



## Curiosity Guide #201

### Vision

Accompanies Curious Crew, Season 2, Episode 1 (#201)

### Making a Peripheral Vision Protractor

STEM Challenge

#### Description

What can you see out of the corners of your eyes? Is it easy to see motion? Color? Shape?

#### Materials

- Team of three people
- Poster board or foam board, 1.5 feet wide and 2 feet long
- Pushpin
- Pencil
- Scissors
- String, 1.5 feet long
- Ruler
- Protractor
- Plastic cup or large spool
- Glue
- Markers
- Popsicle sticks, 12 per team
- Red, yellow, and green construction paper
- Clipboard
- Data sheet

### Procedure 1: Making the Peripheral Vision Protractor

- 1) Lay the poster board out flat, with one long edge off the table.
- 2) Press the pushpin into the center of the two-foot edge.
- 3) Loop one end of the 1.5 foot string around the pin. Loop the other end around a pencil. Measure with a ruler to make sure that there is 1 foot of string between the pushpin and pencil.
- 4) Carefully draw an arc with a 1-foot radius.
- 5) Shorten the string so that the pencil is  $\frac{3}{4}$  inch away from the pushpin. Measure with the ruler.
- 6) Carefully draw an arc with a  $\frac{3}{4}$  inch radius.
- 7) Cut out both semi-circles. The smaller one will fit around the nose of the tester.
- 8) Place the protractor on the center of the pattern. Transfer the angles in degrees from 10 to 90 on both the right and left sides.
- 9) Remove the string from the pushpin. Re-insert the pin across from the nose hole, just in from the edge of the curved side at the 90 degree mark.
- 10) Place a small piece of tape on the underside to cover the sharp edge of the pin and secure it in place. The pushpin will serve as the focal point during the tests.
- 11) Glue the handle on the underside, near the center of the poster board.
- 12) Cut out a circle, square, triangle, and rectangle from each of the three colors of construction paper. Each shape should be approximately 1 square inch. You should have 12 shapes in all.
- 13) Glue or tape the shapes on the ends of the 12 Popsicle sticks.

## Procedure 2: Testing Peripheral Vision

- 1) Decide who will be the tester, the Popsicle stick handler, and the data recorder. You will rotate these jobs to get data from everyone.
- 2) The tester should hold the Protractor by the handle up to the face. Put your nose in the small opening and look at the focal point.
- 3) The handler secretly selects a Popsicle stick and places it on one edge at zero degrees.
- 4) The goal is to find out when the tester sees motion, color, or shape, and which is easiest to see out of the corners of the eyes. The handler slowly slides the stick along the Protractor until the tester first sees it and says, "Stop."
- 5) The recorder writes down the angle of the first view or motion detected.
- 6) The handler then continues moving the stick in to the center. The handler stops each time the tester identifies the color or shape of the object.
- 7) The recorder writes down the angles that color and shape are each detected.
- 8) Repeat with other shapes and colors so that each person has at least three tests.
- 9) Discuss what colors or shapes were easiest or hardest to see.
- 10) Other things to try: Consider variations with different sized objects. Change the level of lighting to determine its impact.

## My Results

### Explanation

The first layer of the curved wall at the back of the eyeball is the retina. The retina holds the photoreceptors known as rods and cones, which are named after their shapes. The majority of the cones are located in the center of the retina, in or near a recessed area known as the fovea. The various cone sizes interpret different colors in well-lit conditions. The fovea is the center part of the eye that provides the clearest image, but it is a small area, proportional to a full moon in the entire night sky.

The rods are outside the fovea. Rods interpret light in dimmer situations. Rods pick up on changes in motion.

When you see something out of the corner of the eye, you use the sides of the retina. The sides of the retina don't have cones, which see color. The sides of the retina also have fewer rods, which makes it difficult to see shapes clearly.

The easiest thing to notice is motion, followed by shape and color when the object is in the focal area. Aside from detecting motion, peripheral vision is pretty weak. We are not aware of how limited it is because we are focused on specific things at all times.

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