Plants and Their Pollinators

Lesson Guide Suggested Student Ages: 7-8 (2nd Grade) Lesson Guide

Getting Started

Welcome to the Missouri Botanical Garden! To start things off, guide students to a place where they can observe plants that are flowering. The Kemper Center for Home Gardening is an ideal place to bring students for this lesson. Provide the students an opportunity to look around at the plants that are in bloom and observe if they see any pollinators such as butterflies, bees, or hummingbirds around the flowers.



Note: There are also bee hives located on the Garden grounds near the Kemper Center for Home Gardening. You can view the bee hives while walking along the main path between the Kemper Center and the Chinese Garden. While the bees are domesticated and usually calm, it is best to view them from the main walking path that way the bees continue to feel comfortable and safe. The bees' activity depends upon factors such as the weather, humidity, and temperature. Some days they might be active and other days they might be less active. Feel free to bring students to come see these important pollinators from a safe distance.

Suggested Program Location: MBG-Kemper Center for Home Gardening (map included, #28 on map)

Background Knowledge: Plant and pollinator relationships are an example of *mutualism*, when two or more species benefit from one another. Plants provide food for pollinators in the form of nectar or pollen. While the pollinator collects the nectar or pollen, pollen dusts the bodies of the pollinators and then brushes onto the female parts of the next flower that the pollinator investigates. This process is called *pollination*. Over hundreds and thousands of years, many flowers and pollinators coevolved and have developed special relationships. A pollinator capable of detecting certain colors or scents, or possessing structures that best fit certain flowers, passes these advantages on to its offspring. Over many generations these traits have become well established. Meanwhile, flowers also evolved, adapting specific characteristics that suit particular pollinators.

Objective

- Understand the relationships between plants and the animals or insects that pollinate them.
- Students will demonstrate that many plants depend on animals for pollination and many pollinators depend on plants for food.
- Students begin to understand that flowers are adapted to attract specific pollinators.

Materials

Data Recording Activity Sheet #1 (one per student)	Magnifying glasses (optional)		
Draw a Plant and its Pollinator Activity Sheet #2 (one per student)	Binoculars (optional)		
Draw Your Own Plant and Pollinator Activity Sheet #3 (one per	Colorful pencils (optional)		
student)			
Plants and Their Pollinators Lesson Guide (one per group)	Pictures of Plants and Pollinators		
Pencils	Clipboards		

Learning Agreements:

- 1. Students will responsibly take care of the plants by walking only in the grass and paved areas while avoiding the planted and mulched beds of the Garden.
- 2. Students are respectful of living plants and encouraged to observe and come into contact with natural items that have naturally already fallen to the ground, rather than pulling live material from plants.

Lesson Standards

Next Generation Science Standards:

2-PS1-1

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-LS2-2

Develop a simple model that mimics the function of an animals in dispersing seeds or pollinating plants.

K-2-ETS1-2

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Running the Program

Observe Interactions with Plants and Pollinators

- 1. **Pre-visit option**: Prior to arrival at Missouri Botanical Garden, print or display a copy of the pictures of the pollinators and flowers for students to observe the shape and structures of both.
 - Question to students: Do you recognize any of the animals in these pictures?
 - Some possible answers could be:
 - Monarch butterfly
 - Bumble bee
 - Ruby-throated hummingbird
 - Introduce the plant pictures to the students and provide the students with the plant names.
 - The plants are:
 - Common milkweed
 - Shasta daisy
 - Trumpet creeper
 - Question to students: Can you guess which plant the hummingbird pollinates? What clues do you
 notice that make you think that? Now, can you guess which plant the Bumble bee pollinates and
 which plant the butterfly pollinates? Hint: Think about how the shape of something helps it function.
 - Some possible answers could be:
 - The hummingbird is a pollinator for the trumpet creeper plant because the flowers are long and tubular in their shape and the hummingbird has a long, narrow beak that fits in perfectly into the flower to gather nectar.
 - The Bumble bee is a pollinator for the Shasta daisy because the flower is disc-shaped and creates a perfect wide open landing pad for the Bumble bees to land upon.
 - The Monarch butterfly is a pollinator for the milkweed plant because Monarchs are able to insert their delicate, long tongues into the thin milkweed flowers.
 - Question to students: How do these plants help the animals survive? How do the animals help the plants? (This is an example of *mutualism*; two or more species benefitting from each other)
 - Some possible answers could be:
 - The plants offer pollen and nectar to the animals, which they eat as food.
 - The animals help to pollinate the plants, which helps the plants fruit/produce seeds (reproduce).
 - Note: There is a special relationship that Monarch butterflies share with Milkweed plants. Milkweeds are the host plant of the Monarch butterfly. This means that Monarch butterflies only lay their eggs on Milkweed plants. When the eggs hatch, the baby Monarch caterpillars feed only on the Milkweed plant leaves. In this way, Monarch butterflies and Milkweed plants have a special unique relationship as host plant and pollinator.
- 2. **On-site visit option**: While visiting the Missouri Botanical Garden, invite the students to observe the flowers that are blooming and encourage them to try and spot any pollinators visiting the flowers (bees, butterflies, bumblebees, hummingbirds, moths, etc.)
 - Invite students to discuss their favorite flowers.
 - Question to students: Why do you think plants have flowers?
 - Plants have flowers to attract pollinators

- Ants like low growing flowers Bees like brightly colored flowers that reflect ultraviolent light (colors such as white, yellow, blue or violet) • Beetles like white or green flowers • Butterflies like red, yellow, orange, blue and purple flowers • Flies like green flowers • Hummingbirds like red or blue flowers • Moths and bats like flowers that open late in the day or throughout the night
- Flower scents that are spicy/fruity attract beetles

 Flies are attracted to stinky flowers
 Bees, butterflies, and moths like the smell of flowers that are sweet
- Question to students: How do these plants help the animals survive?
 - They offer the animals food in the form of pollen or nectar.
 - This is an example of *mutualism*; two or more species benefitting from each other. This mutualistic relationship also helps humans, as pollination provide the backbone to ensuring our human diets are diverse and plentiful with fruits, nuts, and vegetables. In all, there are over 100 crops grown in the United States that depend on pollination.
- Using the <u>Data Recording Activity Sheet #1</u>, challenge the students to observe and record any evidence of pollinator and plant interactions. (Be sure to have the students save <u>Activity Sheet #1</u> for their post-visit activity back at school)
 - They can make tally marks when they notice a specific pollinator feeding on a flower of a specific color.
 - Ask the students to notice whether or not certain colors of flowers get visited more frequently

Example of student work:

Colors of Flower		Tally Marks for Pollinators							
	Bee	Butterfly	Hummingbird	Fly	Moth	Bumblebee	Other		
Sed Red	1111	I							
Orange									
🔶 Yellow									
🗱 Green									
🍀 Blue									
🍥 Purple		+++							
🌞 Pink									
Other									

than others.

• Guide the students to have a conversation about what they observed.

- Encourage the students to share their data with the rest of the group to look for patterns.
- o Did they notice anything similar or different in their data when compared to their classmates?
 - Were bees the largest group of pollinators recorded or was is another pollinator?
 - Did hummingbirds only visit flowers that were red?
 - Were any moths visible as pollinators during the day?

- Using the <u>Activity Sheet #2</u>, invite students to draw and record observations of their favorite flower and any pollinators that come to visit it.
 - Some evidence to draw/record could be:
 - A butterfly visiting a purple flower to drink nectar
 - A bumble bee gathering pollen from a yellow flower
 - Some observations to discuss with students could be:
 - A hummingbird's beak is narrow and long to reach nectar in trumpet-shaped flowers
 - The bumble bee's body seems hairy so that way the pollen sticks to it
 - The flowers are shaped in a way that make the animals reach down into the flower heads to get the food, and by doing so, they get brushed by the plant with pollen, which they take to the next flower. This helps the plants spread their pollen (pollination).

3. Post-visit option: Design Challenge

- Back at school, refer to the <u>Activity Sheet #1</u> and have the students create their own bar graphs of their data collected.
 - Ask students to see if they can recognize any patterns or similar observations between their results and the results of other students in their class.
- Remind the students about the flowers in bloom seen while they were at the Missouri Botanical Garden and recall evidence of pollinators interacting with the plants (e.g. butterflies, bees, or hummingbirds drinking nectar or gathering pollen from the flowers)
 - Using Activity Sheet #3, pose the following problem to student groups:
 - Students want to establish a newly created wildflower patch at their school for a newly found pollinator.
 - Students will design both an ideal pollinator for an ideal plant that can be planted in their schoolyard. Challenge students to design their pollinator and plant and be able to describe why they go together well. The design should mimic how plants and animals work together to help them survive, grow, and meet their needs.
 - How will the pollinator travel?
 - How will the flower attract a pollinator?
 - As students finish their designs, allow students to reflect on the efficiency of their design and how it was designed through incorporating information observed in nature at the Missouri Botanical Garden. Invite students to write a few sentences about why their flower and pollinator attract each other.



Monarch Butterfly (Danaus plexippus)



Bumble Bee (Bombus sp.)



Ruby-Throated Hummingbird (Archilochus colubris)







Common milkweed (Asclepias syriaca)



Trumpet creeper (*Campsis grandiflora*)

Data Recording

Activity Sheet #1

Colors of Flower	Tally Marks for Pollinators							
	Bee	Butterfly	Hummingbird	Fly	Moth	Bumblebee	Other	
Red								
Orange								
🐣 Yellow								
oreen 🗧								
Rlue Blue								
Purple								
ink Pink								
Other								

Draw a Plant and Its Pollinator

Activity Sheet #2

Observe the plants around you. Pick a flower that you would like to draw. Notice the color, shape, and size of the flower. Does the flower have a smell? Does the flower have any pollinators that come to it? Write down any information about the flower that you think is important and then draw your flower.

Circle your answers:

Flower Color- Red	Orange	Yellow	Green	Blue	Violet	Brown	Black	White
Flower Size- Small			Medium		Large			
Pollinators Visiting Flower-		- Bee-	M	Bumble bee- 🛎		Butterfly- 😿		
		Fly-	de la compañía de la comp	Мо	th- 😽		Hu	mmingbird- 🎾

Draw your flower below:



Draw Your Own Plant and Pollinator

Activity Sheet #3

Design your own flower. It can be any shape, color, or size that you want. Then, design and draw a pollinator that will visit your flower to pollinate it. **Remember**: the shape, size, and color of each flower is important. The plant is trying to attract a pollinator. The pollinator also has a body structure that fits well with the plants that it pollinates. They fit together!





MISSOURI BOTANICAL GARDEN

For more information: (314) 577-5100 | mobot.org | Hours: Tuesday-Sunday, 9 a.m.-5 p.m.

Welcome!

Whether you're here for the day or an hour, we hope you enjoy your visit. Thank you for coming!

- 1. Jack C. Taylor Visitor Center
- 2. Linnean House
- 3. Gladney Rose Garden
- 4. Ottoman Garden
- 5. Sensory Garden
- 6. Hosta Garden
- 7-8, Bulb Gardens
- 9. Spink Pavilion
- 10. Iris Garden
- 11. Dry Streambed Garden
- 12. Daylily Garden
- 13. Herring House (Not Open to Public)
- 14. Stephen and Peter Sachs Museum Hours: Tuesdays-Sundays | 11:30 a.m.-4 p.m.
- 15. Mausoleum
- 16. Tower Grove House
- Hours: Wednesdays-Sundays | 13 a.m.-4 p.m.
- 17. Herb Garden
- 18. Victorian Garden
- 19. Observatory and Maze
- 20. Stumpery
- 21. Bavarian Garden
- 22. Strassenfest German Garden
- 23. English Woodland Garden
- 24. Japanese Garden
- 25. Koi Fish Feeding Bridge
- 26. Carver Garden
- 27. Boxwood Garden
- 28. William T. Kemper Center for Home Gardening
- 29. Cohen Amphitheater
- 30. Chinese Garden
- 31. Lehmann Rose Garden
- 32. Doris I. Schnuck Children's Garden Hours: Tuesdays-Sundays | 9 a.m.-4 p.m.
- 33. Brookings Exploration Center and PlantLab
- 34. Climatron
- 35. Shoenberg Temperate House (Closed)
- 36. Rock Garden

