

### Engagement:

Ask students what about what they learned about light when they went to The Discovery.

### Exploration:

Tell the students that you're going to talk about light and refraction. Take the glass and place it in front of the paper with the arrow drawn on it, so that you can see the arrow through the glass. Ask the students which direction the arrow is pointing. Now pour water into the glass and ask the students which direction the arrow is pointing. Ask why it's pointed in a different direction than it was when the glass was empty.

### Explanation:

The light traveled through the air, through the glass, through the water, through the back of the glass then through the air again before hitting the arrow. Anytime light travels from one material to another it bends or refracts. As the light travels through a substance, it becomes concentrated into a focal point, usually near the center. After light passes through the focal point, the rays cross over each other and cause images to appear reversed.

### Extension:

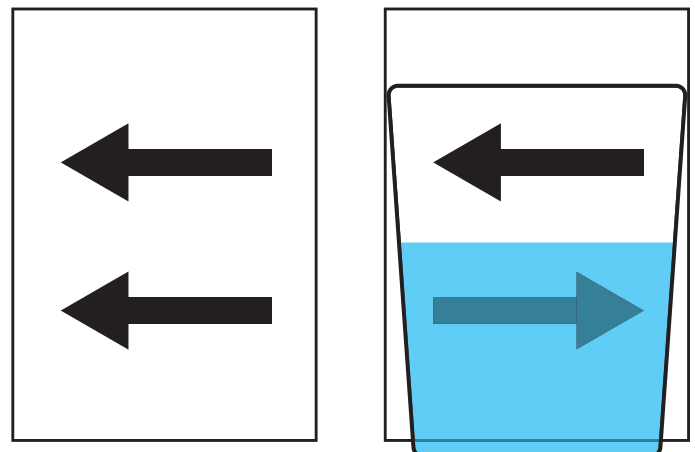
Allow students to examine a straw in a glass of water. Explore what happens to the straw. Why does it appear to bend when in the water? This is due to refraction!

### Other Resources:

Reverse Arrow Light Experiment Demonstration  
<https://www.youtube.com/watch?v=o08jgkut7e8>

### What You Will Need:

- A transparent water glass
- A piece of paper with an arrow drawn on it
- A pitcher of water



### Nevada Academic Content Standards in Science (NGSS):

1-PS4-3. Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

### Common Core:

W.K.2.2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some