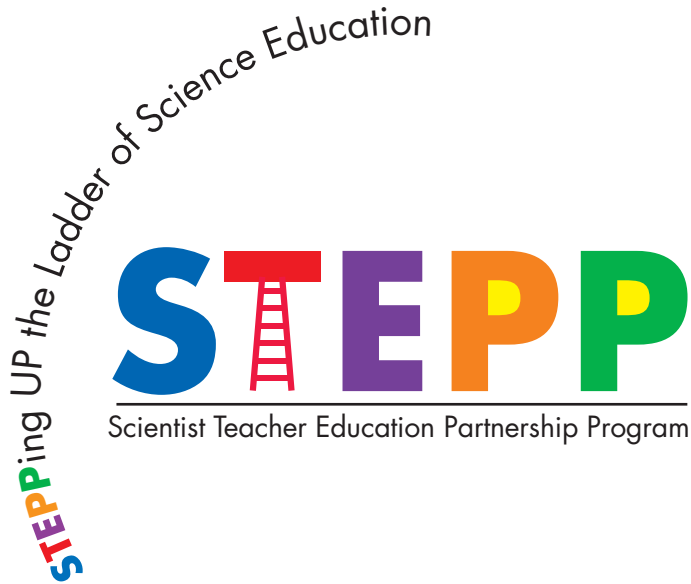


Function Intermediate Vision



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Communication: Our Senses & Our Brain

Lesson Three

In a Nutshell

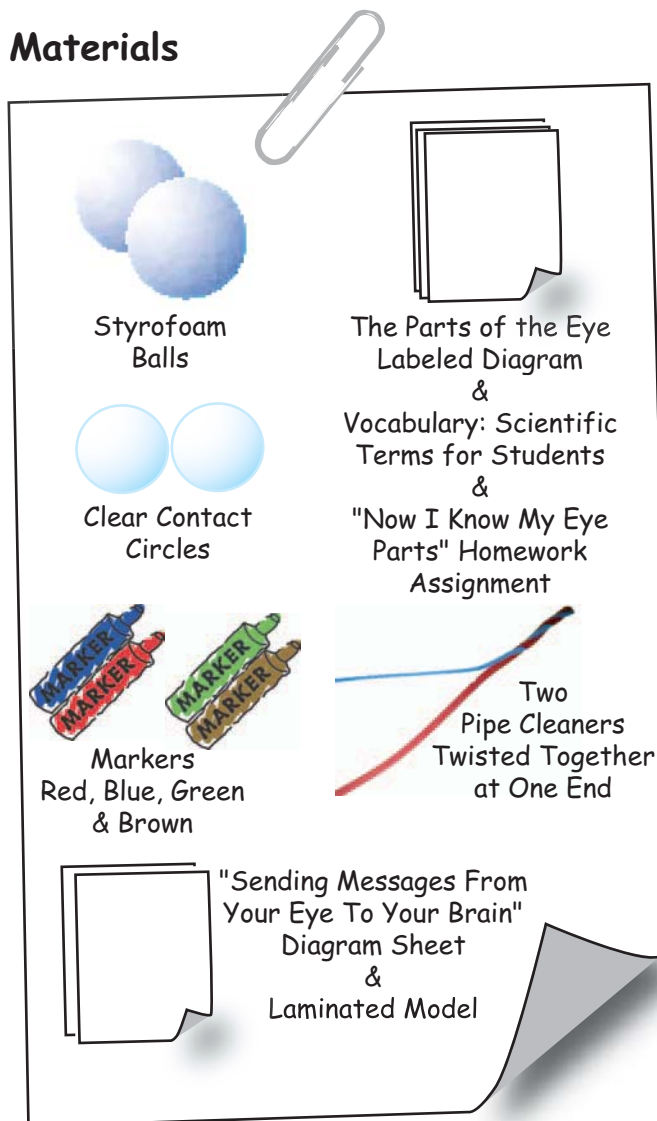
This lesson relies on the human eye to explain how our sense organs are connected to the brain. The students create and utilize an eye model to see how the eye is connected to the brain.

Objectives

The students will create a model of the human eye.

The students will re-create the visual pathway from the eye to the optic nerve to the occipital lobe.

Materials



Vocabulary

Cornea - Clear covering on the front of the eye.

Iris - The color of your eye. The muscles of the iris control the size of your pupil (center of the eye).

Lens - This round, clear part of your eye bends light as it passes through the eye. The lens helps you to focus on an object.

Pupil - Hole in the center of the eye where light passes through.

Retina - Located in the back of your eye. The retina gathers information about an object (color, size, and shape) and sends this information along your optic nerve. An object is still upside down when in the retina.

Optic Nerve - Begins in the back of the eye and runs along the bottom of the brain. The optic nerve connects the eye to the brain. Messages containing visual information are sent from the eye to the brain. The brain receives and interprets the message (information) so that it can recognize what it is seeing.

Vocabulary: Scientific Terms For Teachers

Cornea - Transparent tissue covering the front of the eye. The cornea does not have any blood vessels but it does have nerves.

Iris - Circular band of muscles that controls the size of the pupil. The pigmentation of the iris gives "color" to the eye. Blue eyes have the least amount of pigment; brown eyes have the most.

Lens - Transparent tissue that bends light passing through the eye. To focus light, the lens can change shape by bending.

Pupil - Hole in the center of the eye where light passes through.

Retina - Layer of tissue on the back portion of the eye that contains cells responsive to light (photoreceptors). The retina gathers information about an object (color, size, and shape) and sends this information to your brain via your optic nerve. An object is still upside down when in the retina.

Optic Nerve - Begins in the back of the eye and runs along the base of the brain. The optic nerve connects the eye to the brain. Messages containing visual information are sent from the eye to the brain. The brain receives and interprets the message (information) so that it can recognize what it is seeing.

Procedure

Activity One: Understanding How We See

1. Explain to the class that, similar to the brain having many parts, the human eye contains many parts as well. For today we will only focus on some of the parts that play a major role in how we see.
2. Pass out "The Parts of Our Eye" labeled diagram (pg. 29) and review each part and its function.

Note to Teacher

Explanation of how we see

- A. As you look at an object, light rays bounce off the object and into your eye.
- B. Light enters your eye through your cornea and pupil, and travels to your lens.
- C. When the lens receives the light, it bends the light to help you focus on the object in front of you (the lens "flips" the picture of the object upside down).
- D. Next, this "upside down picture" travels to your retina, which is the whole outer edge of your eye. Your retina receives this upside down picture. The retina is full of nerves, which gather information about the picture such as color, size and shape.
- E. The nerves of the retina send the information to your brain through the optic nerve, which is located at the back of the eye.
- F. When the information reaches your brain, your brain "flips" the picture right side up, interprets the information and allows you to see the object in front of you.

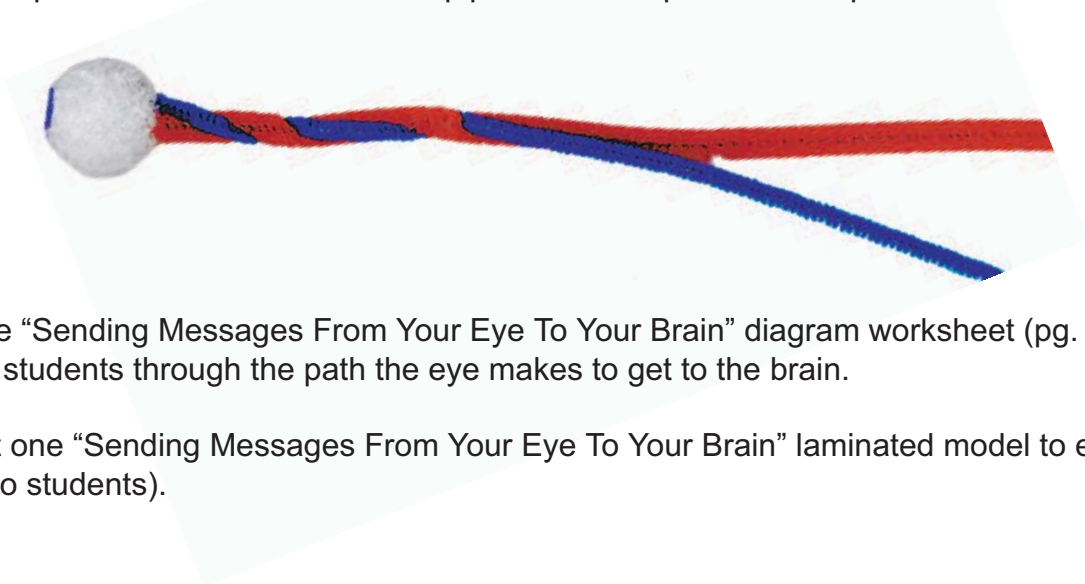
Activity Two: Making A Model Of The Eye

1. Explain to students that they will be making a model of the eye using a Styrofoam ball, clear contact circles and markers.
2. Pass out all materials to each student.
3. Allowing students to use both worksheets (pgs. 22 and 29) they should create an eye model that includes the following: The eyeball (Styrofoam ball), the cornea (clear contact circle), the iris (drawn with marker and made the same color as their own eye), the pupil (drawn with marker- in the center of the iris).
4. Have students briefly share their models with one another.

Activity Three: Sending Messages From Your Eye To Your Brain

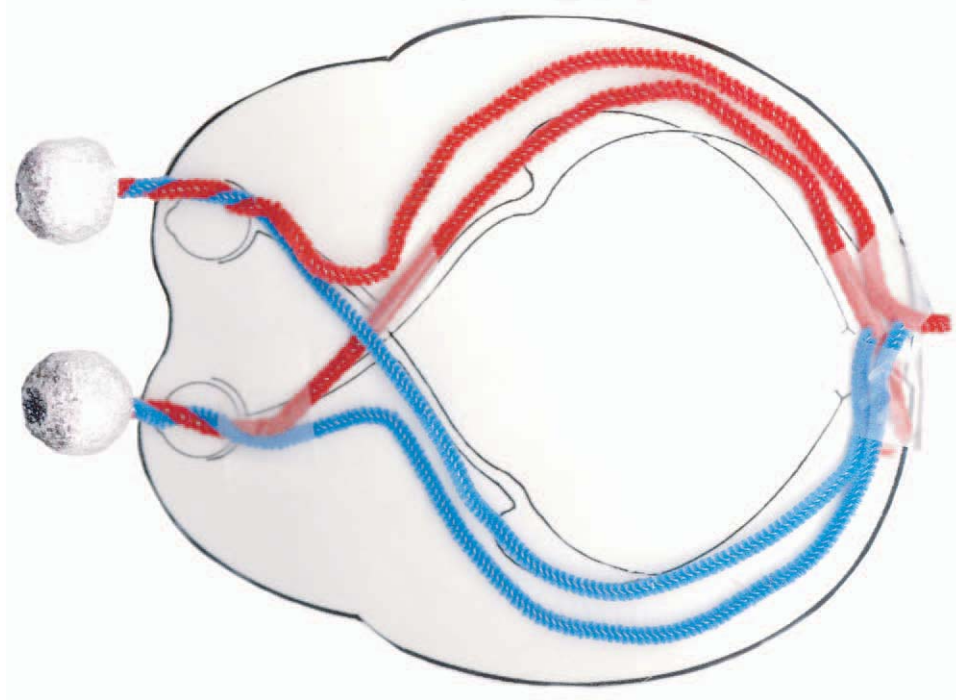
In this part of the lesson the students will be shown and will model the eye's connection to the brain via the optic nerve.

1. Explain to students that we will now see the connection between sense organs and the lobes of the brain. Using their eye models, they will connect the eye to the brain.
2. Students should be assigned/choose a partner.
3. Each student should have his/her eye models. Pass out two pairs of twisted pipe cleaners (one pair for each student) and one "Sending Messages From Your Eye to Your Brain" diagram worksheet (pg. 30) to each group of two.
4. Have each student insert the twisted end of the pipe cleaner into the back of his/her model eyeball. Explain to the students that the pipecleaners represent the optic nerves.



5. Using the "Sending Messages From Your Eye To Your Brain" diagram worksheet (pg. 30), walk the students through the path the eye makes to get to the brain.
6. Pass out one "Sending Messages From Your Eye To Your Brain" laminated model to each team (two students).

7. Using their eye models and the “Sending Messages From Your Eye To Your Brain” diagram worksheet, have the students recreate the eye’s connection to the brain.



Note to the Teacher

When explaining the visual pathway to students be sure to emphasize that the pathway from the left and right eye to the left side of the brain should be one color and that the pathway from the left and the right eye to the right side of the brain should be another color.

Homework

Pass out, “Now I know My Eye Parts” worksheet (pg. 31) and assign for homework.

Note to Teacher

The visual messages contained in the optic nerve are sent directly to a structure, deep in the cerebrum called the THALAMUS (THAL-A-MUS) “inner chamber”. The thalamus acts as a relay station for the visual information and sends it to the occipital lobe.

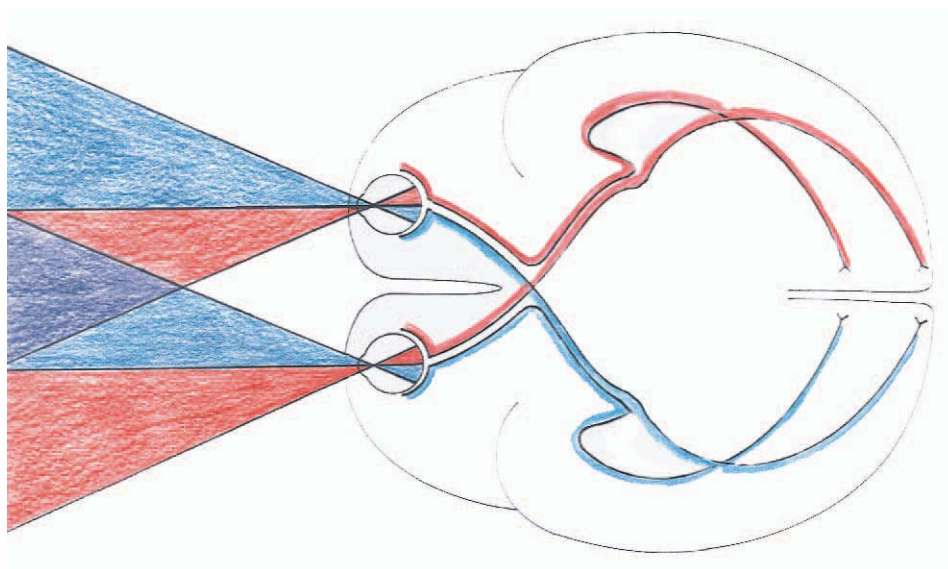
Teacher Information: Extended Explanation

The following is an extended explanation of how the eye is connected to the brain. This is intended for the teacher and is NOT required for the students to know. You may wish to incorporate this into the lesson for “advanced learners” or as an extension.

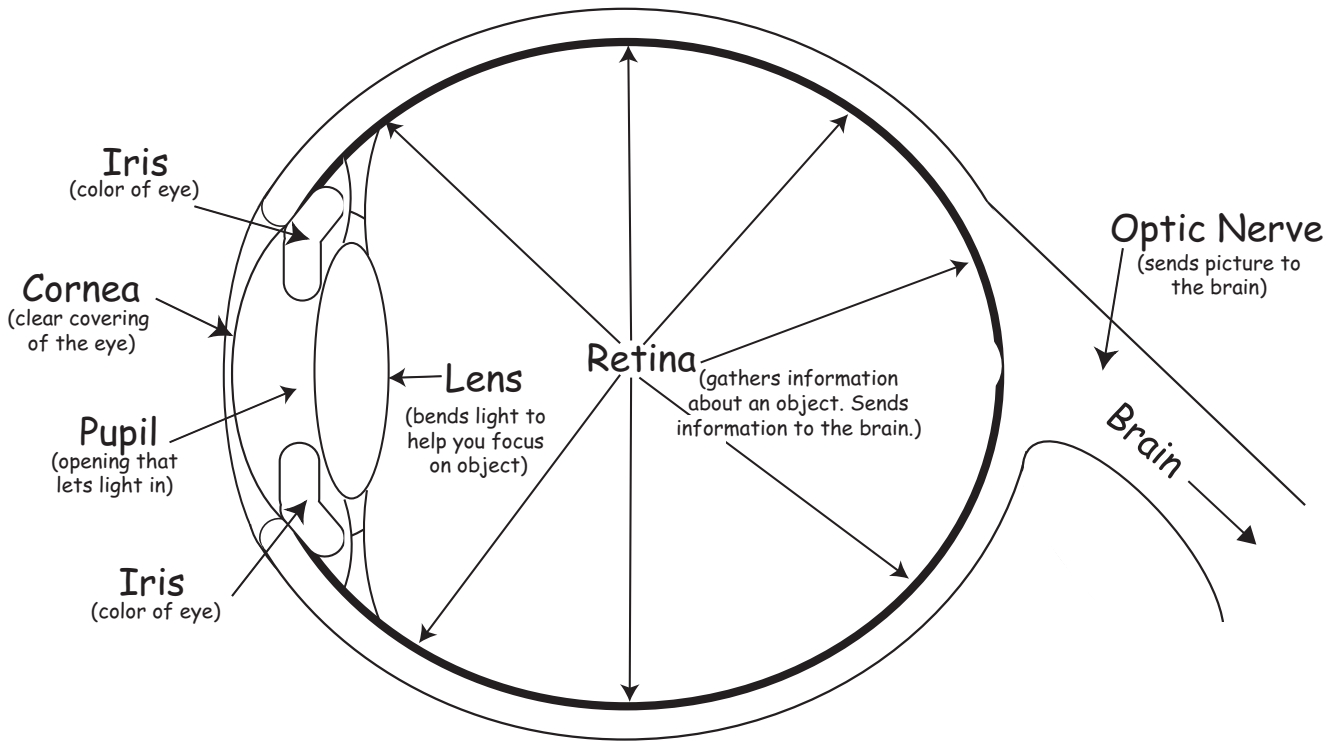
Each eye picks up a slightly different view of the world (its visual field). The left eye’s visual field overlaps the right eye’s visual field. This overlap is one of the major reasons we can perceive depth.

Each visual field itself is divided into two. See diagram below. For both eyes, the left half of the visual field (shaded red in the picture) sends information to the right occipital lobe. Also, for both eyes, the right half of the visual field (shaded blue in the picture) sends information to the left occipital lobe.

The major advantage of this elegant system is redundancy - the same information is picked up by different eyes and processed in different hemispheres. Look at the picture again and see how the right visual field of the left eye overlaps the left visual field of the right eye (shaded purple). If one eye is damaged, the information from that eye is not completely lost, because the other eye can still pick up most of it. Also, if one side of the brain is damaged, the other hemisphere will still have visual information coming in from both eyes.

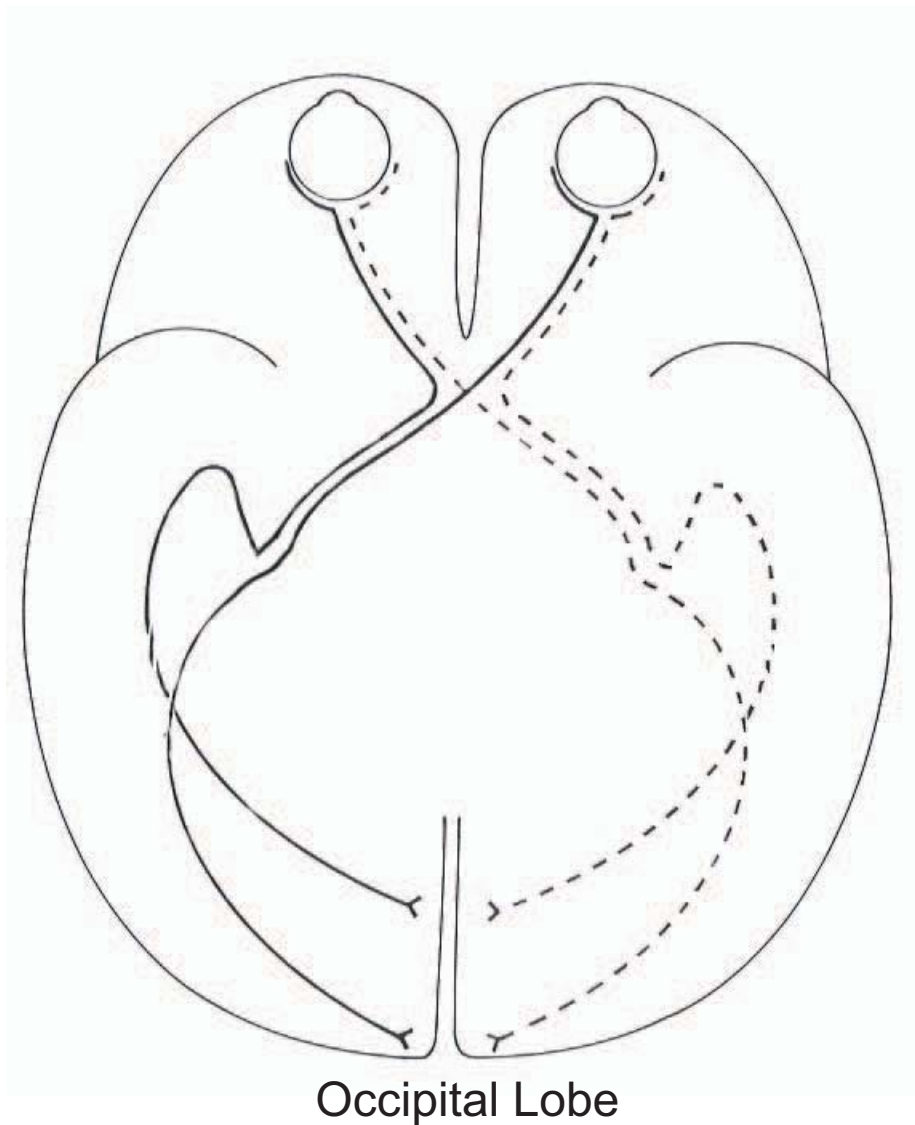


The Parts of Our Eye



Sending Messages From Your Eye to Your Brain

Each eye has one optic nerve that separates into two, with one part going to one side of the occipital lobe and the other to the other side of the occipital lobe.



Color Code

— — — — — = red pipecleaner

————— = blue pipecleaner

Vocabulary For Teachers

Sensory Receptors - A cell or group of cells contained in the sense organs that receive a stimuli from inside or outside the body.

Stimulus - Information obtained from the environment or our body by our senses. **For example, the sound of a bell ringing can be a stimulus.**

Sensation - The detection of simple stimuli by any of the senses.

Sense Organ - Body part specialized to receive sensory information: eye, ear, nose, tongue, skin.

Sensory Neuron - A type of cell that transmits impulses from a sense organ or receptor toward the central nervous system.

Response - Something that is done in reaction to a stimulus. **For example, covering our ears because the sound from a bell is too loud is one response to the stimulus of the ringing sound.**

Reflex - An automatic reaction that happens incredibly fast, before you have time to think about it.

Note to Teacher

When our senses respond it is because we have received information from the environment that has been interpreted by the brain. The process begins when our sense receptors detect a sensation from the environment. Immediately several sensory receptors rush information to the brain. The brain interprets the information that has been sent and the sense organ then responds in a particular way.

Procedure

Activity 1

1. Begin this activity by having students get into teams of two. Explain to the students that they will be observing one another's pupils (dark area in the center of the eye). **Tell student that it is very important that they follow the directions carefully so that they will be able to observe a change in one another's eyes.**
2. Have one student simply look at the pupils (center of eyes) of their partner. Mentally note what size the pupil is. (In a classroom setting the center of the eye (pupil) should be relatively small).
3. Once this observation has been made, pass out pen lights, shut off the classroom lights and have the partner tightly close his/her eyes for approximately thirty seconds.
4. The observing partner should time this and direct the partner to open his/her eyes at the end of the thirty seconds.