

A World of Color

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Overview

Can you imagine how different the world would look if there were no colors? What if everything was just white, grey or black? What is your favorite color? Why? This week we are going to be studying all about color and how it makes our lives richer and more beautiful! We are going to be doing a variety of activities that allow you to not only be scientists, but also artists.

Background Information

You have to have **light** in order to see color. When light hits an object, some colors are absorbed by that object and some colors bounce off of it back to our eyes. A red apple reflects red back to our eyes, while absorbing other colors. Sunlight appears white. However, when it is bent (like in the case of a prism or a rainbow), you can actually see that white is a combination of all the colors. A white object is reflecting all the colors back to our eyes. Black is darkness or the lack of light. A black object absorbs all the colors of light, not reflecting any of them back to our eyes. Because the color black absorbs all this light, you will not be comfortable wearing a black shirt on a very hot day.

Light travels in **waves**, up and down. The various colors have different wavelengths, the distance between one highest point of the wave to the next highest point. **Color** is the measure of how quickly light waves are waving. Red has the shortest wavelength of all the colors that humans can see. Purple has the longest wavelength. The colors of the rainbow are **ROYGBIV**: red, orange, yellow, green, blue, indigo and violet.

Color makes our lives more interesting. There are 3 **primary colors**: red, blue and yellow. They are called primary because they cannot be created by any combination of other colors. When you mix these colors together, you can make purple, orange and green. These are called **secondary colors**.

Some people are **color-blind**. In fact, 8% of men are believed to be partially color-blind, most of them do not see the color red or green. Many animals are color-blind, unable to see any colors. However, bees and butterflies actually have super vision. They see colors that even we as humans cannot see. This helps them find flowers to pollinate. Some animals, like owls, can even see in the dark.

Why are school buses yellow? Yellow catches people's attention more quickly than any other color. Even in bad weather, you can still see yellow objects clearly. People want to pay attention to school buses so that they do not injure any children. Different cultures associate different colors with different feelings.

Main Ideas

- You have to have **light** in order to see color.
- All light is made out of **electromagnetic waves**. The various colors have different wavelengths.
- The colors of the rainbow are ROYGBIV: red, orange, yellow, green, blue, indigo and violet
- **Color** is the measure of how quickly light waves are waving.
- There are 3 **primary colors**: red, blue and yellow.
- The **secondary colors** are green, orange and purple. Mixing the primary colors forms them.
- Some people are **color-blind**, unable to see certain colors.

Materials Needed

- *Mouse Paint* by Ellen Stoll Walsh
- 3 glasses
- A flashlight
- Food coloring
- *Paper towels*
- *Light Makes a Rainbow* by Sharon Coan
- White coffee filters
- Non-permanent Markers
- String
- Pipe cleaners (optional)

Preparation

1. Read "Background Information" to become more familiar with the properties of weather.
2. Read through *Mouse Paint* by Ellen Stoll Walsh. Prepare questions that you can ask along the way.

3. Make sure that you have all the supplies that you will need for each day's experiment or craft.
4. Read through *Light Makes a Rainbow* by Sharon Coan.

Opening

Can you imagine how different the world would look if there were no colors? What if everything was just white, grey or black? What is your favorite color? Why? This week we are going to be studying all about color and how it makes our lives richer and more beautiful! We are going to be doing a variety of activities that allow you to not only be scientists, but also artists. I am going to say a feeling, you tell me what color it makes you think of: happy, angry, jealous, sad, pure, crazy, natural, peaceful, etc.

Read through *Mouse Paint* by Ellen Stoll Walsh.

Making New Colors Experiment

Color makes our lives more interesting. There are 3 **primary colors**: red, blue and yellow. They are called primary because they cannot be created by any combination of other colors. When you mix these colors together, you can make purple, orange and green. These are called **secondary colors**. Lets try making secondary colors on our own.

Materials: food coloring, 3 glasses, 2 paper towels, water

Lay three glasses side by side. Fill up the two glasses on the ends $\frac{3}{4}$ full of water. Put five drops of food coloring into each glass of water. Use primary colors. For example, make the water in one glass yellow and the water in the other glass blue. Leave the center glass empty. Roll up a paper towel. Put one end in the yellow cup and one end in the empty center cup. With the other rolled up paper towel, place one end in the blue cup of water and one end in the empty center cup. You can try this experiment again with different primary colors.

Watch the glasses closely. What do you predict might happen? The water is being absorbed by the paper towel and moving into the center cup. What color do you predict the water in the center cup will turn out to be? What happens if you mix yellow and blue paint? Yellow and red? Red and blue? Mixing primary colors creates secondary colors. What is your favorite color? Is it a primary or secondary color?

What Makes a Rainbow?

What color is light? Light actually contains all the colors. When sunlight shines through water droplets, it bends or separates out the different colors. Give it a try.

Lay a piece of white paper on the floor. Shine a flashlight on it. What color is the light? (white) Now, set a glass of water up on a chair or box (about 10 inches off the floor) close to the edge of the paper. Stand behind the box and shine the light through the water onto the paper. What color is the light on the paper now?

Read through *Light Makes a Rainbow* by Sharon Coan.

Chromatography Butterflies

Chromatography is a big word that just means separating out colors. This is what you do when you create a rainbow. In this activity, we are going to separate out the different colors found in one marker. We will also make a beautiful craft along the way.

Materials: white coffee filters, cups with water, markers, string, pipe cleaners (optional), a pencil

As a group, choose one marker for the first experiment. Black and brown generally come out the coolest. Take one coffee filter and, with a pencil, write the color of the marker in pencil in the center of the filter. Then, with the marker, draw a circle around the color name. (on the flat center, before it meets the ridge of the filter. Before moving on, have students make predictions what they think is going to happen once the filter hits the water. Fold the filter in half and then in half again. You should now have a cone shape. Pull apart the cone shape and place the cone shape on top of a glass of water. The tip of the cone, but not the marker circle, should be just touching the water.

What happens as the water moves up the filter? Does the color stay the same? Why? When you mix different colors together, it makes new colors. Markers can be a combination of lots of different colors. **Try the experiment again with different colored markers. Allow the filters to dry overnight. Then you can tie a string through the center to make a colorful butterfly for the kids to take home. You can even attach pipe cleaners as the butterflies' antennas.**

Further Exploration

The Colors of Nature:

Give each student a clipboard or book to write on and a piece of white paper. However, they will not need a pen or a pencil. Go on a nature walk outside. Have students create a picture by using things they find in nature as color. They can rub a yellow flower on their paper for yellow, a leaf for green, etc. See if they can make a whole picture by using nature's colors.

Sorting Different Shades of Green

Optional: As students are creating their picture, you could also have them collect leaves into one container. When you get back to the classroom, you can sort the leaves from darkest to lightest. In art, we make darker or lighter shades of colors by mixing in black paint to make it a little bit darker and white paint to make it a little bit lighter.

Make Your Own Flag

Countries design flags to represent who they are and what is important to them. Allow students to design and color their own flag. Why did they choose the symbols and colors that they did? What do these colors say about who they are or how they feel?

Wrap Up

- Have students name the colors of the rainbow to a partner.
- Hold up two different markers at a time, have students predict what would happen if you combined the two different colors together. Repeat with two new colors.
- Use the art activity/nature walk to discuss all the different colors that we see in the world around us.
- Allow students to design and color a flag to represent themselves.

Signs of Success

The student will...

- Demonstrate engagement and curiosity in performing the color experiments and creating the crafts.
- Students begin to make more and more accurate hypothesis and predictions with each new color experiment.
- Correctly name the colors of the rainbow, the 3 primary colors and the 3 secondary colors.
- Demonstrate how water can bend light, dividing it into the colors of the rainbow.

Other Books to Explore

Brown Bear, Brown Bear, What Do You See? By Bill Martin Jr and Eric Carle.

Red is a Dragon: A Book of Colors by Roseanne Thong and Grace Lin.

Freight Train by Donald Crews.

Blue Hat, Green Hat by Sandra Boynton.

Mouse Paint by Ellen Stohl Walsh.

Planting a Rainbow by Lois Ehlert

A Color of His Own by Leo Lionni.

Pete the Cat: I Love My White Shoes by Eric Litwin and James Dean.

Vincent's Colors by Vincent VanGogh and The Metropolitan Museum of Art.

Blue Chameleon by Emily Gravett.

Color Dance by Ann Jonas.

Green by Laura Vaccaro Seeger.

Pennsylvania Educational Standards

Art Education

Reading 1.2.3 A, C, E
1.6.3 A, B
1.8.3 A, B

NRC National Science Educational Standards

Content Standard A: Science as Inquiry

Content Standard B: Physical Science

AAAS Benchmarks for Science Literacy

12A Values and Attitudes

12D Communication Skills

Sample Schedule For Making It A Week Long Unit

Day 1:

Introduce the concept of colors and where they come from.
Read through *Mouse Paint* by Ellen Stoll Walsh
Have students perform the making new colors experiment.
Discuss primary and secondary colors.

Day 2:

Perform the What Makes A Rainbow Experiment.
Read through *Light Makes a Rainbow* by Sharon Coan.

Day 3:

Review the colors of a rainbow.
Create the Chromatography Butterflies. Allow them to dry.
Discuss how colors combine to make new colors.

Day 4:

Finish the Chromatography Butterflies.
Go on the Colors of Nature Walk/Art Project.

Day 5:

Review what you learned about how we see color.
Sort the different shades of green from yesterday's walk.
Have students make their own flags, using symbols and colors that represent them.

