



Cow Eye Dissection Field Trip Workshop

GRADE LEVELS:

Grades 6th – 8th

CONCEPTS:

- The structure and function of the human eye is somewhat similar to that of the cow eye.

OBJECTIVES:

- Learn how to safely and properly handle laboratory equipment.
- Dissect a real cow eye using laboratory equipment.
- Identify parts of the eye and their functions.
- Discover how the human eye works and make comparisons to that of the cow's eye.

ACADEMIC CONTENT STANDARDS:

- Life Sciences: 6.2, 6.7, 7.1
- Scientific Inquiry: 6.1, 6.2, 7.4, 8.1

VOCABULARY WORDS:

Aqueous Humor-A clear fluid that helps the cornea keep its rounded shape.

Blind Spot-The place where all nerves from the retina join to form the optic nerve. Each eye has a blind spot where there are no light-sensitive cells.

Cones- One of the type of light sensitive cells in the retina. Cones give you color vision in bright light.

Cornea-A tough, clear covering over the iris and the pupil that helps protect the eye. Light bends as it passes through the cornea. The cornea begins bending light to make an image; the lens finishes the job.

Iris-The muscle that controls how much light enters the eye. It is suspended between the cornea and the lens. A cow's iris is brown. Human irises come in many colors, including brown, blue, green, and gray.

Lens-A clear, flexible structure that makes an image on the eye's retina. The lens is flexible so that it can change shape, focusing on objects that are close up and objects that are far away.

Myelin-The fatty layer that surrounds each nerve fiber.

Optic Nerve-The bundle of nerve fibers that carry information from the retina to the brain.

Pupil-The dark circle in the center of your iris. It's a hole that lets light into the inner eye. While your pupil is round, a cow's pupil is oval.

Retina-The layer of light-sensitive cells at the back of the eye. The retina detects images focused by the cornea and lens. The retina is connected to the brain by the optic nerve.

Rods-One kind of light-sensitive cell in the retina. Rods respond in dim light.

Sclera-The thick, tough, white outer covering of the eyeball.

Tapetum-The colorful, shiny material located behind the retina. Found in animals with good night vision, the **tapetum** reflects light back through the retina.

Vitreous Humor-The thick, clear jelly that helps give the eyeball its shape.

EXTENSIONS AT COSI:

Life Exhibition Area

- Explore the exhibition area and find out other interesting facts about the human body. How does the human body compare to other animals?

ADDITIONAL RESOURCES:

http://www.exploratorium.edu/learning_studio/cow_eye/

SAMPLE TEST QUESTIONS:

1. How would you classify the eye?
 - a. Cell
 - b. Tissue
 - c. Organ
 - d. Organ System
2. Identify all of the body systems that the eye is connected to.
 - a. Nervous
 - b. Skeletal/Muscular
 - c. Circulatory
 - d. All of the Above
3. Is the entire retina able to respond to light with its rods and cones? True/False Why?
 - a. False: There is a blind spot where the optic nerve exits the eye.



Cow Eye Dissection Pre Visit Activities

Labeling the Part of the Eye

Objectives: Students will label the parts of the human eye in preparation for identifying similarities between the human eye and the cow's eye.

Materials:

- Student Worksheet
- Teacher's Answer Sheet
- Vocabulary List

Procedures:

Take some time to have your students familiarize themselves with the anatomy of the human eye.

Have your students review the vocabulary list and attempt to label the various parts of the human eye based on their knowledge.

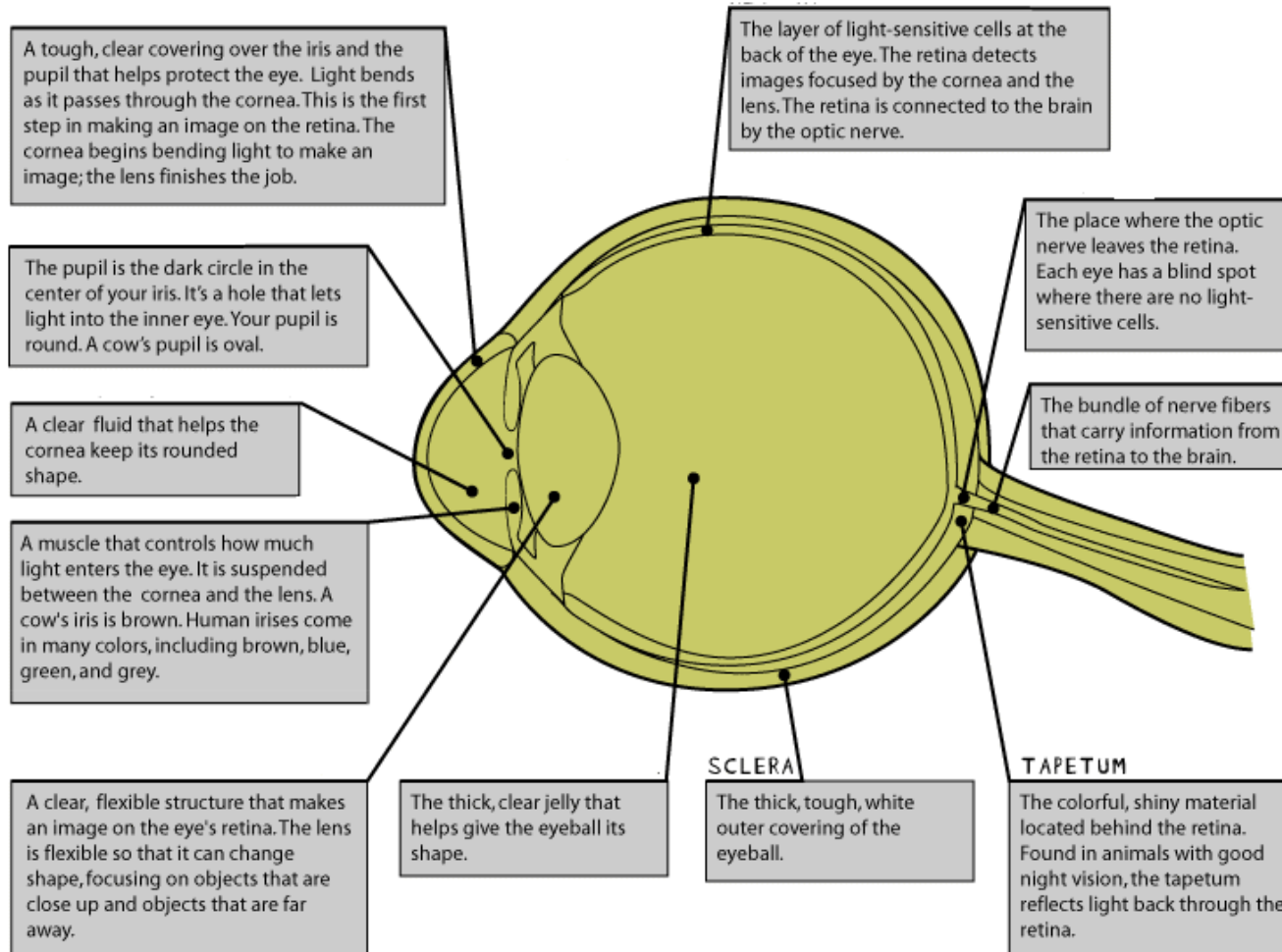
Extensions:

You may extend the lesson through online searches that may reveal additional information regarding the anatomy of the human eye.

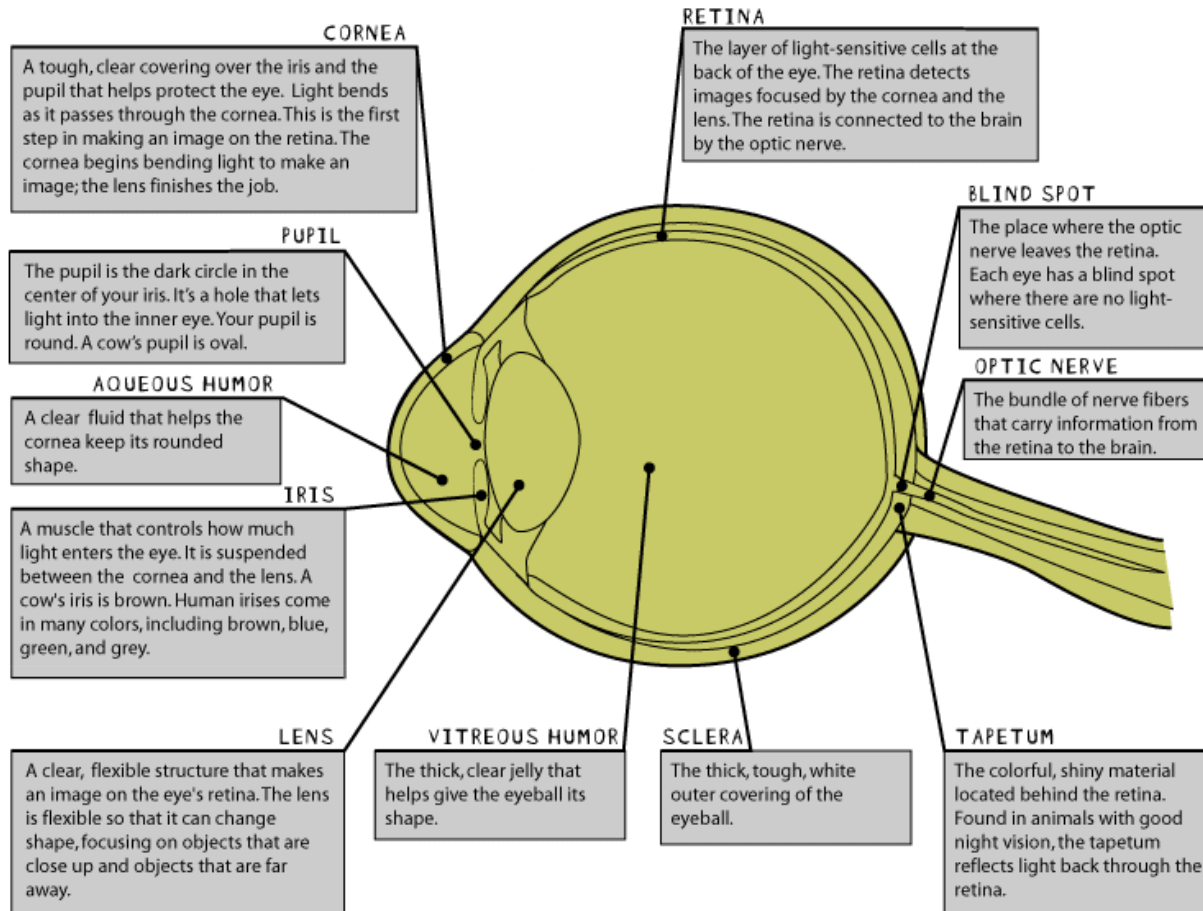
STUDENT WORKSHEET

NAME: _____ DATE: _____

Label the various parts of the human eye. (See bottom right-hand corner for example.)



TEACHERS' ANSWER SHEET





Looking Through Lenses

Objectives: Participants will explore how lenses play a significant role in our everyday life.

Materials:

- Lens-like the one in a magnifying glass or one from a disposable camera
- Room that you can make very dark
- Light source-like a TV set or a brightly lit window
- Sheet of white paper

Procedures:

Look through your lens at these words or at your fingertip. Do things look bigger through your lens? If they do, your lens is a magnifying lens. It will work for this experiment.

Go into a room that has just one source of light. On a sunny day, a window works just fine. (Turn off any electric lights in the room.) At night, you can turn on your TV set and use it as a light source.

You're going to use your lens to make a picture of the light source. So you want a light source that will make an interesting picture. A picture of an ordinary light bulb is just a round spot, which is pretty boring.

Stand a few feet away from your light source. Hold your lens up so that light can shine through it. Hold the piece of paper on the other side of the lens so that light shines through the lens and onto the paper.

The paper is your screen-like the screen in a movie theater. The paper screen will reflect a picture made of light so that you can see it.

Start with the lens up close to the paper, and slowly move it away from the paper and toward the light source. Watch the pattern of light on the paper. When the lens is the right distance from the paper, you'll see a picture of the light source. The picture will be upside down and backward.

If you don't see a picture right away, keep trying. Try standing closer to the light source. Or try moving the lens farther from the paper. It may take some experimenting, but sooner or later you'll get a picture.

Extensions:

You may already know that you can use a lens to focus sunlight into a very bright circle. That circle can be hot enough to start a fire. For many kids, playing with a lens outdoors can be like playing with matches. Take appropriate precautions.

If you take a lens outside and use it to focus a circle of sunlight, DON'T stare at the bright spot. That spot of light is an image of the sun. You can hurt your eyes by staring at it, just as you can hurt your eyes by staring at the sun.



Cow Eye Dissection Post Visit Activities

Where's Your Blind Spot?

Objective: Participants will be able to experiment to find the blind spot in their right eye and hypothesize and determine where the blind spot is in their left eye.

Materials:

- 1 3x5 Index card
- Black marker - one per participant

Procedures:

1. Make a large dot, the size of your thumbnail, on the left side of the card, approximately 2 finger widths from the edge.
2. Make an X, on line and to the right of the dot, approximately 2 finger widths from the right edge of the card.
3. Hold the card in your right hand at arms' length so the dot is directly in front of your right eye and the X is off to the side.
4. Close your left eye.
5. Stare at the dot while slowly moving the card toward your face. When does the X disappear? This is your blind spot. How does the card look at your blind spot? Will you have a blind spot with both eyes open? Does your left eye have a blind spot at the same distance from your face? Let's find out.
6. The X should be on the left side of the card, so flip the card over. Find your blind spot. What did you discover? Why do we have blind spots?

What Happened?

There is a place on each eye where we do not have rods or cones to receive light. When the light hits this place, the eye doesn't receive any visual information. This area is known as your blind spot.

Extension:

Try the same experiment with different students, lengths, and locations. Does changing any of these variables impact the outcome of the experiment?



Hole in Your Hand

Objective: Participants will be able to observe the hole in the hand illusion and predict why you see a hole in your hand.

Materials:

- (1) 11" Cardboard Tube, or a piece of paper rolled into a tube

Procedures:

First step is to determine your dominant eye. (It is important to use your dominant eye for this illusion. To determine your dominant eye, hold your pointer finger up at arms' length. Line it up with an object in the distance. Close your right eye. If your finger appears to shift from where it was lined up, your right eye is dominant. Repeat with your left eye. Your vision with your dominant eye should be approximately the same as with both eyes.)

Hold the cylinder with your right hand in front of your right eye. Hold your left hand next to the cylinder close to the end. Keep both eyes open, and look, or focus, at a point in the distance. What do you see? Now close each eye, one at a time. What do you see with your right eye? What do you see with your left eye? Open both eyes again. Do you see a hole in your hand? Why?

If you do not see a hole in your hand, stare hard down the tube with your right eye, keeping both eyes open. You can see your hand and then you will see a hole you can look through.

What Happened?

You see the hole in your hand because one eye is looking down the tube and the other eye is looking at your hand. The brain mixes the two views together resulting in a hole in your hand.

Extension:

Try changing the length or diameter of the tube and see if that has any impact on the results of the experience.