Flower Power

Key Topics: Plant Anatomy, Pollination, Adaptation, Coevolution
Grade Levels: K, 2-4
Inside and Outside

Lesson Overview:

In this lesson students will practice accurately depicting a flower through drawing its components and will locate the reproductive organs of a flower to discuss pollination, understanding the parts such as stamen and pistil, and the vital roles of pollinators in spreading pollen to produce fruits and seeds. They will analyze how the structures of different flowers are beneficial to a variety of different pollinators and will be able to describe coevolution. Then, students will role-play flowers and pollinators and find their perfect match, followed by an exploration outside to observe coevolved flowers and pollinators! Overall, students will understand how human survival is connected to pollinators through the food system.

Activities:

Option 1 - Flower Anatomy (20 minutes)
Option 2 - Flower and Pollinator Matchmaker (40 minutes)

Suggested Activities & Learning Objectives by Grade:

- K: Flower Anatomy, Flower and Pollinator Matchmaker
  - K-LS1-1 How do plants need pollinators for their survival?
  - K-ESS2-2 How do humans need pollinators for survival?
  - K-ESS2-2 How can humans encourage pollinators to ensure abundant food crops?
- 2: Flower Anatomy, Flower and Pollinator Matchmaker
  - 2-LS4-1 How do different plants and pollinators support each other?
- 3: Flower Anatomy, Flower and Pollinator Matchmaker
  - 3-LS3-2 How do plants and pollinators change their form through evolution to adapt to each other?
- 4: Flower Anatomy, Flower and Pollinator Matchmaker
  - 4-LS1-1 What are the internal and external structures of plants that support reproduction?

Essential Question(s) that Connect CCCs and SEPs:

- Unlike animals, plants can't move from place to place to find their mates. How then does the pollen from one flower get to the pistil of another flower? What is the desired effect of pollination? How would our food system be effected without pollinators? (Cause and Effect; Asking Questions and Defining Problems)
- What is the evidence for the structure of coevolved pollinators and flowers supporting the function of pollination? (eg. hummingbird has long beak to drink nectar out of tubelike shaped

flowers, flies have senses that attract them to red flowers that smell like rotten meat) (Structure and Function; Engage in Argument from Evidence)

Materials:

Option 1 - Flower Anatomy

- Printout of Flower Anatomy Drawing to guide GEM in drawing for the class
- Enough fresh flowers of different varieties for every child to have 1
- Magnifying glasses
- Clipboards, paper, and pencils if doing this outside

Option 2 - Flower and Pollinator Matchmaker

- Flower and Pollinator Matching Chart (see below in Prep)
- 1 copy of Pollinator Cards

EG Team Support Needed:

- None

Prep:

This activity is designed to take place 100% outside! Alternative options in the case of rain: complete the flower anatomy drawing and pollinator discussion/matchmaking inside the classroom, watch a short video on coevolved pollinators and flowers instead of observing pollinators in action outside.

- Forage around the school garden, campus, and neighborhood for fresh flowers of different varieties.
- Walk around the school campus to note areas where there are a lot of flowers for students to observe flower anatomy and pollinators in action.
- Create your Flower and Pollinator Matching Chart. Have pieces of paper taped over each pollinator so students can make educated guesses about which pollinators are coevolved to the flowers.

Pollinator	***Type of Flower Preferred***
Beetle	Small white or light green flowers that hang down near the ground
Honeybee	Flowers with sweet smells and showy, bright petals, often blue or yellow
Fly	Reddish flowers that smell like rotten meat
Butterfly	Bright-colored, sweet-smelling flowers that they can land on
Bat	Large sweet-smelling, white flowers that bloom at night
Hummingbird	Bright red or yellow flowers with long tubelike shape and very little scent
Moth	White or yellow flowers with sweet smell
Wind and water	Small, odorless flowers with pollen that can get picked up in the wind or float on water

Activity Procedure:

Engage:

Begin with announcing what we will be doing today, either in the seating area in your garden or in the classroom. *Today we will be learning about the parts of a flower, identifying pollinators and their role in our ecosystem, and then we will explore our school environment to look for pollinators in action.*

Option 1:

1. Tell students that you brought a variety of different flowers for them to observe today. Explain that you will pass out one flower to every students, and that you would like for them to practice drawing the structure of their flower as accurately as possible. Demonstrate by pulling a flower out of the bag and drawing an overly simple representation of the one in your hand (think stick figure). The goal is for us to draw every component that we see on our flower, even if we don't know what it is. After you finish drawing your flower, label any parts that you do know. What parts of a flower might you already know? (possible answers: petals, stem, leaves, etc.) Remind students what the call-back will be for this lesson (silent coyotes, give me 5, etc.) and stick with it!
2. Pass out one flower and magnifying glass to each student. Give students 5 minutes to observe and draw their flowers. Walk around and assist any struggling students; point out parts of the flower that they may have overlooked drawing.

Comprehension Check

3. Call students' attention back to you. Ask students to raise their hand and share something they saw on their flower and the name of this part if they know it. Draw pictures on the board of what they are describing. Did anyone else see something like this? What about something different?
4. Not all flowers look the same, but they all share common anatomy! What is anatomy? (Hint: parts of human anatomy are our eyes, ears, phalanges, heart, etc.) We already listed some flower anatomy on the board (point out labeled parts of the flower). However, did you know that some flowers are girls, some are boys, and some are both girls and boys! Draw what these parts look like on your board and have students copy your drawing with labels. Refer here for drawing of structure (note: do not need to include the components that make up the stamen (ie. the anthers) or pistil (ie. the ovaries), just the broad structure): Flower Anatomy Drawing. Can you identify if your flower is female, male, or both?

Explore:

Unlike animals, plants can't move from place to place to find their mates. How then does the pollen from one flower get to the pistil of another flower? That's where pollinators come in! A pollinator is anything that helps to spread pollen. What is the desired effect of pollination? Pollinators may drink nectar from the flowers, and some collect and eat the pollen too. In the process, they spread pollen from flower to flower without even trying. Once the pollen fertilizes the egg in the flower ovary, the plant will go on to produce fruit and seeds! So we have pollinators to thank for most of our fruits and nuts and many of our vegetables. Scientists estimate that one out of three things we eat is thanks to pollination by bees. How would our food system be effected without pollinators? (Cause and Effect; Asking Questions and Defining Problems).

There are all kinds of pollinators, and we are going to play a game to learn about them. Display the Flower and Pollinator Matchmaker Chart in front of the class. Each pollinator prefers specific flowers to pollinate, based on their structure and nectar content. Instruct students that it is their job to read the "Type of Flower Preferred" column and make an educated guess for which pollinator would be best adapted to pollinate it. Let students raise their hands to make guesses. If they are correct, remove the paper cover and have them read the pollinator and type of flower they are adapted to pollinate.

Explain:
Expand on the specific adaptation when students need clarification, eg. What structure does a hummingbird have that makes it well suited to drink nectar and pollinate from a long tube shape flower? (It's beak!) Most scientists believe that flowers and their pollinators coevolved. That means that they changed over time to suit one another; they adapted to one another. How does this coevolution benefit the flower? How does it benefit the pollinator? (Structure and Function; Engage in Argument from Evidence)

Elaborate:
Take students out to the school garden, or another area on their school campus with a variety of flowers to observe pollination.

Option 2:

1. Gather students in a toe to toe circle to share instructions for partnering up and the activity. Hop on one foot / thumb war works well here.
2. Give half of the pairs pollinator cards and the other half of the pairs flower cards.
3. Then have the two groups mingle, with pollinators looking for flowers they would like to pollinate and flowers looking for pollinators to carry their pollen to other flowers. Have them role play as a fun way to help each other identify what other groups are from afar ie. beetle group can crawl on the ground, hummingbird group can use their arms to make a beak, etc. Remind the class that there can be more than one pollinator to a flower because different pollinators may like the same type.
4. Once everyone has found a match, have the teams explore together to find a real flower their pollinator might like! Do they see their pollinator in action? Can they find any bees, hummingbirds, beetles, or wind?

Evaluation:

Ask students to raise their hands to share:

When you look at insects near flowers now, what will you try to observe? Can you summarize how your flower and pollinator have co-evolved by describing their internal or external structures? During this activity you learned that often several pollinators like the same flower. For example, bees and butterflies often visit the same type of flower. How would more than one pollinator be an advantage for the flower?

Also, refer back to the Learning Objectives for your grade level and ensure that they have been met by asking the given learning objective question.

Extension Activities:

- Go outdoors with students and sit quietly near some flowers. Watch carefully. What pollinators do you observe? How long does a pollinator stay on each flower?
- Class can adopt a space in the garden (bed, row) and plant a pollinator garden.
- Have students in Garden Club, Sprout Scouts, or you yourself pick flowers, herbs, and greens to make a bouquet for the teachers you work with! It is such a positive way to gift, create joy, and remind them of the beauty of engaging outdoors. Often, our teachers need a reminder of how appreciated they are and spreading joy is never a waste of time to create abundance and gratitude in our social system.

Tips and Caveats:

Adaptations for K-1

K-1 can still practice drawing their flower as accurately as possible. Instead of academically rigorous identification of stamens and pistils, simply explain that pollen needs to be able to travel from one flower to another and show what pollen looks like on a real flower. Assist students in reading the Pollinator and Flower Matchmaker Chart. For K, go outdoors with students and sit quietly near some flowers. Watch carefully. What pollinators do you observe? What type of flower are they visiting? How long does a pollinator stay on each flower?

Cited Curriculum:

LifeLab - The Growing Classroom: Flower Power, Part Two