Reflection

Physical Science | Lesson Guide

3rd Grade

Photo Description

This picture shows a tall glass building that acts like a giant mirror. The glass windows reflect another building, making it look like the second building is inside the first one. The reflection creates interesting patterns and shapes on the shiny surface.

Scientific Phenomena

The anchoring phenomenon here is reflection - when light bounces off a smooth, shiny surface like glass or a mirror. This happens because light travels in straight lines, and when it hits the glass windows at an angle, it bounces back at the same angle, carrying the image of the nearby building with it. The glass acts like a massive mirror, creating a reflected image that appears to be "inside" the building but is actually just light bouncing back to our eyes.

Core Science Concepts

1. Light travels in straight lines - Light moves from the sun or other sources in straight paths until it hits something
2. Reflection occurs when light bounces off surfaces - Smooth, shiny surfaces like glass reflect light better than rough surfaces
3. The angle of reflection equals the angle of incidence - Light bounces off at the same angle it hits the surface
4. Materials have different properties - Glass is transparent (you can see through it) but also reflective when light conditions are right

Pedagogical Tip:

Have students use flashlights and mirrors during indoor exploration time to see how light bounces at predictable angles. This hands-on experience helps them understand that reflection follows rules, not random chance.

UDL Suggestions:

Provide multiple ways for students to explore reflection: kinesthetic learners can use their bodies to "be" light rays bouncing off surfaces, visual learners can draw light path diagrams, and auditory learners can create sound reflections (echoes) to understand the concept.

Zoom In / Zoom Out

1. Zoom In: At the microscopic level, light is made of tiny packets of energy called photons that bounce off the electrons in the glass molecules, causing the reflection we see with our eyes.

2. Zoom Out: This building reflection is part of a larger urban heat island effect - all these reflective glass buildings in a city bounce sunlight around, making cities warmer than surrounding areas and affecting local weather patterns.

Discussion Questions

1. What do you think would happen to the reflection if the glass building had rough, bumpy windows instead of smooth ones? (Bloom's: Predict | DOK: 3)

2. Why can you see the building's reflection better on the glass building than on a brick wall? (Bloom's: Analyze | DOK: 2)

3. How is this building reflection similar to seeing yourself in a puddle of water? (Bloom's: Compare | DOK: 2)

4. If you were standing inside the glass building, do you think you could see the reflection from inside? Why or why not? (Bloom's: Evaluate | DOK: 3)

Potential Student Misconceptions

1. Misconception: "The other building is actually inside the glass building"
   Clarification: The building we see is just a reflection - light bouncing off the glass surface, like looking in a bathroom mirror

2. Misconception: "Only mirrors can reflect things"
   Clarification: Many smooth, shiny surfaces can reflect light, including water, glass, metal, and even ice

3. Misconception: "Light bounces randomly off surfaces"
   Clarification: Light follows predictable rules - it always bounces off at the same angle it hits the surface

Cross-Curricular Ideas

1. Math - Symmetry and Patterns: Have students explore symmetry by looking at the grid patterns in the glass building's windows. They can count the rows and columns of windows, create their own grid designs on graph paper, and discover how reflections create matching patterns on both sides of a line (bilateral symmetry).

2. ELA - Descriptive Writing: Ask students to write a short story or poem from the perspective of the reflected building. "What would the building say if it could talk about being a reflection?" This connects descriptive language skills with the science concept and encourages creative thinking about the phenomenon.

3. Art - Mirror Self-Portraits: Students can create self-portraits using mirrors to observe their own reflections carefully, noticing details they might miss without a mirror. Then they can draw what they see, exploring how artists use reflections in their work. This connects the physics of reflection to visual arts.

4. Social Studies - Community Helpers: Discuss the people who work in tall glass buildings (office workers, architects, engineers) and how reflection and light affect their daily work environments. Connect to local community by having students identify reflective buildings in their own town.

STEM Career Connection

1. Architect - Architects are people who design buildings. They think carefully about what materials to use, like glass, and how sunlight will reflect off the building's surfaces. Architects use math and science to make buildings that are beautiful and work well. Average Salary: $82,000/year

2. Material Scientist - Material scientists study different materials like glass, metal, and plastic to understand how they work. They figure out which materials reflect light best, are strongest, or are safest to use. Their work helps create better glass for buildings, windows, and eyeglasses. Average Salary: $88,000/year

3. Optical Engineer - Optical engineers design and build things that use light, like cameras, telescopes, and special lenses. They understand how light reflects and bends to create clear images. Some optical engineers work on making better glass and reflective surfaces for buildings and technology. Average Salary: $105,000/year

NGSS Connections

- Performance Expectation: 1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light
- Disciplinary Core Ideas: 1-PS4.B - Objects can be seen if light is available to illuminate them or if they give off their own light
- Crosscutting Concepts: Cause and Effect - Simple tests can be designed to gather evidence to support or refute student ideas about causes

Science Vocabulary

* Reflection: When light bounces off a surface and back to your eyes
* Transparent: A material you can see through, like clear glass or water
* Surface: The outside or top layer of something
* Property: A special characteristic that describes what a material is like
* Light source: Something that makes its own light, like the sun or a flashlight

External Resources

Children's Books:
- Shadows and Reflections by Tana Hoban
- Light by David Dreier
- What Is Light? by Robin Johnson