BUTTERFLIES & POLLINATION

Teacher's Guide 2nd Grade Science Unit



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Acknowledgements



Butterfly Lab as developed through support from PNM, Los Alamos National Bank and Los Alamos National Laboratory Foundation and Carolina Biological. Celebrate Planet Earth is grateful for the insights and advice of Judy Chaddick, science teacher emeritus of the Espanola Valley Schools, who helped make these science units easy, educational and fun.





LOSALAMOS NATIONAL LABORATORY FOUNDATION



Celebrate Planet Earth grows children who love & protect the Earth.

Since 1989, more than 15 million children have delighted in raising butterflies, growing sunflowers, learning about the natural world & supporting conservation. Our work empowers students to initiate environmentally responsible actions in school & at home.

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Overview



Teacher's Guide

This hands-on lab for 2nd grade science builds understanding about the importance of pollination and the interactions of plants and pollinators.

The lab includes Pre and Post Assessments along with activities for learning and integration. Based on your students' skills, use the Butterfly Lab in the ways that you think are best. Please see the Calendar below as a suggested sequence.

Su	Μ	Т	W	Th	F	Sa
			Day 1 Pre Assessment	Day 2 What We Know About Flowers	Day 3 Butterfly Song <i>Live caterpillars probably</i> <i>arrive.</i>	Day 4
Day 5	Day 6 Butterfly & Pollination Word Wall	Day 7 What Do Caterpillars Eat?	Day 8	Day 9 Caterpillar Body Parts	Day 10 What Is Pollination?	Day 11
Day 12	Day 13 Parts of a Flower Handout	Day 14 Build a Flower Model	Day 15 Butterfly Finger Puppets	Day 16 Fluttering Pollination Game	Day 17 Cycle of Pollination Flipbook	Day 18
Day 19	Day 20 How Do Plants & Butterflies Interact?	Day 21 Narrative Writing, Butterfly Body Parts	Day 22 Post Assessment	Day 23 Climate Science & Butterflies	Day 24 Celebrate the Earth!	

Overview

Butterfly Lab is designed as a complete unit, but you may choose select the activities that are best for your classroom. You can also adapt an activity in a way that works for your students. Whatever activities you choose, delight in the wonder of nature with your students!

Before the Caterpillars Arrive

If your students have not experienced the wonder of caterpillars changing into butterflies, you may want to wait on some of these activities to keep it a surprise.

Do the *Pre Assessment* with your students. Discuss what it means to be a good friend to the Earth and all her creatures. Make copies of all the handouts in advance.

Have your students share what they know about flowers with *What We Know About Flowers*. Have some fun learning the *For All the Butterflies* song.

The Caterpillars Are Here

The live caterpillars will arrive on a Thursday or Friday. They come with care instructions, a butterfly house & life cycle poster.

Begin building your science vocabulary using the *Word Wall*. Tell the children about *What Do Caterpillars Eat?* When the caterpillars have grown a little bit, compare the *Caterpillar Body Parts* with the living catepillars. Start learning about the interactions of flowers and butterflies with *What Is Pollination?* Continue with the *Parts of a Flower Handout* and *Build a Flower Model*. Have some creative integration with the *Fluttering Pollination Game* and the *Cycle of Pollination Flipbook*.

When they all become chrysalises, transfer them into the butterfly house.

Butterflies Emerge

When the butterflies emerge from the chrysalises, the students can observe them for a few days. Learn even more about *Butterfly Body Parts* and the *How Do Plants & Butterflies Interact?* activity. Sing the songs to have fun and get the wiggles out as often as you like.

Observing the butterflies, your class can practice *Narrative Writing: Butterflies & Pollination.* Remember to do a *Post Assessment* with your students. Have a discussion with your students with the *Climate Science & Butterflies* guidelines from our partners, Climate Science Alliance.

To sustain the butterflies while you are observing them, feed them with a sugar water wick or with cut fruit like oranges and melons. More information is in the *Care Instructions*.

If a butterfly emerges incompletely or is deformed, there is-sadly-nothing you can do to help. Explain to the children that this happens sometimes. Place it in a bush to be eaten by another animal. Remember: caterpillars and butterflies are important parts of your local food web.

Release and Celebrate

Plan a day of celebration when you release the butterflies! You can sing songs to thank the butterflies for all that you have learned about them.

• Outside temperature should reach at least 55°F during the day.

• Open your butterfly house and allow a butterfly to crawl onto a hand.

• The butterfly will borrow heat from your body to warm itself up to 68°F, so that it can fly away. Be gentle and patient.

Discuss with the children what it means to care for the Earth and all her creatures.

Standards Rubric: 2nd Grade

2ND GRADE Comm	on Core: English Language Arts Standards Reading: Informational Text
Key Ideas and Details:	
CCSS.ELA-Literacy.RI.2.1	Ask and answer such questions as <i>who, what, where, when, why,</i> and <i>how</i> to demonstrate understanding of key details in a text.
CCSS.ELA-Literacy.RI.2.2	Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text.
CCSS.ELA-Literacy.Rl.2.3	Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.
Craft and Structure:	
CCSS.ELA-Literacy.RI.2.4	Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.
CCSS.ELA-Literacy.Rl.2.6	Identify the main purpose of a text, including what the author wants to answer, explain, or describe.
Integration of Knowledge	and Ideas:
CCSS.ELA-Literacy.RI.2.7	Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
Range of Reading and Leve	l of Text Complexity:
CCSS.ELA-Literacy.Rl.2.10	By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 2-3 text complexity band proficiently, with scaffolding as needed at the high end of the range.
Next Generation Scien	e Standards
2-LS1	Ecosystems: Interactions, Energy, and Dynamics
	Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
LS1.A	Interdependent Relationships in Ecosystems Plants depend on animals for pollination or to move their seeds around.

Caring for Caterpillars, Caring for the Earth

Young children understand what it means to be a good friend. Talk with them about being a good friend. Write their suggestions on the board. How do you treat good friends? Can caterpillars, other animals and plants be our friends? Is the Earth that gives us so much - air, water, food, beauty - our friend? How might they like to be treated? What can we do to help them?

Caring for living things in the classroom is a wonderful opportunity to learn:

- all living things have needs
- what are the needs of other living things
- how to help with the needs of others

1 - All living things have needs.

Every child understands their own need for food, shelter and care. And every living thing also has needs. We are all connected.

2 - What are the needs of other living things.

Caring for living things teaches your students that we all have unique needs. Not everyone's needs are the same. What is good for a child might not be good for a plant. The care of a seedling is different than the care of an insect.

3 - How to help with the needs of others.

Students want to interact and be involved with the living things around them. Checking to see if plants need water or if the caterpillars are becoming chrysalises builds a child's confidence and understanding. They learn about responding to what is needed and offering to help.

Teaching Students How to Care for Caterpillars

Observing caterpillars in your classroom is a great way to teach children about the pollinators that we depend on for food. Day by day, they observe how the caterpillars grow and change. They can see them eating their food. The children can check that the cup is not in the sun. The students will learn to respect the caterpillars by not shaking or dropping the cup. This is practical experience in understanding the needs of others and learning how to help.

Pre/Post Assessment



Overview

The activities begin with an individual assessment to effectively establish a baseline of students' understanding, help you decide what to emphasize and what needs to be adapted for your classroom. A pre-assessment provides a way to evaluate the children's growth at the end of the unit.

Materials

- Assessment Record (each sheet holds 15 names)
- handout for each student
- pencils/markers

Adapt the assessment, based on your students skill level.

1 Pass out the handouts and have them put their name and date on it.

2 Using a laptop or color print-out with a small group, or projected on the white board for the entire class, show the handout and focus the students' attention on the parts of a flower.

- Tell the students that they will be identifying the parts of a flower by writing a letter inside each circle.
- Read the 4 words out loud; ask the students to repeat the words with you. Let the students know that it is alright if they don't know these words. The whole class will be learning the parts of a flower together.
- Have the students write the letters inside the circles.
- 3 On the handout, focus attention on the second section.
- Tell the students that they will identify how a butterfly pollinates a flower.
- Read the 3 sentences out loud and describe the illustrations above them
- Have the students circle one sentence and illustration.

Assessment Record

	Interdependent Relationships in Ecosystems				
	Ability to identify the parts of a flower		Ability to identify how a buttefly helps pollinate flowers		
Student Name	Pre Post		Pre	Post	

BUTTERFLY LAB Assessment

_

Date _____

Parts of a Flower

Write the correct letter in each circle.





How Does a Butterfly Pollinate?

Circle the correct sentence and illustration.



Caterpillars eat the leaves of plants.



Butterflies lay their eggs on plants.



Butterflies carry pollen from one flower to another.

BUTTERFLY LAB What We Know about Flowers



Overview

Children discuss *What We Know about Flowers*. The teacher records information for display, including space to record *What We've Learned* during the unit.

Diagram

Diagram of a flower on the right

Time

30 minutes

Materials

newsprint, markers, post-it notes, bulletin board, blank sheets of paper

Step One

Explain to students that you'll be learning about flowers and pollination, and also observing caterpillars and butterflies in your classroom. Tell them that this activity is an opportunity to share what they already know about flowers.

Ask the class to tell you - one at a time - a part of a flower. On the whiteboard, draw the flower part and write the label on a postit note with the student's name. Be creative and use a variety of colors, different colors for different parts, to help the students see each one clearly. On blank sheets of paper, have the



students draw a simple flower and label each part along with the teacher.

The finished diagram should include these 4 parts - petals, leaves, stem and roots. Bonus points if they know these 3 - stamens, pistil and pollen.

Any of the 7 parts that they do not know can be added as the class learns about them.

Step Two

Talk about the flower parts. What do they do?

Your students may know many things about flowers like - *poppies are red, my mom planted a rose bush, I watered the garden last summer.* Write these down on post-it notes and line them up beside the diagram of the flower parts.

Following the discussion, transfer the drawing and post-it note labels onto newsprint or a bulletin board.

Step Three

Explain that as the class makes observations and learns new facts, write these on post-it notes and add to the diagram as *What We Learned*.

For All The Butterflies

Sing to the tune of "Frère Jacques"

I'm a flower I'm a flower Roots below Roots below Soil, rain and sunshine Soil, rain and sunshine Watch me grow! Watch me grow!

I'm an egg I'm an egg On a leaf On a leaf Soon I'll be a caterpillar Soon I'll be a caterpillar Watch me eat! Watch me eat!

I'm a caterpillar I'm a caterpillar You're one too You're one too Soon we'll both be butterflies Soon we'll both be butterflies Something new! Something new! I'm a chrysalis I'm a chrysalis Warm and dry Warm and dry Changing from the inside Changing from the inside Into a butterfly! Into a butterfly!

I'm a butterfly I'm a butterfly Flying around *Flying around* Looking for a flower *Looking for a flower* Searching up and down *Searching up and down*

I'm a flower I'm a flower Open to the sky Open to the sky I have lots of nectar I have lots of nectar For all the butterflies For all the butterflies





Background: Caterpillar Body Parts



A Caterpillar or Larva



Larva-the second stage of metamorphosis, another term for caterpillar
Head-the head includes the brain, a mouth, 2 antenna and 12 eyes called ocelli
Thorax-the midsection is called the thorax where the legs are attached
Abdomen-the abdomen contains its heart, digestive system and other organs
True Legs-all insects have 6 true legs with tiny claws attached to the thorax
Pro-legs-on the abdomen, pro-legs have microscopic hooks that help the caterpillar move and climb

Background: Butterfly Body Parts





Abdomen-the third section includes the stomach, heart and other organs Antennae-on the butterfly's head, used to taste the air and help with balance Compound eyes-thousands of tiny lenses help the butterfly see in all directions Head-the head includes a brain, a proboscis, 2 antenna and 2 compound eyes Leg-the butterfly has 3 pairs of legs attached to its thorax Proboscis-the butterfly tongue, which works like a drinking straw Setae-setae are like hairs or bristles on a butterfly's entire body Spiracles-tiny openings on the abdomen that let the butterfly breathe Thorax-the midsection of the butterfly with 3 pairs of legs & 2 pairs of wings Wings-2 pairs of wings on the thorax allow the butterfly to fly

Background: Observing Caterpillars & Butterflies



Having live insects in the classroom is fascinating. Build your students' ability to look closely, describe their observations, ask questions and record what they have seen.

Observing Caterpillars

Have your students look closely at the cup of caterpillars every day. What do they see? What are the caterpillars doing? Has the environment of the cup changed? Have the caterpillars grown and by how much?

1. As a class, discuss what the students have observed and write key observations on the white board for the whole class to record in their science journals.

2. Do the students have any questions about what they have observed? Write interesting questions on the white board. Assign a student to research a question during library time or as homework with their parents. Let them report their answers to the class.

3. Encourage your students to learn the anatomy of a caterpillar and use the correct terms in their descriptions.

Observing Butterflies

Witnessing the transformation of a caterpillar into a chrysalis and then emerging as an adult butterfly is magical.

1. Continue recording the students' questions and assigning them to report on the answers they find.

2. Learn the terms for a butterfly's anatomy and use it in your discussions and reports.

Background: What Do Caterpillars Eat?



Explain the important relationship of caterpillars and plants when the students are observing the caterpillars.

In the cup of live caterpillars, at the bottom of the cup, is a mixture of leaves that has been ground up for the caterpillars to eat. There is enough food for them to grow until they pupate.

Caterpillars are made to eat, eat, eat! And some caterpillars are picky eaters. When a female butterfly is ready to lay eggs, she searches for a host plant. The host plant is the preferred food of the caterpillar.

Different kinds of caterpillars prefer different host plants. For example, a monarch caterpillar prefers the common milkweed. Its eggs are laid on milkweed plants, so that when the caterpillar hatches it can start eating the leaves. Monarch butterflies live in areas where the milkweed grows abundantly.

The painted lady caterpillar prefers many different kinds of host plants. Its eggs are laid on thistles, sunflowers, hollyhocks, mallows, yarrows, burdocks and sagebrush. A female painted lady butterfly can lay her eggs on common plants that are found all over the world. In fact, the painted lady butterfly lives all over the world.

This is one of the ways that plants and animals are interconnected and depend on each other for survival.

Word Wall: Butterflies & Pollination



The Word Wall is a set of words that are all related to butterflies and their role in pollination.

Here are ideas for using the Word Wall:

- **Use in a Sentence** have your students use the words in a sentence. Do it as a writing assignment or spoken out loud.
- Act It Out as you go through the words, act out the meaning with your hands or your whole body. Especially good for kinesthetic learners.
- Relate to Observing Caterpillars & Other Activities as your caterpillars grow and the students learn about pollination, encourage the children to use these vocabulary words to describe what they see.



































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What Is Pollination?

Objectives

- to learn the process of pollination
- to demonstrate an understanding of the parts of a flower
- to understand how butterflies and other pollinators interact with plants to feed on them and to fertilize them
- to become aware of how interconnected life is on earth

This introduction to pollination has 6 components:

- an explanation of the parts of a flower and the process of pollination by the teacher
- a handout for labeling the parts of a flower
- making a model of a flower using construction paper
- playing a Fluttering Pollination Game
- a Cycle of Pollination Flipbook
- a handout on How Plants & Butterflies Interact
- practising observation skills and Narrative Writing: Butterflies & Pollination

Extension

Bring a flower that has prominent stamens and pistil like a tulip, iris or lily into your classroom. Or perhaps a small branch of a flowering tree like a crabapple. Invite the students to look closely at the parts of the flower in their free time. It would be great to take apart the flower or dissect it when the flower begins to fade. Pass around the parts for the children to see and touch.

What Is Pollination?

1. In advance, make a butterfly finger puppet (See finger puppet template).

2. Draw 2 large flowers with stamens and pistil on opposite sides of the whiteboard (see *Parts of a Flower* handout).

3. Explain to the students.

A flower makes seeds. Flowers and butterflies are very important to each other. Without butterflies or other pollinators, the flower cannot make seeds and without flowers, butterflies would not have food. Many fruits and vegetables are pollinated by insects, and without these pollinators we would not have apples, tomatoes, chilies, pumpkins and sunflower seeds.

Label the parts on one flower as you talk about them.

Let's look at the parts of a flower first. On the drawing, there are petals and a stem. In the center of the flower is the pistil, the female part. Around the pistil there are stamens, the male parts. On top of the stamens there is a yellow powder called pollen.

Draw a red line from the stamen of one flower to the pistil of the other.

What is pollination? Pollination is the transfer of pollen from the male parts of one flower to the female parts of another flower. When a grain of pollen lands on top of the pistil, it travels down inside and fertilizes the flower. Seeds develop in the pistil.

Who are the pollinators? A pollinator is usually an animal that carries pollen from one flower to another. Pollinators include butterflies, bees, wasps, moths, birds, flies and bats. Some plants are pollinated by the wind.

Flowers attract pollinators. The things that make a flower beautiful to us attact pollinators to visit the flower-colors, fragrances, nectar and invisible markings on the petals.

The teacher demonstrates with the butterfly finger puppet, sipping nectar and flying from one flower to the other.

A butterfly visits a flower to sip its nectar. Pollen sticks to tiny hairs on the butterfly's legs and body. When the butterfly flutters to other flowers, some of the pollen is brushed off accidentally and lands on the pistil. And the flower is fertilized.

Background: Parts of a Flower

fertilize—to make a flower able to produce seeds; to make an egg able to grow and develop

fragrance-a pleasant smell

organ-a part of the body that has a particular function

petal—one of the colorful parts of a flower surrounding the pistil & stamens **pistil**—seed-bearing female organ of a flower

pollen-a fine yellow powder released from the stamens

seed-a small, hard part of a plant from which a new plant can grow

sepal-green leaf-like parts that surround and protect the flower bud

stamen-the pollen-producing male organ of a flower

stem-the main stalk of a plant

Make a Butterfly Finger Puppet

- 1. Make copies of this template on construction paper.
- 2. Have the students fold the paper in half along the solid line.
- 3. Cut out around the dotted line.
- 4. Make two cuts along the dotted lines in the middle. This makes a strap for your finger.
- 5. Open the butterfly and slip your finger into the strap.
- 6. You can color your butterfly with crayons or paints. Be symmetrical like a butterfly!

Name	Date	o the correct parts of the flower? · inside each circle. lower to the pistil on the other.		
	/er	u match the words on this page to 1. Write the correct letter aw a line from a stamen on one fl	S- stamen	E- PETAL
BUTTERFLY	Parts of a Flow	Can you 2. Dra	P. PISTIL	O - POLLEN

Make a Flower Model

1. Each student will make their own model of a flower. Have the students work together in groups of 2-3.

2. Make templates for each group on tagboard or used file folders.

3. Using construction paper, have each student cut out 3 petals, 2 leaves and 1 pistil in colors they choose.

4. Have your students cut some ground for the plant to grow in and a tall stem. Glue the ground and stem to a background.

5. Glue your leaves on the stem. Glue the petals at the top of the stem.

6. Cut 4-5 strips for stamens and 4-5 circles for the top of the stamens. Glue a circle

at the top of each strip. Glue the bottom of each strip at the center of the petals.

7. Glue the pistil at the center of the petals.

8. With markers add details like roots, viens on leaves & petals, etc.

Fluttering Pollination Game

Materials

For each student Butterfly Finger Puppet(page 30) Flower Model (page 40) container or lunch bag, cut to 1/2 size

For the class Tape Hole punch confetti, 4 separate colors Boom box or iPod with music selection

Directions

The game is like musical chairs, using the flower models in a circle. In advance, each student attaches a flower to a container. Arrange your flowers in a large circle facing out. Then take away one flower.

Tell the children that as butterflies, their job is to pollinate the flowers. Show them the one

color confetti, which is like pollen and place some in a few containers. Place another color confetti in a few more and so on. Tell them that during the game, like a butterfly collecting pollen, they will take a pinch of confetti and carry it to another container.

Use a calm piece of music like Bach's Air on a G String or Beethoven's Moonlight Sonata as a sound cue for fluttering/walking around the flowers when the music starts and freezing touching a flower when the music stops.

Start the music. The students fly/walk with their finger puppets until the music stops. The student who is not touching a flower is out of the game. Take away one or more flowers. Tell the children to take a pinch of confetti and start the music again.

They flutter/walk around the flowers until until you stop the music. Tell them to release their confetti into the container. Students not touching a flower are out of the game. Take away one or more flowers. Tell the children to take a pinch of confetti again and start the music. Keep fluttering until the colors of confetti are mixed up and only one child remains.

Together, take a look at the confetti in the containers. The confetti is like flower pollen that butterflies carry from flower to flower. The container is like the pistil where the seeds develop. They can all see how pollen from different flowers are left behind in the pistil. The class has successfully pollinated a lot of flower!!!

Cycle of Pollination Flipbook

Cycle of Pollination Flipbook

The following flipbooks help the students understand a scientific way of thinking–looking for patterns of interaction that benefit both forms of life.

Make copies of the *Cycle of Pollination Flipbook* in advance. It is a 2-sided handout with cut-outs on a third sheet.

Use the Cycle of Pollination Flipbook after butterflies have emerged.

- The *Cycle of Pollination Flipbook* is a good review of the interaction of plants and pollinators.
- It has two folds and two cuts.
- Read the sequnce on the cover and help the students understand that it is a cycle that keeps going round and round.
- Then one at a time, lift a flap and read what is inside. Read the four stages.
- Cut out the four pictures. Have the students glue the pictures in the correct places. You could do this as a class or individually as an assessment.

Name _____

Date _____

THE CYCLE OF POLLINATION

A butterfly eats flower nectar.

Pollen fertilizes the pistil.

Seeds grow into flowers.

A pistil make seeds.

Cycle of Pollination

Cut out the four pictures. Paste the pictures inside the Cycle of Pollination Flipbook.

How Do Plants & Butterflies Interact?

Materials

handout for each child (see next page)

Step One

Ask the students to describe the interactions of plants and butterflies that they have learned. Butterflies flying from flower to flower. A caterpillar crawling on a plant. Do the children know what is happening? Where do butterflies lay their eggs? What do caterpillars eat? What are butterflies doing when they land on flowers? Do butterflies carry something from flower to flower? How do seeds begin?

Step Two

Once they know the interactions, have them draw pictures of the interactions. Or in small groups, act out the interactions with movements from their dances.

There are four interactions that the students should know:

- 1) Butterflies lay their eggs on the leaves of a host plant.
- 2) Caterpillars eat the leaves of a host plant.
- 3) Flowers make nectar that gives butterflies energy.
- 4) Butterflies carry pollen from one flower to another.

Step Three

Complete the handout.

Writing Extension

Have the students write poem or creative story about a single interaction between the plants and the butterflies.

How Do Plants & Butterflies Interact?

Name _____

Date _____

Draw an arrow from the sentence on the left to the correct picture on the right.

Caterpillars eat the leaves of plants.

Butterflies lay their eggs on plants.

Flowers make nectar that give butterflies energy.

Butterflies flutter from flower to flower sipping nectar and carrying pollen from one flower to another.

Narrative Writing: Butterflies and Pollination

Write a narrative about butterflies and pollination. Include a short sequence of events that describe the actions of a butterfly, body parts used by the butterfly and how the butterfly interacts with the flower. Use words to communicate the order of events and provide a sense of closure.

Observation

When the butterflies emerge, observe them closely as they feed on sugar water or pieces of fruit. Notice how their bodies move, the parts of their bodies used while feeding and imagine what they might be sensing as they feed.

Research

Using the school library or the internet, research a butterfly body part that is used in pollination or while feeding.

- wings used to fly from flower to flower
- setae pollen gathers on the setae and is carried to other flowers
- · proboscis used like a drinking straw to eat flower nectar
- legs used to hold on to a flower, pollen also collects on the legs
- antennae used to "smell" flower nectar and provide direction during flight
- compound eyes used to see colors and patterns on flowers

Post Assessment

Repeat the assessment with your students and compare the pre assessment and post assessment for each student on the rubric.

Celebrate the Earth!

Each school celebrates the Earth's Birthday a little differently, bringing their own unique ideas and interests to the event. Get creative!

Many schools choose a day close to the end of the school year, when the weather's warm, to celebrate by planting seeds, releasing butterflies and demonstrating ways to care for our home planet.

Your celebration is a special gift from the children to the Earth!

Here are some activities for your classrooms to share:

- Sharing a song that students learned in the Butterfly Lab
- Planting seeds in a school garden
- Creating an art project from recycled materials
- Releasing Painted Lady butterflies
- Students can draw pictures of their favorite animal, flower or tree
- Students reporting on ways to care for the earth like saving water, feeding birds, growing vegetables and more

At the close of your celebration, please remember to take the Earth's Birthday Pledge!

No job is too big, No action too small For the care of the Earth Is the task of us all!