COLOR WHEEL (1 Hour)

Addresses NGSS
Level of Difficulty: 3
Grade Range: K-2

OVERVIEW

In this activity, students will construct color wheels and spin them to see that light colors combine to form new colors. Students will experiment with spinning different color combinations to learn about additive color theory.

Topic: Mixing Colors of Light

Real-World Science Topics

- An exploration of how primary light colors combine to form secondary light colors.

Objective

Students will explore additive color theory by creating and spinning color wheels.

NGSS Three-Dimensions

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • With guidance, plan and conduct an investigation in collaboration with peers. **Analyzing and Interpreting Data** Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Analyze data from tests of an object or tool to determine if it works as intended.	**PS4.B Electromagnetic Radiation** • Objects can be seen only when light is available to illuminate them. Some objects give off their own light.	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

COLOR WHEEL

Background Information

The primary colors of light are red, blue, and green. Equal amounts of red, blue, and green light combine to form white light. All colors of light can be made by mixing various proportions of red, blue, and green light. The retina (curved back surface of the eye) contains three types of cone cells: one type to detect red, one for green, and one for blue. Those are the only light colors our eyes can detect. Different proportions of these three different colors make all the other colors. Hard to believe, isn't it!

Equal amounts of red light and blue light make magenta light. Equal amounts of red light and green light make yellow light. Equal amounts of blue light and green light make cyan light.

Therefore, magenta, yellow, and cyan are called the secondary light colors. They are formed by mixing two primary light colors.

In short:
red + blue + green = white
red + blue = magenta
red + green = yellow
blue + green = cyan

This is called additive light theory. This principle governs the mixing of light colors NOT pigments such as paint colors. If you mix red, blue and green paints together, you get black. The red paint absorbs all colors except red. The blue paint absorbs all colors except green. So, when you mix those three paint colors, all light colors are absorbed and none are reflected into your eyes. Therefore, it appears black. This is subtractive color theory and that is not the topic of this activity. It is important to remember that this activity is about colors of light, and not pigments.

Key Vocabulary

Primary light colors – red, green, and blue; mixing these colors create all other colors
Secondary light colors – magenta, cyan, yellow; these colors are made by mixing two primary light colors
Pigment – a material that selectively absorbs certain wavelengths of light (colors) and reflects others
Magenta – a pinkish-purple color mad by mixing equal amounts of red and blue light
Cyan – a blue-green color made by mixing equal amounts of blue and green light

COLOR WHEEL

Materials Needed for the Student Activity

- White paper
- Foam Poster Board, thick styrofoam plates, or thick cardboard
- Scissors
- Pencils
- Red, green, and blue crayons
- Tape
- Yarn or string
- Metal nails
- A drill
- Comic section of newspaper
- Magnifying glasses

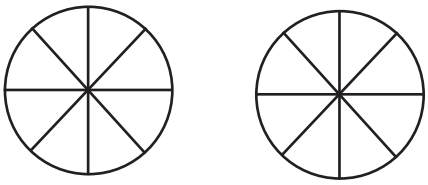
Teacher Preparation

Obtain all materials needed. Cut the foam board into circles with diameters of 5 inches. Cut yarn into pieces 4 feet long.

STEPS FOR *COLOR WHEEL*

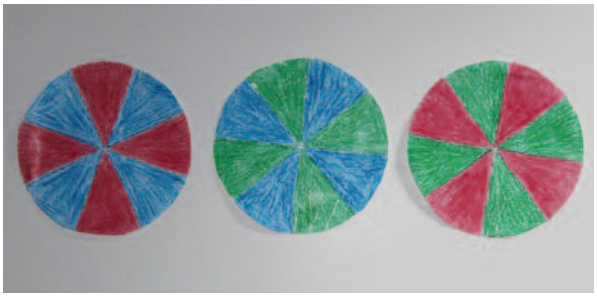
1. **Warm-up Activity:** Ask the class, "What are the "primary" or most important colors?" Keep a list on the board. The class will probably choose the ROY G BIV colors of the rainbow: red, orange, yellow, green, blue, indigo, and violet. Tell the class that you really only need three of those colors! Your eyes can only actually see three of those colors! Ask the class which colors they think are the "important three." Tell them your eyes can only detect red, green, and blue light. All other colors are different combinations of red light, green light, and blue light entering your eyes. For that reason, red, green, and blue are called the primary colors of light. Today we will "mix" the primary colors of light by spinning them really fast so that they look like one color to our eyes.

2. Give students the color wheel templates and have them cut them out with scissors.



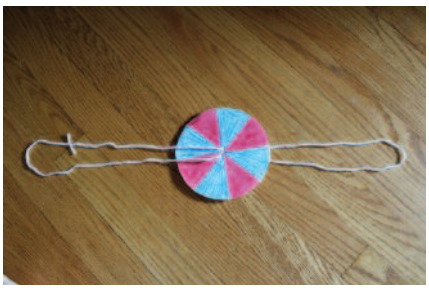
3. Let students color the eight-section circles with combinations of the primary light colors:

red + blue, green + blue, green + red



4. Distribute the Student Handout. Ask students to predict what color they will see when they spin each color wheel really fast. Record predictions in the chart on the Handout.

5. Give the students circular pieces of foam board. Have them tape a color wheel to the foam board. Using a nail, poke two holes near the center of the circle. Pull the yarn through one hole, then back through the other hole. Tie the two pieces of string together to form a loop.



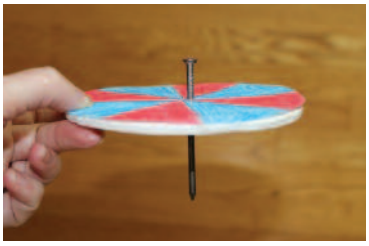
STEPS FOR *COLOR WHEEL*

6. The students will now spin the color wheel. Demonstrate as follows: Hold one end of the loop in each hand. Rotate your wrists to swing the color wheel in a circle. (the same way you would swing a jump rope) Keep swinging until the yarn is very twisted. Then stop swinging and let the yarn unwind. This will cause the color wheel to spin rapidly! Have the students spin their color wheel and observe the color they see while it is spinning. Tell them to record their observations on the handout.

7. Students will repeat for the other two color wheels. Again, record observations on the handout.

8. When students are finished, tell them to color all three primary light colors on the six-sectioned color wheel. Then spin it and observe.

9. Wrap-up Activity: Review with the class what color they saw with each color wheel. For reinforcement, spin each wheel using a drill as you discuss each one.



Ask what color they saw when they spun the red + blue. They will say it looked purple or a pinkish purple. Tell them this color is called magenta.

Ask what color they saw when they spun the blue + green. They will say it looked like a blue-green color or turquoise. Tell them this color is called cyan.

Ask what color they saw when they spun the red + green. Answers may include a yellowish green or a dirty yellow. If primary red and primary green light is combined, it creates yellow light.

Ask what color they saw when they spun all three primary light colors. They will give answers such as gray, light blue, bluish gray, grayish white. Ideally, mixing all three light colors gives white. But, the colors need to be the perfect shades and in exactly equal amounts. Gray is a good result when using crayons. Explain that when you see all the primary light colors together, you see white.

Tell the class that magenta, cyan, and yellow are the secondary colors of light. Colored pictures in newspapers are printed using only magenta, cyan, and yellow ink. With these three colors of ink, all other colors can be made. To prove this, give students a colored comic from the newspaper and a magnifying glass. They will see dots of magenta, cyan, and yellow. You can show the class a color ink cartridge as another example. It contains three colors of ink: yellow, magenta, and cyan.

STEPS FOR *COLOR WHEEL*

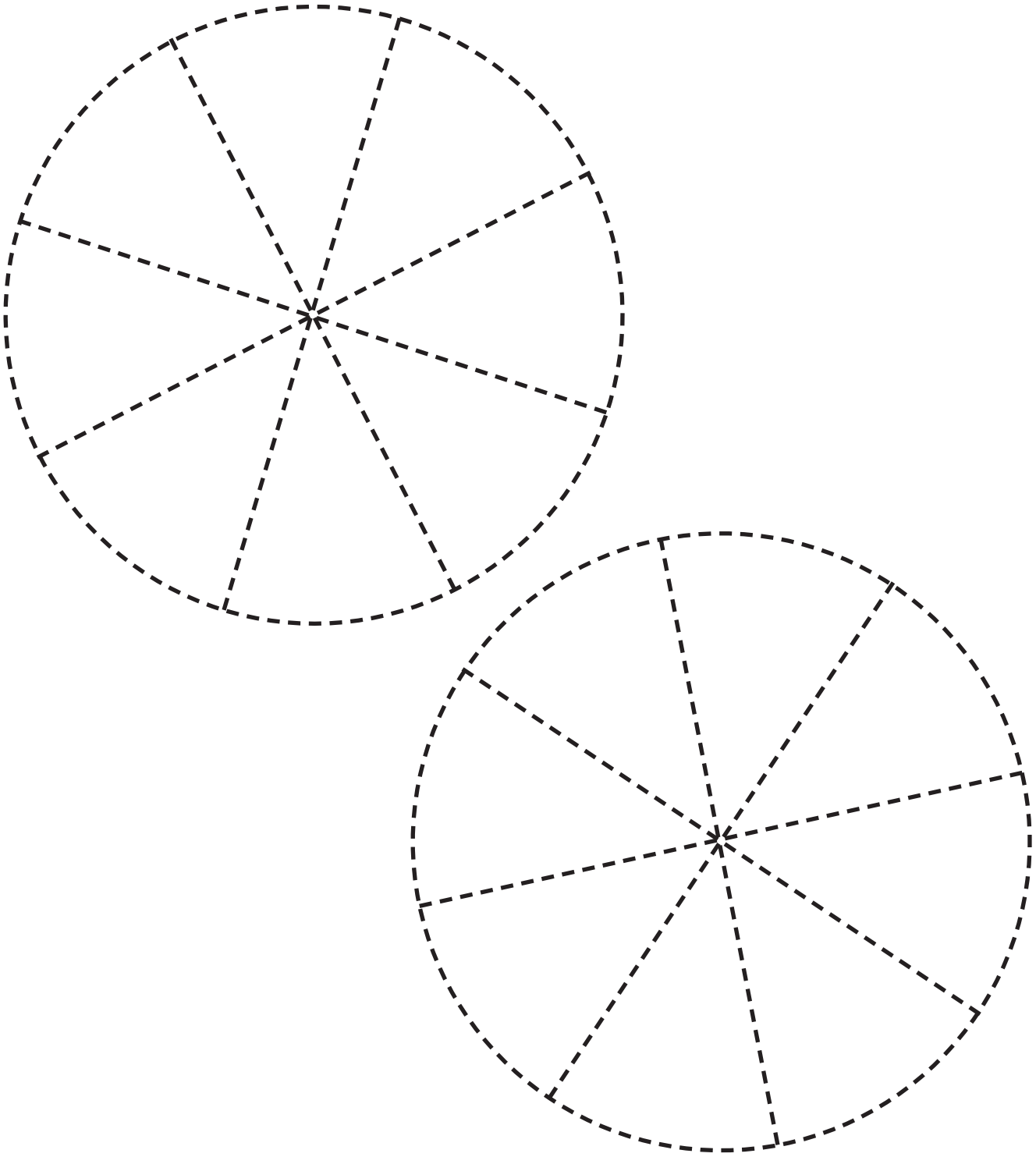
Rainbow Rotations Extension Activity

Students will be very eager to try out all sorts of color combinations. Supply all colors of crayons, let students make predictions, and then test them by making a color wheel and spinning it! There is room on the handout for them to record their predictions and outcomes.

Sources

http://etc.usf.edu/clipart/
http://www.crayola.com/lesson-plans/
http://www.realcolorwheel.com/

COLOR WHEEL
STUDENT HANDOUT



COLOR WHEEL
STUDENT HANDOUT

Name:

Date:

Colors on color wheel	What color do you think it will be when it spins?	What color was it?
Red and blue		
Blue and green		
Red and green		
Blue, red, and green		

COLOR WHEEL
TEACHER HANDOUT

Colors on color wheel	What color do you think it will be when it spins?	What color was it?
Red and blue	Answers will vary	Pink/purple
Blue and green	Answers will vary	Blue-green or turquoise
Red and green	Answers will vary	Yellow
Blue, red, and green	Answers will vary	Gray