Curiosity Guide #705
Color Science

Accompanies Curious Crew, Season 7, Episode 5 (#705)

Color Spinner

Investigation #1

Description

You won't believe your eyes when you try this spinning fun!

Materials

- Cardboard
- Plastic cup
- Compass for drawing circles
- Plastic bottle cap
- Permanent markers: yellow, red, and blue
- Ruler
- String
- Scissors
- Pencil

Procedure

1) Choose one of these ways to draw three concentric circles on the cardboard.

- Idea 1: Use the top and bottom of the cup and the bottle cap as circle templates. Draw around the top of the cup. Center the bottom of the cup inside that circle and draw around the bottom of the cup. Center the bottle cap inside that circle. Draw around the bottle cap.
- Idea 2: Place a center dot on your paper. Then place the compass with its pointed side on the center dot. Draw a circle

that is 6 inches in diameter. Inside that circle, with your compass point on the center dot, draw a circle 4 inches in diameter. Inside that circle, draw a circle 2 inches in diameter.

2) Place the edge of the ruler on the center dot. Draw a diameter line through the center point of the concentric circles.

3) Color each of the sections on the circles as follows.

- Color one hemisphere of the largest circle red and the other side blue.
- Color the center hemisphere under the blue side red and the opposite hemisphere yellow.
- Color the inner half of the smallest circle blue under the yellow side and color the opposite side yellow.

4) Place the ruler on the diameter line and measure one inch out from each side of the center point. Make a mark on each side.

5) Use the point of the scissors to pierce a small hole through the cardboard at each mark.

6) Measure and cut a 48-inch length of string.

7) Feed one end of the string through one of the holes.

8) Loop the string back through the second hole, and then tie off the two string ends with an overhand knot. You should be able to slide the spinner, so that the spinner is centered on the loop of string.

9) Wind the spinner by rotating both hands in the same direction as you do when using a jump rope. This should twist the string and make the overall length of the string loop shorter.

10) Pull your hands apart, stretching out the strings.

11) What do you notice?

12) As the spinner slows down, try pulling the strings apart again.

My Results

Explanation

In the subtractive color system, color is produced when different wavelengths of light are absorbed or reflected. The color that we see corresponds to the wavelengths that are reflected off an object. When the spinner begins to spin, the colors begin to change. At rest, the outside sections of the spinner appear to be red and blue. When in motion, the outside band appears to be purple. The middle circle that had been red and yellow appears orange, and the smallest circle that was yellow and blue appears green. Red, yellow, and blue are primary colors in the subtractive color system. Mixing two of these primary colors makes purple, orange, or green. These are called secondary colors. The secondary colors appear on the spinner because of the speed at which the spinner is rotating. Our eyes cannot detect the two primary colors in each circle because of the speed of the rotation, so our brains combine the two colors. We see the secondary colors instead. Pulling the twisted-up spinner apart untwists the spinner and makes the spinner rotate quickly. The momentum that the spinner has when the string finally unwinds causes the spinner to twist the string the other way. Pulling the string repeatedly rotates the spinner very quickly one way and then the other way, and you can view the color change from primary to secondary colors.

Extend your knowledge. To be technical, the primary colors identified in a subtractive color system are **magenta**, **yellow**, and **cyan**. If you look these colors up, you will see that magenta, yellow, and cyan are close in appearance to the red, yellow, and blue we learned as primary colors when we were young. To be accurate, use the technical names. You may get some funny looks, but people will be impressed that you know this detail about colors!

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