

Bay Area Scientists in Schools Presentation Plan

Lesson Name Lights! Colors! Vision!

Presenter(s) Neuroscience: Annelinde, Juli, Matthias

Grade Level 3/4 Standards Connection(s): PS: Light has a source and travels in a direction. Light is reflected from mirrors and other surfaces. Vision: We see objects when light traveling from an object enters our eye. LS: Structures of living things help them grow, survive and reproduce.

Next Generation Science Standards:

4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model to describe phenomena. (4-PS4-2) Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2)</p> <p>Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Construct an argument with evidence, data, and/or a model. (4-LS1-1)</p>	<p>PS4.B: Electromagnetic Radiation An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)</p> <p>LS1.A: Structure and Function Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)</p> <p>LS1.D: Information Processing Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)</p>	<p>Cause and Effect Cause and effect relationships are routinely identified. (4-PS4-2)</p> <p>Systems and System Models A system can be described in terms of its components and their interactions. (4-LS1-1), (LS1-2)</p>



CRS

COMMUNITY RESOURCES FOR SCIENCE
practical support for great science teaching

1611 San Pablo Avenue, Suite 10B
Berkeley, California 94702
(510) 527-5212 • www.crscience.org

Common Core Standards:

ELA/Literacy:

RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Mathematics:

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

MP.4 Model with mathematics.

FOSS Connections:

Grade 4 Module: Matter and Energy

Investigation 2: Light

Teaser:

The eye is a complicated and fascinating structure directly wired to the brain. It is through constant communication between the eye and the brain that we are able to see things and respond to what we see. Today we'll talk about the part of the eye known as the retina. We will look at real eyeballs under a microscope and talk about optical illusions. The students will even be able to make their own optical illusion to take home.

Objective:

Students will learn about the different parts of the eye, focused mainly on the retina and how it transmits information to the brain. We will also talk about color blindness and how our eyes and brains can sometimes trick us.

Vocabulary/Definitions:

retina: a layer of the back of the eye that senses light and transmits information to the brain

rod: a light-sensitive cell in the retina that is responsible for night vision

cone: a light-sensitive cell in the retina that is responsible for color vision

colorblind: unable to distinguish certain colors due to problems with the cone cells

Materials:

We will bring:

Slides and microscope

Eyeball model

Animal eyeballs

Laptop with slide show presentation

Students will need:

Paper and markers

Classroom Set-up:

Students will start the lesson as a whole group and then divide into two groups.



CRS

COMMUNITY RESOURCES FOR SCIENCE

practical support for great science teaching

1611 San Pablo Avenue, Suite 10B
Berkeley, California 94702

(510) 527-5212 • www.crs-science.org

Classroom Visit

1. Personal Introduction: _____ **5** _____ **Minutes**

Hello! We are all students from UC Berkeley. We study the psychology and biology. Who can tell us what those things mean?

Topic Introduction: _____ **10** _____ **Minutes**

Students will learn about the retina and its main components, the rods and cones. These light-sensitive cells are known as photoreceptors and are responsible for sensing light from the outside world. This information is then sent to the brain where it is processed. The brain then tells our muscles what to do in response to what our eyes have seen. Rods are concentrated around the outer part of the retina and are responsible for night vision. Cones are concentrated at the center of the retina and are responsible for color vision. Most people have three different types of cones, those responsible for red, green, and blue. Use the example of a camera flash and movie theater.

2. Learning Experience(s): _____ **30** _____ **Minutes**

Station 1: Anatomy Station

In this station, we will talk about the different parts of the eye and what they do. We will examine a model eyeball and look at real animal eyeballs too! Students will get a chance to look at a fish eye under a microscope as well.

Station 2: Optical Illusion Station

In this station, we will talk about optical illusions as well as colorblindness. Students will observe a short slideshow of illusions and we will talk about how rods and cones affect how we see each illusion. The students will then have a chance to make their own after image illusions to take home.

3. Wrap-up: Sharing Experiences _____ **10** _____ **Minutes**

What have you learned today? How would our vision be different if we had only rods or only cones? How would our vision be different if our three types of cones didn't all work? [Remind students about three types of cones and prompt for colorblindness].

4. Connections & Close: _____ **5** _____ **Minutes**

Our eyes are an extremely important part of our body. The constant communication between our eyes and brain allows us to move and react to things, whether it's a baseball thrown toward us, or a car driving down the street. The different parts of the eye are also important, and each has unique qualities. Make sure students remember what rods and cones do and how they are different.

Total 50 – 60 Minutes

Follow-up – After Presentation

ELA Activity:

Suggest students write a letter explaining “How we learned about vision and how we see...”

Reading Connections:

- The Brain: Our Nervous System by Seymour Simon
http://www.seymoursimon.com/index.php/books/detail/the_brain/
- Seeing (Senses and Sensors) by Alvin Silverstein <http://www.amazon.com/Seeing-Senses-Sensors-Alvin-Silverstein/dp/0761316639>
- The Complete Human Body by Dr. Alice Roberts <http://www.amazon.com/Complete-Human-Body-Book-DVD-ROM/dp/075666733X/>

Other:

Lots of related follow-up activities can be found in the Exploratorium’s Snack Book (<http://www.amazon.com/The-Exploratorium-Science-Snackbook-Jossey-Bass/dp/0470481862/>) or on the associated website: <http://www.exploratorium.edu/snacks/>

Label the Eye Diagram

Read the definitions, then label the eye anatomy diagram below.

Cornea - the clear, dome-shaped tissue covering the front of the eye.

Iris - the colored part of the eye - it controls the amount of light that enters the eye by changing the size of the pupil

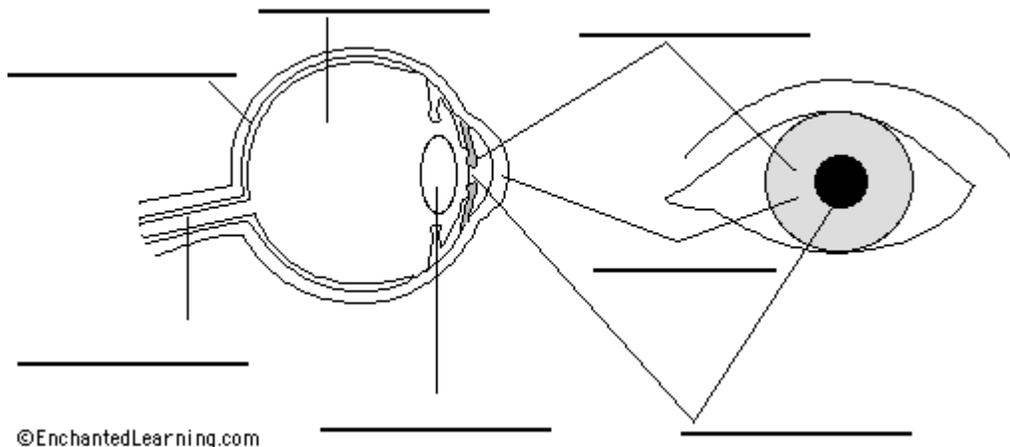
Lens - a crystalline structure located just behind the iris - it focuses light onto the retina

Optic nerve - the nerve that transmits electrical impulses from the retina to the brain

Pupil - the opening in the center of the iris- it changes size as the amount of light changes (the more light, the smaller the hole)

Retina - sensory tissue that lines the back of the eye. It contains millions of photoreceptors (rods and cones) that convert light rays into electrical impulses that are relayed to the brain via the optic nerve

Vitreous - a thick, transparent liquid that fills the center of the eye - it is mostly water and gives the eye its form and shape (also called the vitreous humor)



CRS

COMMUNITY RESOURCES FOR SCIENCE
practical support for great science teaching