Symbiotic Relationship

Life Science | Lesson Guide

5th Grade

Photo Description

This image shows a bee visiting a bright red flower covered in yellow pollen. The bee's body is dusted with golden pollen, and you can see the flower's red petals and yellow stamens (the pollen-producing parts). The bee is collecting food while pollen sticks to its fuzzy body, which it will carry to other flowers.

Scientific Phenomena

Anchoring Phenomenon: Pollination is a symbiotic relationship between bees and flowering plants where both organisms benefit from each other.

Why This Happens Scientifically: Bees visit flowers to collect nectar and pollen, which they use as food. As the bee moves from flower to flower, pollen grains stick to its fuzzy body. When the bee visits another flower, some of that pollen rubs off onto the new flower's stigma (female part), allowing the plant to reproduce. This is called pollination. The bee gets food (energy), and the plant gets help making seeds—both organisms benefit, making this a mutualistic symbiotic relationship.

Core Science Concepts

* Symbiosis and Mutualism: A symbiotic relationship is when two different organisms live together and interact. In mutualism, both organisms benefit. The bee benefits by getting food; the flower benefits by getting pollinated so it can make seeds.

* Adaptation and Structure: Bees have fuzzy bodies, which is an adaptation that helps pollen stick to them. Flowers produce bright colors and sweet nectar, which are adaptations that attract pollinators like bees.

* Energy and Nutrition: Bees depend on flowers for nectar and pollen as their food source (energy). Plants depend on bees to help them reproduce.

* Pollination as a Life Process: Pollination is essential for plant reproduction. Without pollinators like bees, many flowering plants could not make seeds and would not survive.

Pedagogical Tip:

When teaching pollination, have students physically model the process: one student is the bee (wearing a wool sweater or fuzzy fabric), another student is the flower holding a container of powder or glitter. As the "bee" visits the "flower," powder sticks to their clothing. When they visit another "flower," the powder transfers. This kinesthetic modeling makes the abstract concept concrete and memorable.

UDL Suggestions:

Universal Design for Learning (UDL) Consideration: Provide multiple means of representation by offering visual diagrams of pollination, physical models of flower parts, real flower specimens, and videos of bees pollinating. Some students may also benefit from tactile exploration of real flowers and pollen to engage multiple senses in understanding this concept.

Zoom In / Zoom Out

Zoom In — Microscopic Level:
At the cellular level, pollen grains are tiny structures containing male genetic material. When a pollen grain reaches the flower's stigma, it grows a pollen tube down into the ovule. This fertilizes the plant's egg cell, allowing seeds to develop. Without this microscopic process completing, the flower cannot produce seeds.

Zoom Out — Ecosystem Level:
In the larger ecosystem, pollinators like bees are keystone species—they support the survival of many flowering plants. If bee populations decline, it affects the entire food web. Many animals depend on seeds and fruits from flowering plants for food. Humans also depend on pollinated crops (apples, almonds, cucumbers) for much of our food supply. The relationship between bees and flowers is part of a much larger network of interdependence in ecosystems worldwide.

Discussion Questions

* "Why do you think the bee's body is fuzzy instead of smooth?" (Bloom's: Analyze | DOK: 2)
  - This question encourages students to connect structure to function and think about how adaptations help organisms survive.

* "If all the bees disappeared from an area, what might happen to the flowers and the animals that eat the seeds from those flowers?" (Bloom's: Evaluate | DOK: 3)
  - This question asks students to think about cause-and-effect relationships and ecosystem interdependence at a higher level.

* "How do you think the flower 'knows' to attract bees with bright colors and sweet nectar?" (Bloom's: Evaluate | DOK: 3)
  - This question prompts discussion about evolution, adaptation, and how organisms change over time to survive.

* "Is this relationship between bees and flowers fair to both organisms, or does one benefit more than the other? Explain your thinking." (Bloom's: Analyze | DOK: 2)
  - This question develops critical thinking about symbiotic relationships and fairness in nature.

Potential Student Misconceptions

* Misconception: "Bees are trying to help the flower by carrying pollen on purpose."
  - Clarification: Bees don't intentionally pollinate flowers. Bees visit flowers to collect food for themselves. Pollination happens as a side effect of the bee's visit. Both organisms benefit, but the bee's primary motivation is feeding itself, not helping the plant.

* Misconception: "Pollen is dirt that gets stuck on the bee."
  - Clarification: Pollen is not dirt—it is a powder made by flowering plants that contains the plant's genetic material (like the plant's DNA). It's how plants reproduce. The bee's fuzzy body is perfectly designed to pick up and transport pollen.

* Misconception: "All flowers need bees to make seeds."
  - Clarification: Some flowers are pollinated by other animals (butterflies, hummingbirds, bats) or by wind. However, many flowering plants depend heavily on bees because bees are efficient, reliable pollinators that visit many flowers.

Extension Activities

* Flower Dissection Lab: Provide Fifth Graders with large flowers (like tulips or lilies) to carefully dissect. Have them identify the pistil (female part), stamen (male part), petals, and sepals. They can observe and draw pollen under a simple magnifying glass. Discuss how each part has a special job in pollination and reproduction.

* Bee and Flower Role-Play Simulation: Create a classroom simulation where some students are bees (wearing fuzzy clothing or tape) and others are flowers (standing in different areas with pictures of pollen grains taped to them). As "bees" move from "flower to flower," pollen (represented by tape or paper cutouts) transfers between them. Afterward, discuss what they learned about how pollination spreads pollen and why bees are effective pollinators.

* Create a Pollinator Garden Observation Plan: Work with your school or classroom to plant pollinator-friendly flowers (zinnias, sunflowers, marigolds). Over several weeks, students observe and record which insects visit the flowers, how often they visit, and which flowers are most popular. Create a class chart of data and discuss what this tells them about plant-pollinator relationships in their local ecosystem.

Cross-Curricular Ideas

* Math - Data Collection and Graphing: Students can count how many bees visit different flowers over a set time period and create bar graphs or pie charts showing which flowers attract the most pollinators. This connects to data analysis standards.

* ELA - Informative Writing: Have students write an informative paragraph from the perspective of a bee, explaining why they visit flowers and what happens to the pollen they carry. This practices explanatory writing while reinforcing science concepts.

* Social Studies - Agriculture and Food Systems: Discuss how many foods humans eat depend on pollination (apples, almonds, blueberries, cucumbers, pumpkins). Have students research and present on one pollinator-dependent crop and its importance to farming and food security.

* Art - Botanical Illustration: Students create detailed colored pencil or watercolor drawings of flowers with pollinators. This develops observation skills and fine motor control while deepening their understanding of flower anatomy and insect-flower relationships.

STEM Career Connection

* Beekeeper: A beekeeper manages honeybee colonies, caring for the bees and harvesting honey and beeswax. Beekeepers must understand bee biology, behavior, and how bees pollinate crops. They help protect pollinator populations, which is vital for food production. Many beekeepers also educate the public about the importance of bees. Average Annual Salary: $47,000–$52,000 USD

* Plant Biologist/Botanist: A plant biologist studies how plants grow, reproduce, and interact with their environment, including pollination. They might research how to breed crops that attract more pollinators or develop plants that resist disease. Average Annual Salary: $62,000–$75,000 USD

* Pollination Ecologist: A pollination ecologist studies the relationships between plants and their pollinators in natural ecosystems. They track bee populations, monitor plant health, and work to protect habitats where both bees and flowering plants thrive. This job helps save endangered species. Average Annual Salary: $55,000–$68,000 USD

NGSS Connections

5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

This standard is met because students can model how matter (nectar, pollen, nutrients) moves between the bee and the flower, and how this relationship supports both organisms' survival and growth.

- 5-LS2.A The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met.

- Systems and System Models
- Energy and Matter

Science Vocabulary

* Pollination: The process of moving pollen from one flower to another, which allows plants to make seeds.

* Pollen: A powder made by flowers that contains a plant's genetic material and is needed for the plant to make seeds.

* Symbiosis (or Symbiotic Relationship): A close partnership between two different organisms that live together and interact with each other.

* Mutualism: A type of symbiotic relationship where both organisms benefit or gain something they need.

* Nectar: A sweet liquid made inside flowers that bees collect as food.

* Adaptation: A body structure, behavior, or characteristic that helps an organism survive and thrive in its environment.

External Resources

Children's Books:

* The Bee Tree by Patricia Polacco — A warm story about a grandfather who teaches his granddaughter the importance of bees and flowers, with beautiful illustrations.

* Pollinators by Susan L. Roth and Cindy Trumbore — A picture book that explores different pollinators (bees, butterflies, hummingbirds, bats) and their relationships with flowering plants.

* The Reason for a Flower by Ruth Heller — A poetic exploration of flowers' purposes, including detailed illustrations of how flowers attract pollinators and create seeds.