adults: incomplete and complete metamorphosis. Give each student a puzzle piece, and ask the students to put together the incomplete and complete metamorphosis puzzles. Discuss the difference between the puzzles, and ask students which kind of metamorphosis the "Hungry Caterpillar" experienced.

2) Tell students that they are going to go on a lifecycle obstacle course (adapted from earthsbirthday.org). Tell students that they are going to set out one at a time and follow the signs through the course. At each sign, they need to do what the signs tell them as they follow the arrow to the next sign. As the students finish the course, ask them to try to find signs of butterflies, e.g. eggs on leaves, chrysalises, and butterflies.

3) 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).

Basking – Because butterflies are cold blooded, they must spend time absorbing heat from the sun. Have students stand with their arms outstretched.

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

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

Mating Dance – Dance around to attract a mate. Have students dance.

4) Show students a model or puppet of a butterfly. Discuss several of the parts including the abdomen, antennae, thorax, compound eyes, proboscis, wings, and spiracles. Discuss how adaptations of different parts help the butterfly to survive. Bring out a model or puppet of a moth. Examine its body parts, and compare them to the butterfly. Hand out pictures of butterflies and moths to each student. Have the students examine their pictures and read the information on the back. Let each student introduce their butterfly or moth by showing the picture, telling the group its name, whether it is a butterfly or a moth, and something they learned about butterflies or moths.

LIFE CYCLE OBSTACLE COURSE SIGNS

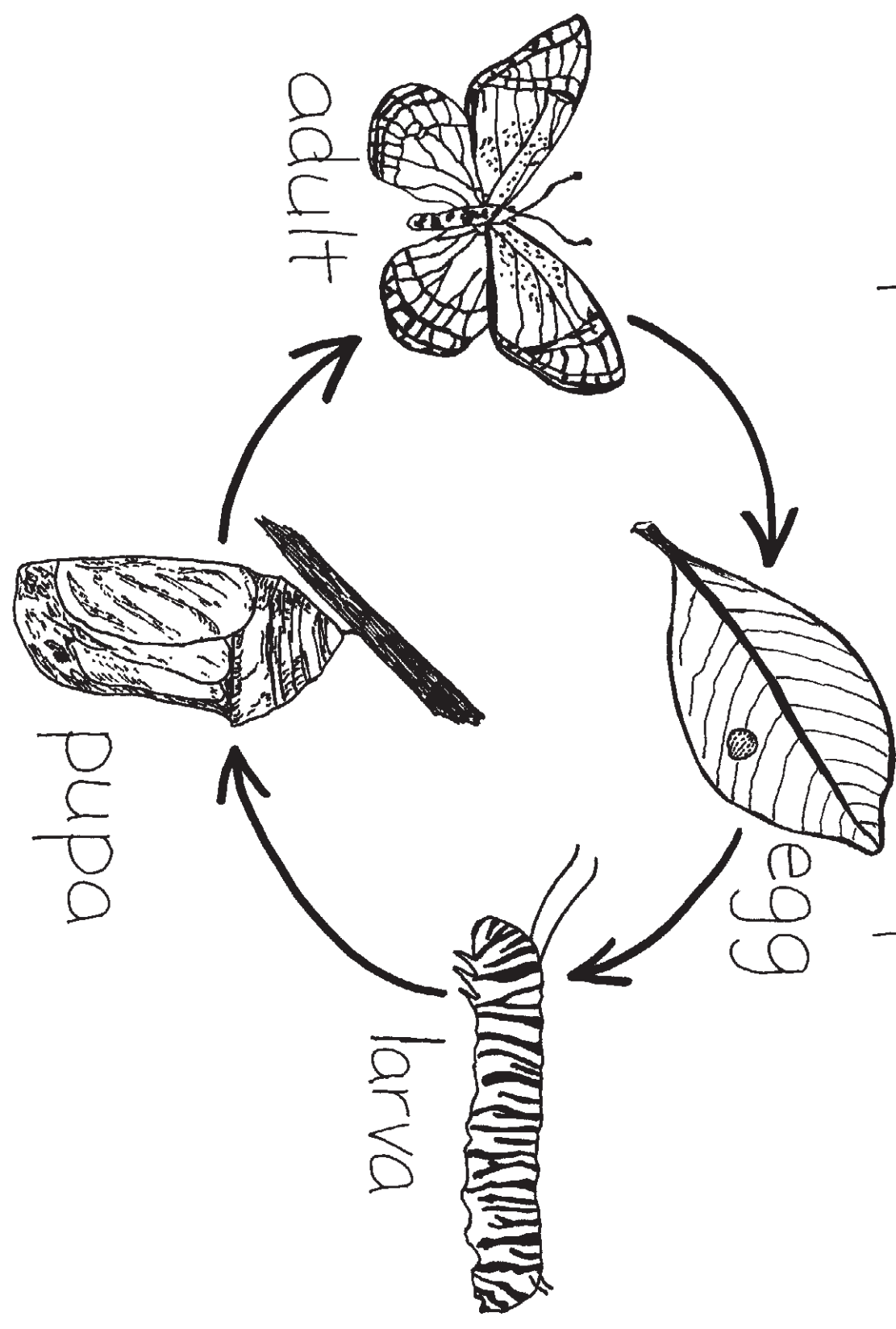
Sign 1. Place in a sandy area underneath trees. "Egg – Curl up small like an egg. Then, pretend to hatch. Crawl to the next sign."

Sign 2. Place in the shrubs. "Creep and Crawl – Crawl like a caterpillar through the shrubs. Pretend to eat the leaves."

Sign 3. Place in area with high branches. "Just Hanging – Stand and clasp one of the branches like a pupa. The pupa shakes because the adult is just about to hatch and is squirming inside to break free. Count to 20. Hatch, and fly away!"

Sign 4. Place in an open area. "Flower Power – Flap your wings, and fly around sipping nectar."

Complete Metamorphosis



STATION #4

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; bug boxes; *Gall Fantasy* (Lingelbach, 1986, 87);

Note

Before the station, put a few of one type of gall such as the cottony rabbitbrush gall into bug boxes. Cut one gall open so students can view larva inside.

PROCEDURE

1) Have students examine the galls in the bug boxes, 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 a gall. Tell them the story of galls, including the following points:

- a. Galls are temporary homes for insects.
- b. Galls form when an insect chews on and injects a chemical into the plant, causing a swelling.
- c. Gall-making insects each have their own special species of plant that they must choose, or the gall will not form.
- d. Each kind of gall insect causes its own specific type of gall to form. Show students a variety of galls.

2) Using the poster, review complete metamorphosis stages. Tell students that 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) Go on a gall hike, and look for galls growing on different plants. On the return, ask children to silently count how many galls they see on the way back to the station site. (This works well where there are a great number of galls this time of year, such as some areas of thick rabbitbrush,

coyote willow, big sagebrush, or Utah juniper.) Have students compare how many galls they found.

4) Read *Gall Fantasy*, and have students follow the guided imagery.

GALL FANTASY

You are about to become tiny, defenseless creatures. Please, very quietly, get your jackets and find a place where you can be protected, but where you can easily hear my voice. Crouch, become as small as you can, put your jacket over your head and be very silent. Close your eyes.

It is fall now, the days are growing shorter and nights are cold. But you can't see the daylight or feel the chill; you are snug in your gall home. You can eat, your food is all around you, warm and dry, and you need only reach out to the nearest wall for food. *Eat*, rest, and *eat* again.

The leaves have fallen, beaten to the ground by gusty winds and pelting rain. You are safe and dry in your gall home. But you are alone and it is dark.

Autumn turns to winter. The snows have come, the ponds are iced, and winter buries food for creatures like you.

The sun is higher now, owls are nesting, streams are thawing, and you are growing bigger. It is warm, the snow is melting, and the sap is running. You sleep your final sleep, deep inside your private gall. The time has come for you to change.

The days are growing longer and warmer. Grass is green and flowers bloom. Your gall home is brown and dry. You feel an urge to stretch and move, stretch and move, and suddenly you are out of your gall, standing tall, soaking in the sunlight, drying your wings. You are an adult.

(Reprinted with permission from *Hands-On Nature: Information and Activities for Exploring the Environment with Children*, 1986. Edited by Jannepher Lingelbach. Vermont Institute of Natural Science, Woodstock, VT 05091.)

POST-TRIP ACTIVITY

Cycles, Cycles, Cycles

Objectives

Students will be able to:

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

Materials

The Reason for a Flower (Heller 1983); *complete metamorphosis* poster; insect metamorphosis stage cards (cards with a name of an insect stage on each); amphibian metamorphosis stage cards (cards with a name of an amphibian stage on each).

PROCEDURE

- 1) Discuss the field trip with students, emphasizing the various life cycles explored.
- 2) Read *The Reason for a Flower* to the students.
- 3) Review the stages in the life cycle of a flower. 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) Review the stages of insect complete metamorphosis, 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 hold up stage cards, one at a time, asking students to act out each card. Vary the order, and increase your speed.

5) 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. Vary the order, and increase your speed.



References and Resources

- Caduto, M. & Bruchac, J. (1988). *Keepers of the earth: Native American stories and environmental activities for children*. Golden, CO: Fulcrum.
- Carle, E. (1987). *The tiny seed*. New York, NY: Scholastic.
- Carle, E. (1969). *The very hungry caterpillar*. New York, NY: Putnum.
- Clover Kids. (n.d.). *Beautiful butterflies*. retrieved July 29, 2003 from www.extension.iastate.edu/4h/clover/butterfliesck
- Earth's Birthday (n.d.) retrieved July 29, 2003 from www.earthsbirthday.org/butterflies.
- Emmel, T. C. (1975). *Butterflies*. New York, NY: Alfred A. Knopf.
- Heller, R. (1983). *The reason for a flower*. New York, NY: Grosset & Dunlap.
- Incredible insects*. (1989). Ranger Rick's NatureScope. Washington, DC: National Wildlife Federation.
- Let's hear it for herps*. (1987). Ranger Rick's NatureScope. Washington, DC: National Wildlife Federation.
- Lingelbach, J. (Ed.). (1986). *Hands-on-nature: Information and activities for exploring the environment with children*. Woodstock, VT: Vermont Institute of Natural Science.
- Mathewson, R. (1987). *Reptiles and amphibians*. Los Angeles, CA: Price Stern Sloan, Inc.
- Morreale, S.J., Kransy, M.E., & Schneider, R. L. (2001). *Hands on herpetology: Exploring ecology and conservation*. Arlington, VA: NSTA Press.
- Santore, C. (Illus.). (1988). *Aesop's fables*. New York: Jelly Bean Press.
- Tweit, S. J. (1992). *The great southwest nature factbook*. Bothell, WA: Alaska Northwest Books.
- Willis, J. (2000). *What did I look like when I was a baby?* New York: Scholastic.
- Williams, D. (2000). *A naturalist's guide to canyon country*. Helena, MT: Falcon Publishing.