Vine

Life Science | Lesson Guide

5th Grade

Photo Description

This image shows a climbing vine with long, green pod-like fruits growing over a wooden fence. The vine has large heart-shaped leaves and curly tendrils that help it grip and climb the wooden structure. Small yellow flowers are visible among the leaves, which will eventually develop into the mature pods you see in the photo.

Scientific Phenomena

Anchoring Phenomenon: Why do some plants climb structures instead of growing straight up?

This image illustrates plant adaptation and growth behavior. The vine grows upward and outward by climbing the fence because plants naturally grow toward sunlight (a process called phototropism). The tendrils are specialized leaf structures that curl around objects, allowing the plant to grip and support itself as it grows taller. This climbing strategy helps the plant reach more sunlight without needing a thick, sturdy stem like a tree. The plant produces flowers and fruits (the long pods) once it has enough energy from photosynthesis, showing how growth and reproduction are connected.

Core Science Concepts

* Plant Structures and Functions: Different plant parts have specific jobs. Tendrils grip structures, leaves capture sunlight for energy, flowers produce seeds, and roots absorb water and nutrients from soil.

* Plant Growth and Life Cycles: Plants grow through stages—seed germination, growth, flowering, and fruit production. Environmental factors like light and water affect how fast plants grow.

* Adaptations: Climbing vines have special features (tendrils, flexible stems, large leaves) that help them survive and thrive in their environment by reaching sunlight efficiently.

* Energy Flow in Plants: Through photosynthesis, plants use sunlight, water, and carbon dioxide to make their own food, which gives them energy to grow, reproduce, and produce fruits.

Pedagogical Tip:

When teaching about plant adaptations, use the "form follows function" approach. Have students observe the tendril and ask, "What job do you think this curly part does?" This helps them develop scientific thinking by connecting structure to purpose before you formally introduce the concept.

UDL Suggestions:

To support multiple means of engagement and representation: (1) Provide images of different climbing vines alongside images of non-climbing plants so students can compare structures visually; (2) Offer tactile models of tendrils students can manipulate; (3) Allow students to choose between drawing, writing, or building a model to demonstrate their understanding of how tendrils help plants climb.

Zoom In / Zoom Out

Zoom In — Cellular Level:
Inside the plant's cells, photosynthesis is happening in the green leaves. Chlorophyll (the pigment that makes leaves green) captures light energy and converts it into chemical energy (glucose). This process occurs in tiny structures inside leaf cells called chloroplasts. The plant uses this energy to build new cells, creating stems, leaves, tendrils, flowers, and fruits. Without this microscopic process, the visible growth you see would be impossible.

Zoom Out — Ecosystem Level:
This climbing vine is part of a larger garden ecosystem. The vine provides food (fruits and nectar) for insects, birds, and other animals. As pollinators visit the flowers, they help the plant reproduce. The fence acts as a structural support that mimics what trees or rock formations provide in nature. The vine's growth is influenced by seasonal changes, water availability, and temperature—all factors that connect to the broader climate system and weather patterns of the region.

Discussion Questions

1. "Why do you think this vine grows up the fence instead of spreading out along the ground?" (Bloom's: Analyze | DOK: 2)
   Guides students to think about light availability and growth strategies.

2. "If we removed this fence, what do you predict would happen to the vine? What other structures could it climb instead?" (Bloom's: Predict/Apply | DOK: 3)
   Encourages transfer of knowledge to new situations.

3. "Look at the tendrils. What problem does a curly tendril solve better than a straight stem would?" (Bloom's: Evaluate | DOK: 3)
   Develops critical thinking about design and function.

4. "How does the fence help this plant, and how does the plant help other living things (like insects or birds)?" (Bloom's: Analyze | DOK: 2)
   Explores interdependence and ecosystem relationships.

Potential Student Misconceptions

* Misconception: "Plants eat soil like we eat food."
  Clarification: Plants don't eat soil. Instead, their roots absorb water and dissolved nutrients from soil. Plants make their own food using sunlight through photosynthesis. Soil provides minerals and water needed for growth, but it's not the food itself.

* Misconception: "Tendrils are just decorations or accidents in how plants grow."
  Clarification: Tendrils are purposeful adaptations that help climbing plants grip surfaces and climb toward sunlight. They're as important to a climbing vine as legs are to a person—they serve a specific function for survival.

* Misconception: "Plants only grow roots and stems; flowers and fruits just appear randomly."
  Clarification: Plants follow a life cycle. Once a plant has grown large enough and has enough energy, it produces flowers. After pollination, flowers develop into fruits containing seeds. This is a predictable, organized process, not random.

Extension Activities

1. "Grow Your Own Climbing Vine" Investigation:

Plant seeds (beans or peas work well) in cups and provide small trellises, sticks, or string for them to climb. Students measure growth weekly, sketch the plant's position, and record observations about how the plant grips the support structure. This hands-on exploration directly mirrors the phenomenon in the photo.

2. Tendril Engineering Challenge:
Provide students with pipe cleaners, string, and various "climbing" scenarios (smooth dowels, textured rope, mesh). Challenge them to design and test which materials tendrils could grip most effectively. Students hypothesize, test, and analyze why different structures work differently—connecting to plant adaptations.

3. Plant Adaptation Comparison Museum:
Have students research and create fact cards or posters comparing different plant climbing strategies (tendrils, suckers, twining stems, adhesive pads). Display them as a "museum exhibit" where students can view and discuss how different plants solve the same problem of reaching sunlight.

Cross-Curricular Ideas

* Math: Measure vine growth over weeks and create line graphs showing growth patterns. Calculate the rate of growth (cm per week). Measure the angle at which tendrils curl and explore spirals in nature mathematically.

* ELA — Informative Writing: Research and write a fact sheet titled "All About Climbing Plants" or create a narrative from the plant's perspective: "A Day in the Life of a Climbing Vine." Include vocabulary and life cycle stages.

* Social Studies — Agriculture: Explore how humans cultivate climbing plants (beans, peas, hops, grapes) for food. Research farming practices around the world that use climbing plants, connecting to food production and cultural differences.

* Art: Create observational drawings of the vine focusing on tendril shapes and leaf arrangements. Use spirals as an art element inspired by nature. Photograph or sketch the interplay of light and shadow on the leaves and fence.

STEM Career Connection

Botanist: A botanist studies plants—how they grow, what they need, and how they adapt to different environments. A botanist might investigate why vines climb differently than other plants, or develop new varieties of crop plants. They work in laboratories, gardens, and forests. Average Salary: $65,000–$85,000 per year.*

Agricultural Engineer: These scientists design and improve farm equipment and growing systems to help crops like climbing beans and peas grow better. They might create better trellises or irrigation systems. Average Salary: $70,000–$90,000 per year.*

Horticulturist: A horticulturist grows and cares for plants, including vegetables, fruits, and ornamental plants. They use their knowledge of plant biology to help gardens and farms thrive. Average Salary: $50,000–$75,000 per year.*

NGSS Connections

Performance Expectation:
3-LS1-1: Develop models to describe that organisms have internal and external structures that function to support survival, growth, behavior, and reproduction.

Disciplinary Core Ideas:
* 3-LS1-A: Structure and Function
* 3-LS3-B: Inheritance of Traits
* 3-LS4-C: Adaptation

Crosscutting Concepts:
* Structure and Function: The tendril's spiral shape functions to grip and support the plant's climbing behavior.
* Cause and Effect: The climbing vine's growth (effect) is caused by its need to reach sunlight and the fence's structural support.
* Adaptations: The vine's special features (tendrils, flexible stem, large leaves) are adaptations that help it survive in its environment.
* Systems and System Models: The plant-fence-sunlight system shows how organisms interact with their physical environment.

Science Vocabulary

* Tendril: A thin, curly part of a plant that wraps around objects to help the plant climb and hold on.

* Photosynthesis: The process where plants use sunlight, water, and air to make their own food for energy and growth.

* Adaptation: A special trait or body part that helps a living thing survive and thrive in its environment.

* Pollination: The transfer of pollen from flowers to other flowers, which allows plants to make fruits and seeds.

* Chlorophyll: The green pigment in plant leaves that captures sunlight and helps plants make food.

* Life Cycle: The series of stages that a living thing goes through—birth, growth, reproduction, and death.

External Resources

Children's Books:

A Seed Is Sleepy* by Dianna Hutts Aston, illustrated by Sylvia Long — A lyrical exploration of seeds and their characteristics, including how they grow into plants like climbing vines.

Up in the Garden and Down in the Dirt* by Kate Messner, illustrated by Christopher Silas Neal — Explores above-ground and below-ground plant life, showing how roots, stems, and leaves work together.

The Tiny Seed* by Eric Carle — A classic story following a seed's journey and growth into a flowering plant, perfect for understanding plant life cycles.