

## Seeing Color – Water Prisms

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**Grade(s):** k-5

**Topic:** Physical Science

**Standards:**

Disciplinary Core Ideas –PS4

Crosscutting concepts:

Cause and Effect

Patterns

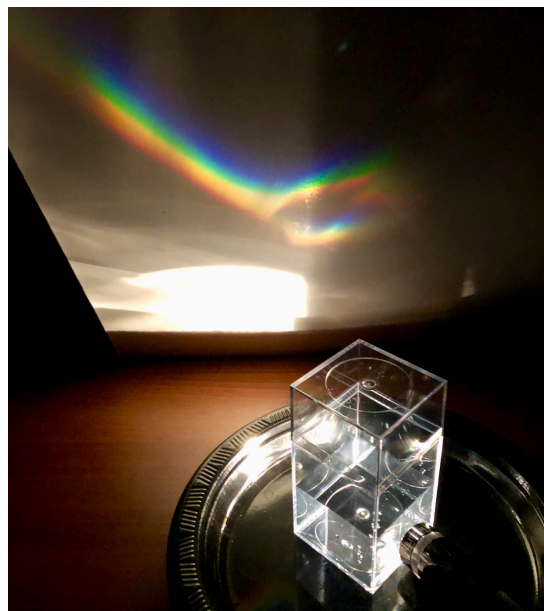
Structure and Function

Science and Engineering Practices:

Asking questions and defining problems

Planning and carrying out investigations

Developing and using models



**Objective:**

- Understand the white light is a combination of many colors of light. Different light sources are a combination of different colors of light.
- A clear container filled with water can be used as a prism to see all the colors in white light-visible spectrum.

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**Materials:** Per group of 2

Rectangular clear containers with lids

Black plastic plates

Flashlights or Mag-Lights

Straws

White sheet of paper

**Advanced Preparation:**

1 set per 2 students:

Fill plastic containers  $\frac{1}{2}$  with water.

Place container on a black plate.

Have flashlights ready for part 2 of the activity.

**Activity****Part 1**

Have students make observations.

Possible observations: it's clear, transparent, it makes objects appear larger, it reflects light and refracts light, they may see colors on the corners.

Have students write down their observations.

Discuss the difference between reflection and refraction.

This can be confusing to students since everything we see is from light bouncing off an object and entering into our eyes.

Refraction occurs when light passes through a transparent material and gets slowed down and bent.

Give each group a straw and have them place it inside the container.

Make observations. Why does the straw look like it is broken?

Refraction of light through water and air causes the light to slow down in water and bend.

**Part 2**

Have students predict what new or different observations they will notice using a flashlight instead of the classroom lights.

Hand out the flashlights and turn off the classroom lights.

Have students to make observations and write them down.

Possible observations: they see the colors of the rainbow, particles floating in the water, beams of light rays, shadows from the container and from the water. Make sure all students project the rainbow spectrum on the white sheet of paper or wall.

Discuss the differences between using regular classroom light vs flashlight. Discuss their predictions.

Compare and contrast the observations.

**Underlying Science:**

An exploration using classroom lights (white light), which include all the colors of the visible spectrum. It's difficult to see the spectrum with the large amount of light source, but there are still interesting observations. One of the important observations is that the water is clear (transparent). This leads to the discussion of refraction. When the students place the straw into the water and observe the straw from the side, it appears broken. They may also see many reflections of the straw. The flashlight is also white light. The light entering is focused and allows light to be seen as it bends to create a rainbow. Each color represents a different wavelength of light and bends at different rates. ROY G BIV. (red, orange, yellow, green, blue, indigo and violet)

Violet will bend the most and red will bend the least.

Refer back to the broken straw image from part 1. It's the same phenomena.

Next time you see a rainbow remember: Each drop of water acts like a prism. Every drop of water bends the light at different rates creating the rainbow.

**LIGO Connection:**

LIGO uses many sizes of mirrors (optics) that are made of beautifully polished glass. This allows for reflection and transmission of the laser light used in different chambers of the interferometer. Some of the mirrors allow for almost all of the light to be reflected back to another mirror while other mirrors allow both reflection and transmission of light.

Using properties of light as a wave LIGO is able to detect gravitational waves.

**Resources:**

**F.B. Royalty, “Making rainbows in the classroom, “Physics Teacher 22, 523 (Nov. 1984)**

**Safety Considerations:**

Students may spill water on their clothes. Provide plenty of paper towels.