

## Photo Description



## Scientific Phenomena

This image demonstrates the Anchoring Phenomenon of plant growth and germination in an upcycled container. The plant is exhibiting positive phototropism (growing toward the light source from the window) and has successfully established itself in the makeshift planter. The phenomenon occurs because plants need specific environmental conditions - light, water, nutrients from soil, and carbon dioxide - to carry out photosynthesis and cellular respiration for growth. The clear bottle allows us to observe the root system and soil environment that supports the plant's development.

## Core Science Concepts

1. Plant Life Cycles and Growth Requirements - Plants need sunlight, water, air, and nutrients from soil to survive and grow through their life cycle stages.
2. Phototropism and Plant Responses - Plants respond to their environment by growing toward light sources to maximize photosynthesis.
3. Recycling and Environmental Stewardship - Humans can reduce waste by repurposing materials like plastic bottles for new uses like planters.
4. Structure and Function Relationships - The plant's leaves are positioned to capture maximum sunlight, while roots (hidden in soil) absorb water and nutrients.

### Pedagogical Tip:

Use this image to launch a classroom investigation where students create their own bottle planters and track plant growth over time. This hands-on approach helps students make concrete observations about abstract biological processes.

### UDL Suggestions:

Provide multiple ways for students to document plant observations - through drawings, photos, measurements, or verbal recordings - to accommodate different learning preferences and abilities.

## Zoom In / Zoom Out

1. Zoom In: At the cellular level, chloroplasts in the plant's leaves are capturing light energy and converting carbon dioxide and water into glucose through photosynthesis, while root cells are actively absorbing water and dissolved minerals from the soil.

2. Zoom Out: This small container garden connects to larger environmental systems - the plant helps clean air by absorbing CO<sub>2</sub>, the recycled bottle reduces landfill waste, and successful container gardening can contribute to urban food systems and biodiversity.

### Discussion Questions

1. What evidence can you observe that shows this plant is healthy and growing well? (Bloom's: Analyze | DOK: 2)
2. How might this plant's growth change if we moved it to a dark closet for a week? (Bloom's: Predict/Hypothesize | DOK: 3)
3. What are the advantages and disadvantages of using a plastic bottle instead of a clay pot for growing plants? (Bloom's: Evaluate | DOK: 3)
4. How does reusing this bottle for a planter help both the plant and the environment? (Bloom's: Synthesize | DOK: 2)

### Potential Student Misconceptions

1. Misconception: Plants get their food from the soil like animals eat food.

Clarification: Plants make their own food through photosynthesis using sunlight, water, and carbon dioxide. Soil provides water and nutrients, but not food.

2. Misconception: Plants don't need air to survive.

Clarification: Plants need carbon dioxide from air for photosynthesis and oxygen for cellular respiration, just like animals.

3. Misconception: Any container will work equally well for growing plants.

Clarification: Containers need drainage holes and appropriate size for root growth. This bottle setup works but may need modifications for long-term plant health.

### Cross-Curricular Ideas

1. Math Connection - Measurement and Growth Tracking: Students can measure their bottle plants weekly using rulers and create line graphs to show plant height over time. This reinforces measurement skills and data representation while connecting to the science of plant growth rates.

2. ELA Connection - Informative Writing: Have students write step-by-step instructions for creating a bottle planter, or write persuasive letters to their families explaining why upcycling is important. This builds procedural and persuasive writing skills while reinforcing scientific vocabulary.

3. Art Connection - Environmental Awareness Posters: Students can create colorful posters showing ways to reduce, reuse, and recycle materials. They could illustrate different items that can be upcycled into planters, combining art skills with environmental messaging.

4. Social Studies Connection - Community Gardens: Research local community gardens or urban farming projects in your area. Discuss how growing plants in containers helps communities with limited space grow their own food, connecting to civic responsibility and sustainable living.

## STEM Career Connection

1. Botanist - A botanist is a scientist who studies plants and how they grow. Botanists work to understand plant diseases, develop new crop varieties, and help protect endangered plants. They might work in laboratories, greenhouses, or outdoors in nature. Some botanists help create better gardens and farms to grow food for communities. Average Annual Salary: \$63,000
2. Environmental Engineer - Environmental engineers design systems to help protect our planet. They work on projects like creating recycling programs, managing waste, and designing sustainable spaces where plants and people can thrive together. Some environmental engineers help design green roofs or community gardens in cities. Average Annual Salary: \$96,000
3. Horticulturist - A horticulturist is an expert in growing plants like fruits, vegetables, flowers, and ornamental plants. They work in nurseries, botanical gardens, farms, and research facilities to help plants grow healthily and develop better plant varieties. Horticulturists use their knowledge to teach people how to garden successfully. Average Annual Salary: \$52,000

## NGSS Connections

- Performance Expectation: 5-LS1-1 - Support an argument that plants get the materials they need for growth chiefly from air and water
- Disciplinary Core Ideas: 5-LS1.C - Organization for Matter and Energy Flow in Organisms
- Disciplinary Core Ideas: K-ESS3.A - Natural Resources
- Crosscutting Concepts: Systems and System Models
- Crosscutting Concepts: Structure and Function

## Science Vocabulary

- \* Photosynthesis: The process plants use to make food from sunlight, water, and carbon dioxide
- \* Germination: When a seed begins to grow into a new plant
- \* Phototropism: The way plants grow toward light sources
- \* Upcycling: Reusing old materials to create something new and useful
- \* Life cycle: The stages a living thing goes through as it grows and develops
- \* Nutrients: Important substances from soil that help plants stay healthy

## External Resources

Children's Books:

- From Seed to Plant by Gail Gibbons
- The Reason for a Flower by Ruth Heller
- A Seed Is Sleepy by Dianna Hutts Aston