Parts of a Plant

Life Science | Lesson Guide

5th Grade

Photo Description

This image shows a bean seedling that has just started to grow from its seed. The green shoot with small leaves is growing upward while white roots are spreading out below. You can see the brown seed coat still attached to the stem where the plant first emerged.

Scientific Phenomena

The anchoring phenomenon here is seed germination - the process where a dormant seed begins to grow into a new plant. This happens when the seed absorbs water, which activates enzymes that break down stored food (starch) in the seed. The embryo inside uses this food energy to grow its first root (radicle) downward and its first shoot (plumule) upward. The plant is responding to gravity (gravitropism) and light (phototropism) to orient itself properly for survival.

Core Science Concepts

1. Seed Structure and Function: Seeds contain an embryo (baby plant), stored food, and a protective coat that work together to create new plants.

2. Plant Growth and Development: Plants grow in predictable patterns with roots growing down to absorb water and nutrients, while shoots grow up toward light for photosynthesis.

3. Plant Response to Environment: Plants respond to environmental stimuli like gravity, light, and water through growth movements called tropisms.

4. Life Cycles: This represents the beginning stage of a plant's life cycle, showing how plants reproduce and continue their species.

Pedagogical Tip:

Have students compare germinated seeds at different stages (1 day, 3 days, 5 days) to help them understand that growth is a process that happens over time, not instantly.

UDL Suggestions:

Provide tactile experiences by having students gently touch different parts of germinated seeds while describing what they observe, supporting kinesthetic learners and students with visual processing differences.

Zoom In / Zoom Out

1. Zoom In: At the cellular level, water enters seed cells through osmosis, causing them to swell and break the seed coat. Enzymes convert stored starch into simple sugars that fuel cell division and elongation in the growing embryo.

2. Zoom Out: This single germinating seed connects to larger ecosystems where plants serve as primary producers, converting sunlight into food energy that supports entire food webs and contributes oxygen to our atmosphere.

Discussion Questions

1. What do you think this plant needs to continue growing successfully? (Bloom's: Evaluate | DOK: 3)
2. How might this seedling look different if it were grown in complete darkness? (Bloom's: Analyze | DOK: 2)
3. What evidence can you observe that shows this seed has been growing for several days? (Bloom's: Analyze | DOK: 2)
4. Why do you think the roots grow downward while the shoot grows upward? (Bloom's: Understand | DOK: 2)

Potential Student Misconceptions

1. Misconception: "Plants get their food from soil like animals eat food."
   Clarification: Plants make their own food through photosynthesis using sunlight, water, and carbon dioxide. Soil provides nutrients and water, but not food.

2. Misconception: "Seeds are not alive until they start growing."
   Clarification: Seeds contain living embryos in a dormant state, waiting for the right conditions to begin active growth.

3. Misconception: "All plant parts grow the same way."
   Clarification: Roots show positive gravitropism (grow toward gravity) while shoots show negative gravitropism (grow away from gravity).

Cross-Curricular Ideas

1. Math - Measurement and Data: Have students measure the height of germinating seeds each day for two weeks and create a line graph showing plant growth over time. They can calculate the average growth rate per day and predict future heights based on patterns in their data.

2. ELA - Narrative Writing: Students can write a "Day in the Life" story from the perspective of the germinating seed, describing what it experiences as it grows, what it needs, and the challenges it faces. This helps them connect emotionally to the plant's journey while practicing descriptive writing.

3. Social Studies - Agriculture and Food Systems: Explore how farmers depend on seed germination and plant growth to produce food for communities. Students can research different crops grown in their region and learn how understanding plant growth helps farmers decide when to plant seeds for the best harvest.

4. Art - Botanical Illustration: Students can create detailed pencil or watercolor drawings of germinating seeds at different growth stages, practicing observational skills while creating a visual record of the growth process. They can display these illustrations as a "growth journal."

STEM Career Connection

1. Botanist - A botanist is a scientist who studies plants, including how they grow, what they need to survive, and how they help our environment. Botanists might work in gardens, greenhouses, or laboratories to learn more about plants and help farmers grow better crops. They use microscopes, conduct experiments, and keep detailed records of their observations. Average Annual Salary: $65,000

2. Agricultural Scientist - An agricultural scientist works to improve crop growth and farming practices by understanding plant needs and experimenting with new growing methods. They might test different soil types, water amounts, or fertilizers to help plants grow healthier and stronger. This helps farmers produce more food for people around the world. Average Annual Salary: $68,000

3. Horticulturist - A horticulturist is an expert in growing plants like vegetables, flowers, and fruits. They design gardens, care for plants in greenhouses, and teach people the best ways to help plants thrive. Some horticulturists work in public gardens or parks, while others help develop new plant varieties. Average Annual Salary: $55,000

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
  - K-LS1.C - Organization for Matter and Energy Flow in Organisms
- Crosscutting Concepts:
  - Patterns - Observable patterns in plant growth and development
  - Structure and Function - How seed parts relate to their functions

Science Vocabulary

* Germination: The process when a seed begins to grow into a new plant.
* Embryo: The tiny baby plant inside a seed that grows into a full plant.
* Radicle: The first root that grows out of a germinating seed.
* Plumule: The first shoot that grows upward from a germinating seed.
* Tropism: The way plants grow toward or away from things like light or gravity.
* Cotyledon: The first leaves that emerge from a seed, often containing stored food.

External Resources

Children's Books:
- From Seed to Plant by Gail Gibbons
- The Tiny Seed by Eric Carle
- A Seed Is Sleepy by Dianna Hutts Aston