

K-1: The Senses

OUR SENSE OF VISION

Written by

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Activities from the *K-1: The Senses Teacher's Guide* may be used alone or with integrated unit components. The Learning Brain: Senses unit is comprised of the guide, a PowerPoint® slide set, "What Sound Is It?" for use with the activity, "Our Sense of Hearing," and a student storybook, *Making Sense!* (available as a PowerPoint® file and in PDF format). All files are available free-of-charge at BioEd Online (www.bioedonline.org).

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OUR SENSE OF VISION

Guiding Questions

Which parts of the body are involved in vision (seeing)? Is light important for vision?

Concepts

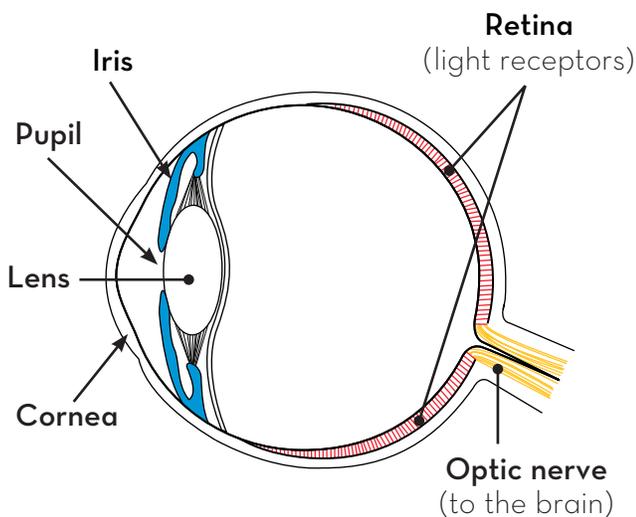
- All of the senses are connected to the brain.
- Our senses let us know what is going on inside and outside our bodies.
- The sense of vision (or sight) allows us to process information from light.
- Light is essential for vision.
- The brain processes information from the eyes, which are “light detectors.”

Time

Setup: 15 minutes

Class: 2 sessions of 30 minutes

Much of our understanding of the environment is made possible by our sense of vision. We are able to “see” because our eyes and brain transform signals produced by light energy into perceptions of movement, color and form. The capacity to recognize a face, identify an object under different light conditions, or interpret the components of a landscape is a product of complex processes that occur in numerous areas of the cerebrum (thinking part of the brain). Even our most sophisticated computers and software cannot duplicate the strategies used by the brain to enable our sense of vision.



We understand many aspects of how the visual system works. First, light enters the eye through the cornea, the transparent outer layer. The cornea bends (refracts) light rays that pass through the pupil (round hole in the center of the eye), and the iris (colored area that surrounds the pupil), opens and closes to regulate the amount of light that enters. After passing through the pupil, light is focused by the lens onto the retina, where it activates



special light-sensitive cells, known as rods and cones. These cells convert light energy into electrical signals that travel along the optic nerve to the visual centers of the brain.

The primary visual cortex, where signals are first processed, is located at the back of the head. However, at least 20 additional areas of the cerebral cortex are devoted to processing visual information. Cells in different areas of the visual cortex respond to different characteristics of objects (for example, motion, form and color). This information is assembled along parallel routes, not yet fully understood, to form a three-dimensional mental perception of what is being viewed.

MATERIALS

Teacher (See Setup)

- 8 sheets of silver foil paper (shiny, reflective foil with paper backing, available from art supply stores. One 8.5-in. x 11-in. sheet will provide enough material for three kaleidoscopes.)
- 1-2 sheets of black construction paper

- Apple, orange or other brightly colored object
- Classroom human body diagram (see Activity 2, “The Brain: Protection”)
- Flashlight
- Kaleidoscope template (see illustration below)
- Metric ruler
- Pair of scissors

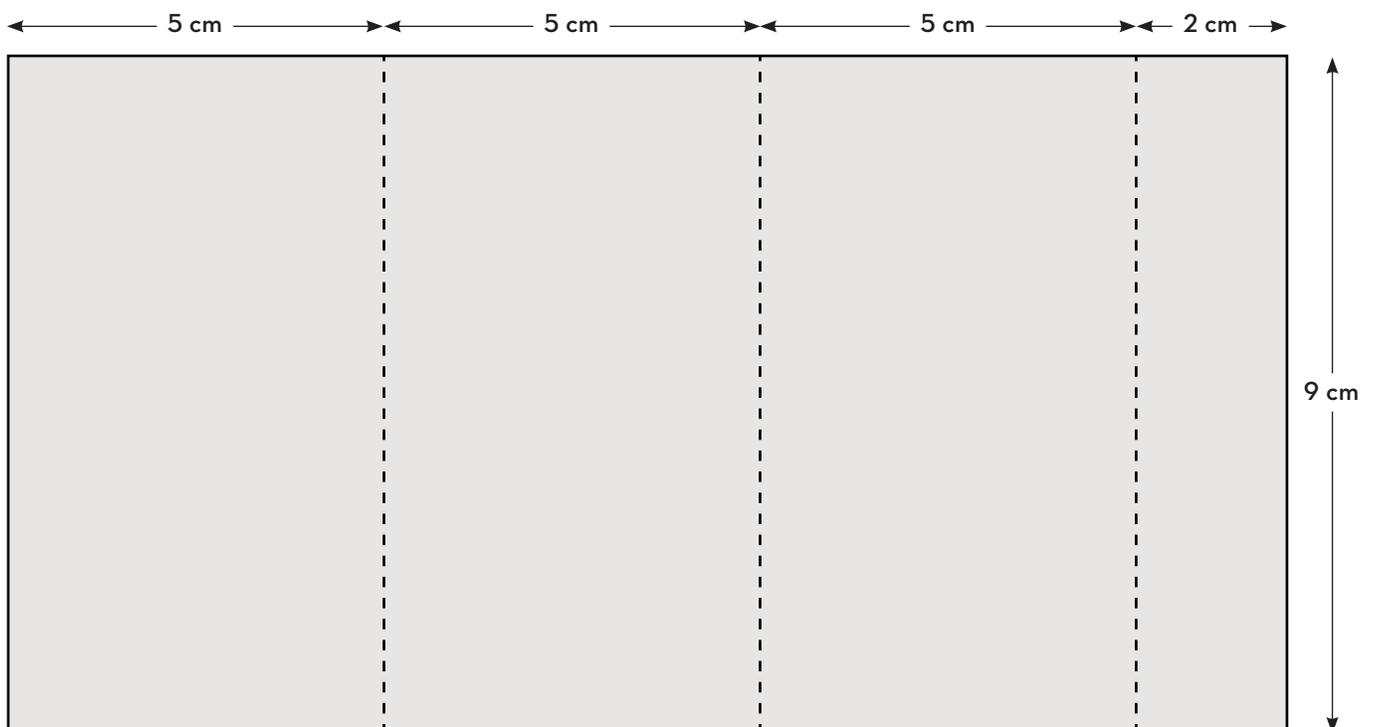
Optional: Hole punch

Per Student

- 17-cm x 9-cm piece of silver foil paper
- 3-in. x 5-in. white card
- Clear tape
- Colored markers and/or crayons
- Small mirror
- Science notebook

SETUP

Using a copy of the template below, cut out enough kaleidoscopes for all students. Prepare each kaleidoscope for folding by scoring the fold lines (dotted lines) with a ballpoint pen and straight edge. This will facilitate





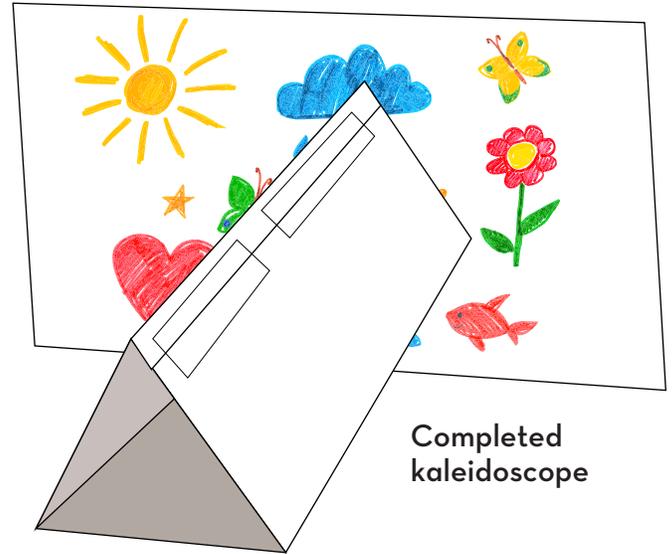
accurate folding. If students are not capable, fold the kaleidoscopes in advance, but let students refold and tape them together during the lesson.

Make a small hole in the sheet of construction paper (see Part 2, item 7).

PROCEDURE

Part 1

1. Have students sit in a circle. Place an apple, orange or other colorful item in the center of the circle. Ask students to share observations about the item. Make sure they mention the color. Ask, *how do you know the color of the object and how are you able to describe so many details?* Students should mention “vision,” “eyes” or “seeing” as being essential for describing the object.
2. Have all students close their eyes. Turn the lights off and darken the room as much as possible. Tell students to open their eyes and observe the object once again. Ask, *Does it look the same? If not, how is it different?* Students should notice that with limited light, the color is not as bright. Depending on the level of darkness attainable, the object may even be barely visible. Explain to students that light is necessary for vision (“seeing”), and the object’s appearance has changed because less light is available.
3. Explain that they are going to make kaleidoscopes, which will enable them to see new combinations of shapes and colors. Give each student a cut out template for the kaleidoscope. Demonstrate how to make the folds, and help students tape the flap over the top edge.
4. Instruct students to use their kaleidoscopes to explore the classroom. Ask, *What is happening?* Hopefully they will notice that they are seeing reflections of objects in the room on the inside panels of the kaleidoscopes. This may be a good time to talk about the word, “reflection.”
5. Ask, *What happens when you place your hand over the opening? Can you still see the reflections? Why or*



why not? Students should notice that they need light to be able to see.

6. Distribute the 3-in. x 5-in. cards. Instruct students to create colorful art on one side of the card. Have them position their kaleidoscopes over the decorated cards. Prompt students to look through the open end. Ask, *What do you see? What is happening?* [No light]
7. Next, have students hold the decorated cards to the end of their kaleidoscopes. Ask them to lift the kaleidoscopes up and look through the open end. Light should filter through the card, making colorful patterns on the inside panels.
8. Lead students to understand that eyes are light detectors that take in the light reflected from every surface. When students cover one end of the kaleidoscope with their hands (or the desk), light is blocked, and they cannot see.
9. Have students tape the decorated cards into their notebooks.

Part 2

1. Have students work in pairs. Direct students first to observe their own eyes with a mirror, and draw and label what they observe in their science notebooks.
2. Have students observe their partner’s eye and then discuss ways in which their eyes are similar and different. Students should consider variables such as color, shape, size, etc.



3. Ask, *Do all eyes have the same parts?* Use either a diagram of the eye or draw a picture on the board. Point to the different parts of an eye and ask students which parts they were able to see. [Students will be able to observe the iris and pupil, and will notice their eyelids and eyelashes, which protect the eyes. It is not necessary or important for students to know the names for the parts, just to know that they exist.]
4. Tell students they are going to look at their eyes again and identify the iris and pupil. Explain that the circular colored part (membrane) is the iris. It regulates the amount of light entering the eye by adjusting the size of the pupil. The black circle in the center of the eye is the pupil. It contracts (gets smaller) when exposed to strong light or focusing on a near object, and dilates (enlarges) when in the dark or focusing on a distant object. Explain that light enters the eye through the pupil, similar to the way light entered the kaleidoscope through the end of the paper tube.
5. Have students use the mirror to observe the size of their pupils with the lights on. Then, turn off the lights for a few minutes. Explain that students should be ready to observe the size of their pupils again, as soon as the lights are turned back on. Make sure everyone's mirror is ready, and then turn on the lights. Ask, *What happened to your pupil?* Students should notice that their pupils became larger while the lights were out.
6. Explain that the iris and pupil work together to allow light into the eye. When the room was darker, their pupils opened wider so their eyes would receive more light.
7. Remind students that light is essential for vision. Reinforce this idea with a flashlight and the sheet of construction paper. Turn off the room lights again. Cover the flashlight beam with the prepared sheet of black construction paper. Have students observe how much light gets through the small hole in the

Did You Know?

- When you blink, you shut your eyes for 0.3 seconds. That's a total of 30 minutes each day!
- More than half of all people in the U.S. use some type of lens to correct their vision.
- People sometimes have red eyes in photographs because light reflects off of the retina.
- Blinking helps lubricate your eyes. Remember to blink when reading a book or working on a computer.
- Smoking increases the risk of some eye diseases such as age-related macular degeneration and cataracts.
- Color blind means that you have trouble telling the difference between certain colors.
- Ninety percent of eye injuries could be prevented by using protective eyewear.

paper to illuminate a white surface. Enlarge the hole in the paper and again have students observe how much reaches the white surface. Ask, *Do you notice a difference? Why do you think this happened?* (The larger hole, like a wider pupil, allows additional light to pass through.)

8. Ask, *How do you think information about the objects you see travels from your eyes to your brain?* Have one student use a piece of yarn to connect the eye and brain on the class body cutout. Encourage students to recall how signals travel through the spinal cord, all the way to the brain. Similarly, information gathered in the eyes travels to the brain via optic nerves. (Specifically, the retina sends nerve impulses along the optic nerve to areas in the brain.)
9. Ask, *Do you think it takes a long time for information to travel from your eyes to the brain? Why or why not?* Help students understand that information travels rapidly in the nervous system.
10. Have students write one or more sentences in their science notebooks about vision.

RECOMMENDED RESOURCE

- Rissman, Rebecca. *Seeing (The Five Senses)*. (2010) Heinemann. ISBN: 978-1432936853



My Science Journal

Name _____

Drawing

Key Words to Use

I Observed...
