

## Photo Description



This image shows a small green plant sprouting from soil with two seed coats (the brown shells) still attached—one at the base and one at the top. The green stem is growing upward, and you can see the beginning of the plant's life cycle as it breaks out of its protective seed covering. The seeds are cracking open because a new plant is growing inside and needs to push its way out into the world.

## Scientific Phenomena

**Anchoring Phenomenon:** Seed germination—the process where a seed breaks open and begins to grow into a plant.

**Why It Happens (Scientific Explanation):** Seeds are dormant (sleeping) packages containing a baby plant and stored food. When seeds get the right combination of water, warmth, and oxygen, they "wake up." The baby plant (embryo) absorbs water, swells inside the seed coat, and eventually cracks it open. The plant then uses the stored food in the seed to grow roots downward and a stem upward. This is nature's way of ensuring plants grow only when conditions are favorable for survival.

## Core Science Concepts

- \* **Seed Structure:** Seeds have protective outer coats, stored food for the baby plant, and an embryo (the tiny plant inside). The seed coat keeps the baby plant safe until it's ready to grow.
- \* **Conditions for Growth:** Seeds need three main things to germinate: water (to activate growth), warmth (to speed up the process), and oxygen (for the plant cells to function). Without these, seeds stay dormant.
- \* **Life Cycles:** Plants go through different stages of life—seed, sprout, seedling, mature plant, and reproduction. Germination is the beginning stage where a seed becomes a visible plant.
- \* **Energy Transfer:** Seeds store energy (food) inside them that the baby plant uses to grow before it can make its own food through photosynthesis once its leaves develop.

### Pedagogical Tip:

Students at this age are concrete thinkers and learn best through direct observation. Rather than just showing this photo, consider planting bean seeds in a clear cup so students can watch germination happen over 1-2 weeks. They can draw daily observations and measure growth with a ruler. This transforms the photo from a static image into a personal discovery experience where they become scientists tracking real change.

### UDL Suggestions:

To support diverse learners: (1) Provide a labeled diagram of seed parts alongside the photograph for visual learners; (2) Allow kinesthetic learners to manipulate a large seed model or actual soaked bean seeds to feel the softening seed coat and locate the embryo; (3) Create audio descriptions or use think-aloud protocols so students can hear scientific language modeled; (4) Offer a graphic organizer showing the germination sequence for students who need structured note-taking.

### Discussion Questions

1. What do you think is happening to the seed in this picture, and why do you think the seed coat is cracking open? (Bloom's: Understand | DOK: 2)
2. What do you predict this plant will look like in two weeks? What does it need to keep growing? (Bloom's: Predict | DOK: 2)
3. Why do you think seeds have hard outer coats that need to crack open? What problem do they solve? (Bloom's: Analyze | DOK: 3)
4. If we kept a seed completely dry in a sealed bag, would it germinate? Explain your thinking. (Bloom's: Evaluate | DOK: 3)

### Extension Activities

1. Seed Germination Observation Lab: Give each student a clear plastic cup with moist soil and a bean seed planted 1 inch deep. Have students observe and sketch the germination process daily for 2-3 weeks, measuring stem and root growth with a ruler. Create a class graph showing how fast different seeds germinate under identical conditions.
2. Seed Dissection & Discovery: Provide soaked bean or sunflower seeds (soaking softens the coat). Students carefully open seeds with a plastic knife, locate the embryo, seed coat, and stored food, and match their findings to labeled diagrams. This hands-on exploration helps them understand hidden internal structures.
3. Germination Condition Experiment: Set up three identical cups with seeds but vary one condition in each: (1) keep moist and warm; (2) keep dry in sunlight; (3) keep moist but in a cold location. Students predict which will germinate fastest and check daily. This teaches the scientific method and the importance of variables.

### NGSS Connections

Performance Expectation: 3-LS1-1 Develop models to describe that organisms have unseen parts that help them survive, grow, and produce offspring.

Disciplinary Core Ideas:

- \* 3-LS1.B Growth and Development of Organisms—Plants require water, air, and energy to grow
- \* 3-LS3.A Inheritance of Traits—Individual traits vary and some traits are inherited from parents (seeds contain genetic information)

Crosscutting Concepts:

- \* Patterns The patterns of germination occur when specific conditions are met
- \* Cause and Effect Water and warmth cause dormant seeds to germinate

### Science Vocabulary

- \* Germination: When a seed wakes up, absorbs water, and begins to grow into a plant.
- \* Seed Coat: The tough, protective outer shell of a seed that keeps the baby plant safe.
- \* Embryo: The tiny baby plant living inside a seed.
- \* Dormant: In a sleeping or resting state; seeds are dormant until conditions are right for growth.
- \* Sprout: The first visible shoot that emerges from a germinating seed.

\* Oxygen: A gas in the air that living things, including sprouting seeds, need to survive.

## External Resources

### Children's Books:

The Tiny Seed\* by Eric Carle—A story following a tiny seed's journey through seasons until it finally germinates and grows into a beautiful flower.

From Seed to Plant\* by Gail Gibbons—A non-fiction picture book with clear, labeled diagrams showing each stage of plant growth from seed to mature plant.

How a Seed Grows\* by Helene J. Jordan—A simple, observation-focused book perfect for students conducting their own germination experiments.

### YouTube Videos:

\* "Time-Lapse: Seed to Plant Growth" by National Geographic Kids (2:30 min)—Shows plant germination and growth compressed into beautiful, fast-moving visuals; great for engaging visual learners. [https://www.youtube.com/results?search\\_query=national+geographic+kids+seed+to+plant](https://www.youtube.com/results?search_query=national+geographic+kids+seed+to+plant)

\* "What Do Seeds Need to Grow?" by Crash Course Kids (4:15 min)—Explains water, air, and warmth requirements with clear animations and relatable examples. <https://www.youtube.com/watch?v=l1YxW4F9OYc>