



HANDS-ON STEM

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Changing Arrows

AT A GLANCE

Students will dive into the ways that light is refracted through water. Adult supervision is a must—along with a flash of scientific curiosity!

BACKGROUND INFORMATION

In physics, refraction is the change in direction of a wave passing from one medium to another, caused by change in speed. For example, waves travel faster in deep water than they do in shallow water.

MATERIALS

- Glass of water
- Pen
- Paper
- Spoon

PROCEDURE

1. Draw an arrow on a piece of paper.
2. Place the paper behind an empty glass, pointing the arrow to the right.
3. Fill the glass with water.
4. You can try other glasses to find the best shape for the experiment.
5. Continue checking the arrow to see if it's pointing in the opposite direction.
6. Try writing letters and other shapes on a piece of paper. Does it still work?

THE SCIENCE

This experiment illuminates the changes taking place as light is refracted through water. Simply put, refraction is an optical illusion. Light bends when it passes from a substance of one density into a substance of a different density—in this case from air to water.



Take the experiment further to see how the concave (turned inwards) surface of a spoon reflects images upside-down. Being a concave surface, the light waves hit the various parts of the spoon at different angles, so they're all bent somewhat differently. By the time they've been reflected back at you, they're all bending differently in a way that makes things look inverted (upside down).