Reflection

Physical Science | Lesson Guide

5th Grade

Photo Description

The image shows bright red flowers called gerbera daisies sitting in a clear glass vase filled with water. The flowers are positioned on a shiny, curved glass table that reflects light from above. You can see the green stems of the flowers going down into the water in the vase.

Scientific Phenomena

The anchoring phenomenon here is plant water transport and reflection of light. The flowers are demonstrating how plants transport water from their roots (or cut stems) up through their vascular system to keep the petals and leaves healthy. The curved glass table shows how smooth surfaces can reflect light, creating mirror-like images. The water in the vase also demonstrates refraction, where light bends as it passes through different materials, making the stems appear slightly different when viewed through the water.

Core Science Concepts

1. Plant Transport Systems: Plants have special tubes called xylem that carry water from the roots up through the stem to the leaves and flowers, similar to how straws carry liquid upward.

2. Light Reflection: Smooth, shiny surfaces like the glass table act like mirrors, bouncing light back to our eyes and creating reflections of objects above them.

3. Light Refraction: When light travels from air into water, it bends or changes direction, making objects underwater appear in slightly different positions than they actually are.

4. Properties of Materials: Different materials (glass, water, plant tissue) interact with light in unique ways based on their physical properties.

Pedagogical Tip:

Have students make predictions about what they observe before explaining the science. Ask them to draw what they see, then compare their observations to build scientific thinking skills.

UDL Suggestions:

Provide multiple ways for students to demonstrate understanding: drawing observations, verbal descriptions, or hands-on experiments with water and different materials to accommodate diverse learning styles.

Zoom In / Zoom Out

1. Zoom In: At the cellular level, plant cells in the stem have specialized structures called xylem vessels that form tiny tubes. Water molecules stick together (cohesion) and to the tube walls (adhesion), creating a continuous column of water that moves upward through the plant.

2. Zoom Out: This water transport system connects to the larger water cycle on Earth. Water absorbed by plants eventually evaporates from their leaves (transpiration), returning moisture to the atmosphere and contributing to cloud formation and precipitation patterns.

Discussion Questions

1. What do you think would happen to these flowers if we removed them from the water for several hours? (Bloom's: Predict | DOK: 2)

2. How is the way plants transport water similar to and different from how humans transport blood through their bodies? (Bloom's: Compare | DOK: 3)

3. Why can you see a reflection of the flowers in the glass table but not in the wall behind them? (Bloom's: Analyze | DOK: 2)

4. What evidence can you observe in this photo that shows the flowers are still "alive" even though they've been cut? (Bloom's: Evaluate | DOK: 3)

Potential Student Misconceptions

1. Misconception: Plants drink water through their leaves like animals drink through their mouths.
   Clarification: Plants absorb water primarily through their roots, and it travels up through the stem to reach all parts of the plant.

2. Misconception: Reflections are actual objects trapped inside mirrors or glass.
   Clarification: Reflections are images created when light bounces off smooth surfaces back to our eyes - no actual objects are inside the reflective surface.

3. Misconception: Cut flowers don't need water because they're no longer growing.
   Clarification: Cut flowers still need water to keep their cells healthy and maintain their structure, even though they can't grow new parts.

Cross-Curricular Ideas

1. Mathematics - Measurement and Data: Have students measure the height of the flowers, the diameter of the vase opening, and the water level at different times. Create a chart or graph showing how water levels change over several days as the flowers drink water. This connects to 5.MD standards about measurement and graphing.

2. ELA - Descriptive Writing: Ask students to write a detailed description of the flowers using sensory words (what they see, imagine touching, etc.). Then have them write from the flower's perspective—a journal entry about the journey water takes from the vase through the stem to the petals. This builds descriptive vocabulary and narrative writing skills.

3. Art - Color and Light: Students can create their own still-life drawings of the flowers, focusing on how light reflects off the glass vase and table. Discuss how artists use shading and highlights to show how light interacts with different materials. Challenge them to draw the same scene with different light sources.

4. Social Studies - Global Water Systems: Connect plant water transport to the larger water cycle and human water use. Discuss where the water in vases comes from, how water travels through our community, and why plants are important to our environment and food systems worldwide.

STEM Career Connection

1. Botanist - A botanist is a scientist who studies plants and how they grow, survive, and adapt to their environments. Botanists conduct experiments with plants, observe how they transport water and nutrients, and work to help plants grow better in gardens, farms, and nature. They might work in greenhouses, universities, or nature centers. Average Annual Salary: $63,000 USD

2. Florist/Horticulturist - A florist or horticulturist is someone who grows and arranges plants and flowers for people to enjoy. They understand what plants need to stay healthy (like water, sunlight, and soil), create beautiful arrangements like the one in this photo, and help customers select flowers that will last longest. Some horticulturists work in nurseries growing plants. Average Annual Salary: $48,000 USD

3. Optical Engineer - An optical engineer is a scientist and engineer who works with light and how it travels through materials like glass, water, and lenses. They design things like mirrors, glasses, camera lenses, and telescopes. Understanding reflection and refraction (like we see in this photo with the glass table and water) is a big part of their job. Average Annual Salary: $78,000 USD

NGSS Connections

- Performance Expectation: 5-PS1-3 - Make observations and measurements to identify materials based on their properties
- Disciplinary Core Ideas: 5-PS1.A - Structure and Properties of Matter
- Disciplinary Core Ideas: 5-LS1.C - Organization for Matter and Energy Flow in Organisms
- Crosscutting Concepts: Structure and Function
- Crosscutting Concepts: Patterns
- Science and Engineering Practice: Planning and Carrying Out Investigations

Science Vocabulary

* Xylem: Special tubes inside plant stems that carry water from the roots to the leaves and flowers.
* Reflection: When light bounces off a smooth surface and creates an image we can see.
* Refraction: The bending of light when it passes from one material into another, like from air into water.
* Transpiration: The process where plants release water vapor through tiny holes in their leaves.
* Vascular system: The network of tubes that transport water and nutrients throughout a plant's body.
* Cohesion: The way water molecules stick together to form a continuous stream.

External Resources

Children's Books:
- From Seed to Plant by Gail Gibbons
- The Magic School Bus: How Plants Eat by Joanna Cole
- Light: Shadows, Mirrors, and Rainbows by Natalie Rosinsky