

# I'll Build You A Rainbow

## Summary

Experiments and demonstrations are used to help students understand that white visible light is composed of the colors of the spectrum.

## Time Frame

1 class periods of 45 minutes each

## Group Size

Large Groups

## Materials

For the Teacher:

- Shallow Baking Dish
- Water
- Small Mirror
- Modeling Clay
- White Paper
- 3 Flashlights
- Red, Green, and Blue Cellophane

For the Student:

- Clear Plastic Cup
- Water
- Straw
- Pencil
- Penny
- Prism
- Flashlight
- White Paper
- Science Journal

## Background for Teachers

People first thought rainbows were something of a supernatural explanation. The first person to realize that light contained color was a man in 1666 named Sir Isaac Newton. Newton discovered the colors when he bent light. We see a rainbow of colors when we use a prism or water to separate the colors of sunlight. Light is bent as it passes through the water or prism and the colors are spread apart into a spectrum. Each color becomes individually visible. Each color has a different wavelength with red being the longest and violet the shortest. When light passes through a prism or water, each color is bent at a different angle.

Color is an essential part of our life. Everything we see has color. Colors are in the clothes we wear, in the plants and animals. The sky is blue. The snow is white. The asphalt is black. Can you imagine what our world would be like if there were no color?

If you were asked to draw a rainbow, in which order would you put the colors? Young (and sometimes older) children may think each rainbow, like each person is unique. They're not aware that real rainbows contain specific colors and that these colors are always arranged in the same order. This is quite an amazing idea. All the rainbows that ever were or ever will be have the same colors in the same order.

## Intended Learning Outcomes

- Observe simple objects, patterns, and events, and report their observations.
- Demonstrate a sense of curiosity about nature.
- Cite examples of how science affects life.

## Instructional Procedures

### Introduction:

Begin by briefly discussing rainbows.

How many of you have ever seen a rainbow?

Where were you when you saw the rainbows?

Can you explain what makes a rainbow?

Help students understand that the colors in rainbows actually come from white light.

Explain to the students that light bends and when we bend light we can see the colors of the rainbow. This process is called refraction.

### Part 1: Making Light Bend

Give each student a clear plastic cup half-full of water and a straw. Instruct the students to put their straw into a glass of water and then look at the straw from the side.

Ask them why the straw looks broken when it is not.

Explain that light rays change direction as they leave the water. This 'bending' of the light rays makes the straws look bent in the middle, even though they are actually straight. This process is called refraction.

Take out the straw and try a pencil.

Ask the students if the part of the pencil out of the water looks different from the part in the water. Does it appear bent?

The water refracts (bends) the light as it travels from the pencil to your eyes making it look larger than it actually is. It looks magnified.

Let the students try a penny.

Ask them why they think the penny looks bigger? This happens when light passes through the water and refracts.

Explain to the students that we can actually SEE the colors of the rainbow when we refract light.

### Part 2: Making a Rainbow

Fill a flat dish half full of water.

Put the mirror in the dish so it slants back against the side. Secure it with the modeling clay.

Shine a flashlight on the part of the mirror under the water.

Hold the piece of white paper above the light. A rainbow will appear on the paper.

Put the rainbow away and have the students name each color. Tell students there is an easy way to remember the order of the color spectrum: ROY G BiV. (red, orange, yellow, green, blue, indigo, and violet.) Discuss with students that indigo isn't actually in the spectrum of a rainbow. That is why we write it with a lower-case i.

Tell students that water is not the only way to make a rainbow. We can also use prisms.

Use a prism to demonstrate how a rainbow can be formed. (Casting the rainbow on a piece of white paper will make it more visible.)

Give students prisms and allow them to experiment making rainbows by using flashlights, and (if time permits) sunlight.

### Part 3: Making White Light

We have experimented with separating white light into the colors of the spectrum. Now we will see if we can combine the colors of the spectrum to form white light.

Ask students to name the primary colors (red, yellow, and blue.)

Explain that red, yellow, and blue are the primary colors of pigment (or paint), but light has

different primary colors. They are: red, green, and blue.

Cover the ends of three flashlights with the red, green, and blue cellophane.

Give the flashlights to three students and have them point them one at a time toward a white paper. Challenge them to mix the primary colors of light to form white light.

#### Conclusion:

Have students answer the question, "What makes a rainbow?" in their science journals.

#### Extensions

Read any of the following books to lead additional activities related to color.

- *Hailstones and Halibut Bones*  
by Mary O'Neill
- *Color*  
by Ruth Heller
- *My Many Colored Days*  
by Dr. Seuss

#### Assessment Plan

Use the Science Writing Rubric to assess responses in science journals.

#### Rubrics

[Science Writing Rubric](#)

#### Bibliography

Original lesson plan created by Rita Garbett.

#### Authors

[Teresa Hislop](#)

[KIRSTIN REED](#)