

## Photo Description



A small plant with green leaves is growing from a clear plastic bottle that has been cut and filled with dark soil. The bottle is sitting on a windowsill with sunlight coming through. This shows how people can reuse materials to create a simple planter for growing plants.

## 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.

### 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

YouTube Videos:

- "How Do Plants Make Food? Photosynthesis for Kids" - Simple explanation of photosynthesis with animations (<https://www.youtube.com/watch?v=sQK3Yr1p5nM>)
- "Plant Life Cycle for Kids" by Homeschool Pop - Covers germination through full plant development ([https://www.youtube.com/watch?v=tk\\_KmDh6dkw](https://www.youtube.com/watch?v=tk_KmDh6dkw))