

## Photo Description



A butterfly with black wings and cream-colored spots feeds on a pink flower with yellow centers. The butterfly uses its long, thin proboscis to drink sweet nectar from deep inside the flower. This shows how animals and plants work together in nature.

## Scientific Phenomena

The anchoring phenomenon here is mutualism - a beneficial relationship between two different species. The butterfly obtains energy-rich nectar from the flower for survival, while the flower receives pollination services when pollen grains stick to the butterfly's body and get transferred to other flowers. This co-evolution has resulted in flowers developing bright colors and sweet nectar to attract pollinators, while butterflies evolved specialized mouthparts and color vision to locate and access these food sources.

## Core Science Concepts

1. Pollination Process: Butterflies transfer pollen between flowers as they feed, enabling plant reproduction and seed formation.
2. Mutualistic Relationships: Both organisms benefit - butterflies get food energy, flowers get reproductive assistance.
3. Structural Adaptations: The butterfly's proboscis is perfectly designed to reach nectar, while flower shape and color attract specific pollinators.
4. Energy Transfer: Nectar provides chemical energy that butterflies convert to mechanical energy for flight and metabolic processes.

### Pedagogical Tip:

Use hand gestures to show the coiled proboscis unrolling - students remember concepts better when they engage multiple senses and use body movements to represent scientific processes.

### UDL Suggestions:

Provide tactile experiences by having students use flexible straws to "feed" like butterflies from paper flowers, accommodating different learning styles while reinforcing the feeding mechanism concept.

## Zoom In / Zoom Out

1. Zoom In: At the cellular level, nectar contains sugar molecules (glucose and fructose) that butterfly cells break down through cellular respiration to produce ATP energy for muscle contractions and flight.

2. Zoom Out: This pollination interaction is crucial for ecosystem food webs - successful plant reproduction produces fruits and seeds that feed other animals, while maintaining plant populations that provide habitat and oxygen for the entire ecosystem.

### Discussion Questions

1. "How might the butterfly's feeding behavior change if this flower had a different shape?" (Bloom's: Analyze | DOK: 3)
2. "What would happen to both butterflies and flowers if one species disappeared from this ecosystem?" (Bloom's: Evaluate | DOK: 3)
3. "How does the butterfly's proboscis compare to other animal feeding structures you know?" (Bloom's: Analyze | DOK: 2)
4. "Why do you think flowers evolved to have bright colors and sweet nectar?" (Bloom's: Synthesize | DOK: 2)

### Potential Student Misconceptions

1. Misconception: "Butterflies bite flowers to get nectar."

Clarification: Butterflies cannot bite - they have a straw-like proboscis that sucks up liquid nectar, similar to using a drinking straw.

2. Misconception: "Flowers make nectar to feed butterflies because they're being nice."

Clarification: Flowers produce nectar as a "reward" to attract pollinators for their own reproductive benefit, not out of kindness.

3. Misconception: "All butterflies pollinate all flowers."

Clarification: Different butterflies are adapted to different flower types - some flowers are specifically shaped for certain pollinators.

### Cross-Curricular Ideas

1. Math - Data Collection & Graphing: Have students observe flowers in a garden or schoolyard and record how many different butterfly species visit each flower type over a week. Create bar graphs comparing pollinator visits to different flowers, then analyze which flowers are "most popular" and why.

2. ELA - Narrative Writing: Students write a creative story from the butterfly's perspective, describing its journey finding flowers, feeding, and spreading pollen. Encourage descriptive language about colors, textures, and sensations to bring the experience to life.

3. Art - Nature Illustration: Students create detailed drawings or paintings of butterflies and flowers, focusing on realistic color patterns and anatomical features. This connects to scientific observation skills while developing fine motor control and artistic expression.

4. Social Studies - Local Ecosystems & Conservation: Research native butterflies and flowering plants in your region. Learn about local conservation efforts to protect pollinator habitats, and discuss how human activities (like pesticide use or habitat loss) affect these relationships.

### STEM Career Connection

1. Entomologist - A scientist who studies insects, including butterflies and how they interact with plants. Entomologists work to understand butterfly behavior, protect endangered species, and solve problems like crop damage. They might work in universities, nature centers, or environmental agencies. Average Salary: \$65,000-\$75,000 per year
2. Botanist - A scientist who studies plants and how they grow, reproduce, and interact with animals like pollinators. Botanists might breed flowers to have better colors or more nectar to attract butterflies, or help restore damaged ecosystems. Average Salary: \$63,000-\$72,000 per year
3. Pollinator Conservation Specialist - A professional who protects butterflies and other pollinators by creating butterfly gardens, reducing pesticide use, and educating communities about why these insects are important. They might work for environmental organizations, parks departments, or schools. Average Salary: \$55,000-\$68,000 per year

### NGSS Connections

- Performance Expectation: 5-LS2-1 - Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment
- Disciplinary Core Ideas: 5-LS2.A - 5-LS1.C - 5-PS3.D
- Crosscutting Concepts: Systems and System Models - Energy and Matter

### Science Vocabulary

- \* Proboscis: A long, tube-like mouthpart that butterflies use to drink nectar from flowers.
- \* Nectar: Sweet liquid that flowers make to attract animals that help with pollination.
- \* Pollination: The process of moving pollen from one flower to another to help plants make seeds.
- \* Mutualism: A relationship where two different living things help each other survive.
- \* Adaptation: A special body part or behavior that helps an animal or plant survive in its environment.

### External Resources

#### Children's Books:

- The Magic School Bus: Inside a Beehive by Joanna Cole
- From Caterpillar to Butterfly by Deborah Heiligman
- Flower Garden by Eve Bunting