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Anatomy of the visual system education curriculum for grades K-3

Jessica Bowers
Pacific University

Jennifer Kannberg
Pacific University

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Anatomy of the visual system education curriculum for grades K-3

Abstract

The Anatomy of the Visual System Education Curriculum for Grades K-3 was developed for educators teaching kindergarten through third grade. Currently, early grade school curriculums have limited educational material available for elementary teachers relating to the visual system. This project was designed to provide material to elementary instructors as a way of introducing the visual system to children. The project consists of ten lesson plans ranging from basic ocular anatomy to function of the visual system. Each lesson includes activities such as art, reading, and writing and is designed to last 20-30 minutes.

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Master of Science in Vision Science

Committee Chair

Graham Erickson

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ocular anatomy curriculum, eye lesson plan, eye related activities, learning the visual system

Subject Categories

Optometry

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ANATOMY OF THE VISUAL SYSTEM EDUCATION CURRICULUM
FOR GRADES K-3

By

JESSICA BOWERS

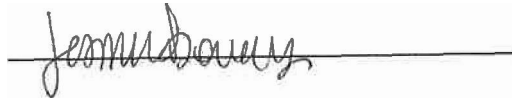
JENNIFER KANNBERG

A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
for the degree of
Doctor of Optometry
May 2004

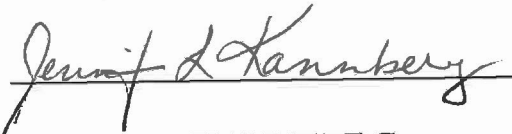
Advisors:

GRAHAM ERICKSON, O.D., FAAO, FCVOD

ANITA McCLAIN, M.ED, ED.D.



JESSICA BOWERS



JENNIFER KANNBERG



GRAHAM ERICKSON, O.D., FAAO, FCVOD



ANITA McCLAIN, M.ED, ED.D.

Biographies

Jessica Bowers grew up in Willmar, MN where she graduated from Ridgewater College and received an A.A. degree in Liberal Arts. She then graduated with honors from Dordt College in Sioux Center, IA where she received a B.A. in Psychology. Following graduation from Pacific University College of Optometry in Forest Grove, OR Jessica is planning on returning to Willmar, MN to join a private practice.

Jennifer Kannberg grew up in Creston, WA and attended Central Washington University, where she graduated *cum laude* with a B.A. in Biology. Following graduation from Pacific University College of Optometry Jennifer is hoping to work for a private practice in rural Washington, where she can emphasize in contact lenses and pediatric vision exams. Her goal is own a practice in partnership with the established optometrist.

Abstract

The Anatomy of the Visual System Education Curriculum for Grades K-3 was developed for educators teaching kindergarten through third grade. Currently, early grade school curriculums have limited educational material available for elementary teachers relating to the visual system. This project was designed to provide material to elementary instructors as a way of introducing the visual system to children. The project consists of ten lesson plans ranging from basic ocular anatomy to function of the visual system. Each lesson includes activities such as art, reading, and writing and is designed to last 20-30 minutes.

Key words:

Ocular Anatomy Curriculum

Eye Lesson Plan

Eye related activities

Learning the Visual System

Acknowledgements

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Unit of Study: The Human Eyes
Lesson Plan #1- The Eyes as Part of the Body
Grades K-3
Ideal grade: 1

It is important to understand that the eyes are a valuable part of the body and are used to gather information from the surrounding environment

Goal: Students will understand that their eyes are valuable

Benchmarks: Science Benchmark 1- Forming the question/hypothesis
Analyze scientific information
Interpret data from investigation
English Benchmark 1- Use correct spelling, sentence construction
Art Benchmark 1- Apply artistic elements

Objectives:

- To understand that the eyes are used to gather visual information from the world
- To learn that eyes enable us to see a variety of things large and small
- To understand how to protect our eyes from harm

Materials:

- Sunglasses
- Handout
- Crayons or colored pencils
- 8 ½ x 11 white paper

- I. Pre-Assessment (3 min)
 - A. Give students handout and ask them to think about and list some things their eyes enable them to see in the world.
 - B. Ask students to write a sentence about how they can protect their eyes from harm
- II. Activity (15-20 min)
 - A. Ask students to close their eyes for 30 seconds to experience what the world would be like without being able to see
 - B. Have students open their eyes and look around the room noticing all the different things they can see with their eyes
 - C. Have students look at the top of the handout showing them some of the things their eyes allow them to see
 - D. Ask students to draw something very big that they can see with their eyes such as a mountain
 - E. Ask students to draw something very small that they can see with their eyes such as a ladybug
 - F. Have students color the worksheet as well as draw additional things that they are able to see with their eyes at the bottom of the worksheet
 - G. Ask students what they felt like when they weren't able to see

- H. Ask students how their life might be different if they weren't able to see
 - I. Have students think of different ways they can protect their eyes from harm
 - J. Explain to students that their eyelashes, eyelids, and eyebrows all help protect their eyes from harmful substances
 - K. Explain that tears help wash away substances that accidentally get into the eyes
 - L. Discuss ways that students can protect their eyes from harm including:
 - Keep sharp objects away from eyes
 - Wear safety goggles when working with dangerous substances such as chemicals or working near flying debris
 - Never look directly at the sun
 - Wear sunglasses when outside in bright light
 - M. Hand out sunglasses to the students and have them look toward a classroom window
 - N. Ask students what they see with the glasses on. Ask students how things look different with the glasses on compared to the glasses off
 - O. Explain that sunglasses help eliminate harmful rays of light that reach their eyes
 - P. Tell students that they can now use their sunglasses to protect their eyes when they are outdoors
- III. Post-Assessment (3 min)
- A. Ask students what their eyes allow them to see
 - B. Have students write a sentence about how they can protect their eyes from harm

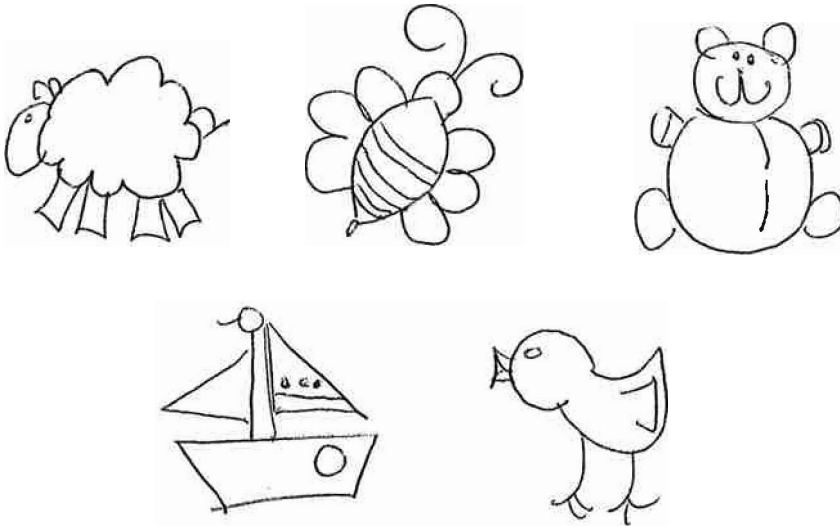
Resources:

"Oregon Standards." Oregon Department of Education. Spring 2001.

Name _____

I Can See With My Eyes

Write a sentence about how you can protect your eyes from harm



Draw some additional things you can see with your eyes below

Describe some ways in which you can protect your eyes from harm

Unit of Study: The Human Eyes
Lesson Plan #2- What is in an Eyeball
Grades K-3
Ideal grades: 1-2

It is important to the evaluation of the human eyes and visual system to understand that there are several parts to the eye, each in a specific location.

Goal: The students will know the basic structures of the human eye and their locations within the eye.

Benchmarks: Science Benchmark 1- Forming the Question/Hypothesis,
Art Benchmark 1- Apply artistic elements
English Benchmark 1- Follow directions, read directions, write descriptively

Objectives:

- Students will become familiar with the different parts of the eye. Students will learn how the different parts fit in the eye.
- Students will construct an eyeball to facilitate the learning of the different parts, their shapes, and location within the eye.

Materials:

- Pre-Assessment Activity Sheets
- Cut-n-Paste Activity
 - o 1 sheet of white cardstock/construction paper per student with eye ball outline
 - o 2- 2"x 4" piece of white vellum per student
 - o 1 sheet of red vellum per student
 - o 1- 2"x 4" piece of brown, blue, or green construction paper-based on eye color per student
 - o 1- 2"x 4" piece of red construction paper per student
 - o 1 red marker and black marker per student
 - o 1 sheet of patterns preferably on cardstock for each student
 - o 1 pair scissors for each student
 - o 1 bottle of glue for each student
- Post-Assessment Activity Sheets

- I. Pre-Assessment Activity (3 min)
 - A. Instruct the students to read the instructions (or read aloud).
 - B. Ask them to complete the assignment.
- II. The Eye Ball and its Parts
 - A. Explain that a cross section is a view from the side, so that we can see and understand all the parts in the eye.
 - A. Introduce the eyeball and point out all the parts.
 - B. Instruct the students to cut out the patterns to be used for tracing (or have those pre-cut).

- C. Have the students then trace the patterns onto the correct color of paper.
 - 1. Cornea- white vellum
 - 2. Iris- blue, brown, or green construction paper
 - 3. Muscle- red construction paper
 - 4. Lens- white vellum
 - 5. Retina- red vellum
 - D. The students then should cut out the different shapes (these can also be precut for the students). (Figure 1)
 - E. Next the eyeball on white construction paper will be cut out (can be precut).
 - F. The different shapes will then be pasted one the eyeball outline in the correct location.
 - G. Optional: Label the different parts with black marker.
 - H. Optional: Draw blood vessels on the red vellum to represent the blood vessels.
 - I. Display their hard work on a theme bulletin board that can be referred through the week. (Figure 2)
- III. Post-Assessment Activity (3 min)
- A. Instruct the students to read the instructions (or read aloud).
 - B. Ask them to complete the assignment.

Resources:

“Oregon Standards.” Oregon Department of Education. Spring 2001.

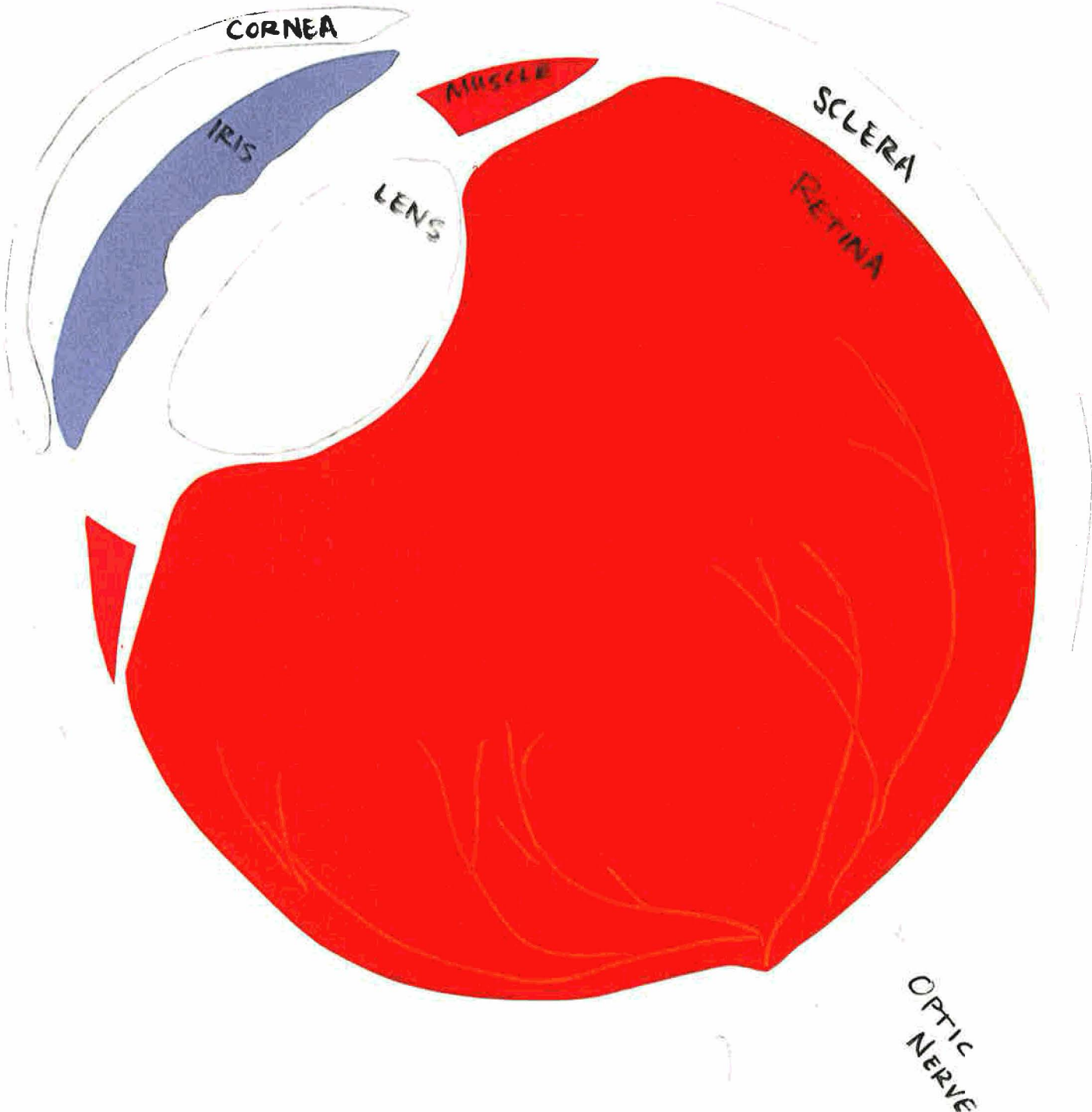
Lesson Plan #2
Assessment

Name _____

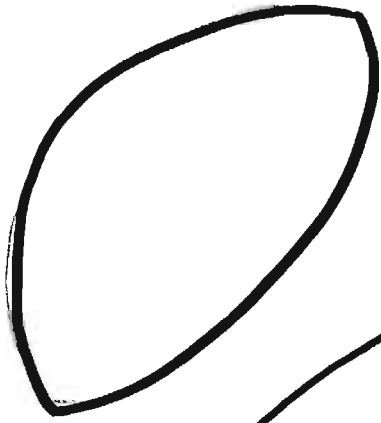
1. Describe the human eyeball.

2. Draw an eyeball.

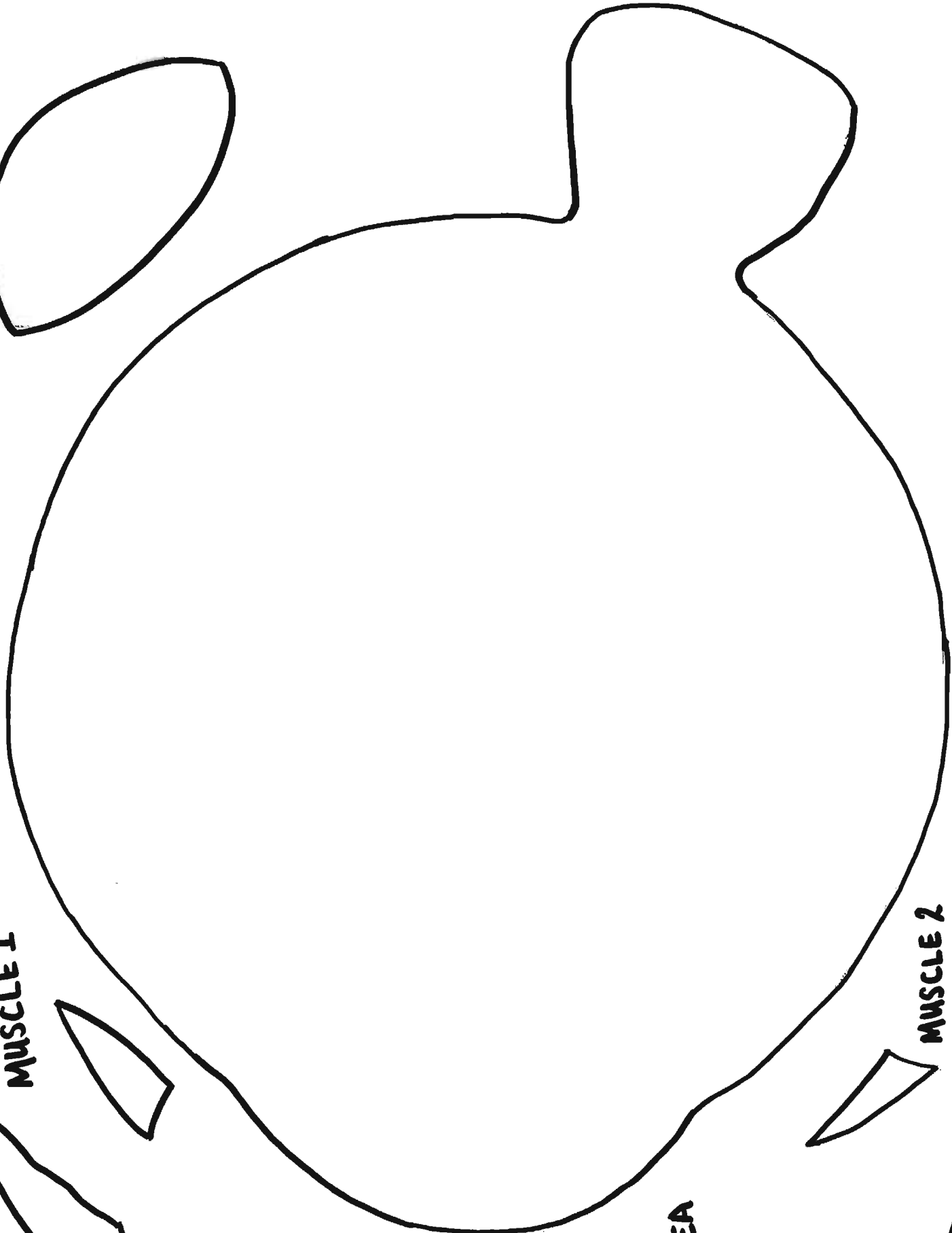
Figure 2- Completed Project



LENS



EYEBALL



MUSCLE 1



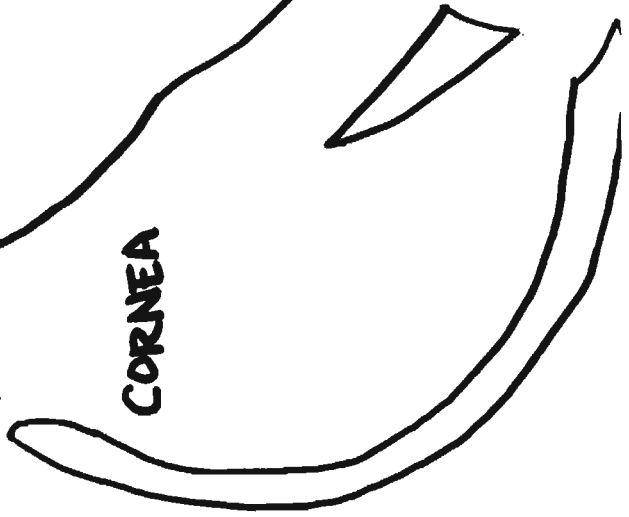
MUSCLE 2

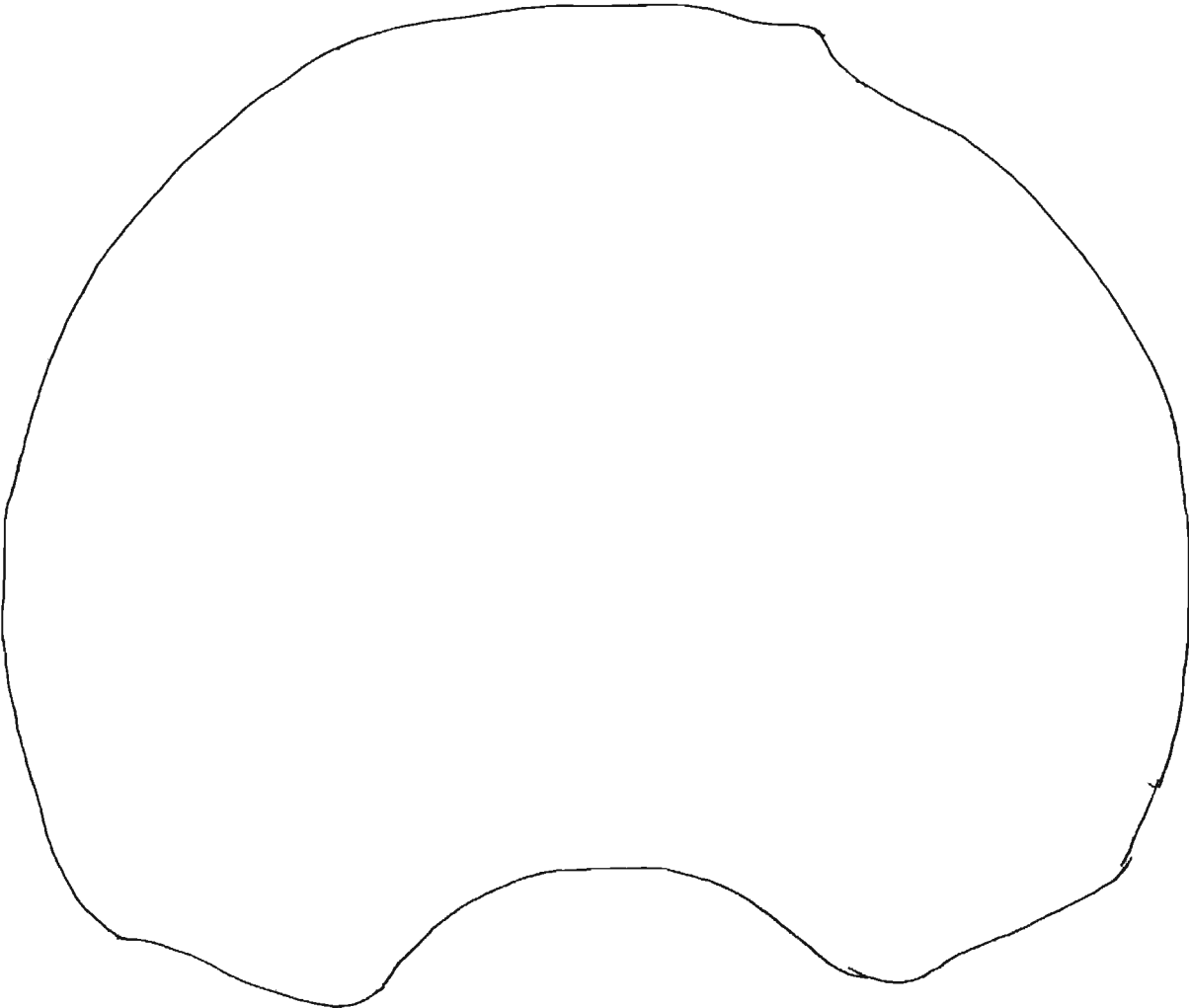


IRIS



CORNEA





Unit of Study: The Human Eyes
Lesson Plan #3- How the Eye Does it's Job
Grades K-3

Now that the students can identify the parts of the human eye, it is crucial to understand the importance of each structure and how it contributes to the function of the visual system.

Goals: The students will know the basic function of the various structures of the human eye.

Benchmarks: Science Benchmark 1- Forming the Questions/Hypothesis,
Collecting and Presenting Data, Analyzing and
Interpreting Results,
English Benchmark 1- Demonstrate literal comprehension of a variety of
printed materials; increase vocabulary

Objectives:

- Students will review the parts the eyeball.
- Students will learn how the eye sees, how an image is transmitted.
- Students will learn the "job" of each part of the eye.
- Students will perform a variety activities to learn about different functions of the eye.

Materials:

- 2-3 penlights or small flashlights
- 1 sheet of white paper with the anatomy of the eye per student
- 1 pencil per student
- 1 copy of the function description (one description per group) with illustrations
- 1 Pre-Assessment Sheet per student
- 1 Post-Assessment Sheet per student

I. Pre-Assessment (3 min)

- A. Instruct the students to read the instructions (or read aloud).
- B. Ask them to complete the assignment.

II. Multiple Stations (-20 min)

A. Picture/Image to Brain (6 min)

1. Draw an image/picture in front of the eye (something simple, but it needs to have vertical orientation, like a tree or a letter 'A').
2. Draw the same picture on the retina (the inside of the back of the eye) up side down. The lens flips the image.
3. Draw the same picture right side up in the brain.

B. Eye Muscles (6 min)

1. Explain that there are six muscles attached to the eye that help us look around (up, down, left, right, and sideways!).
2. The students will work in pairs.

3. One will ask the other to look at their finger or pencil and to follow it with their eyes. One child will be moving a pencil in a circle while watching his/her partners' eyes, while the other follows the pencil of finger with his/her eyes.
 4. Then switch partners and repeat.
- C. How the pupil works (6 min)
1. Explain that the pupil is hole in the iris that lets light into our eye, thus allowing pictures to our eye and ultimately our brain. The pupil will change as the amount of light changes.
 2. The students will work in pairs.
 3. One student will look at their partners' pupils and then shine the light in the eye briefly and watch it get smaller.
 4. Then switch partners and repeat.
- III. Alternative (-20 min)
- A. Break the students into small groups (3-4 students per group)
 - B. Assign each group a part of the eye and ask them to work together to develop descriptive words that will help describe the function of that part.
 - C. To aid in their assignment, each group will be given a paragraph describing their part of the eye and some pictures.
 - D. Each group will then explain to the class how their assigned part of the eye helps us to see, without reading from the paragraph, but using the pictures given or created to help illustrate.
- IV. Post-Assessment (3 min)
- A. Instruct the students to read the instructions (or read aloud).
 - B. Ask them to complete the assignment.

Resources:

"Oregon Standards." Oregon Department of Education. Spring 2001.

Cornea

The cornea is clear and will allow light into the eyeball. The cornea protects the eye, so that only light gets inside.



Iris

The iris limits the amount of light that gets to the retina. The iris will make the pupil smaller to allow a little light to the retina. The iris will make the pupil bigger to allow more light into the eyeball, like when it is dark outside.



Pupil

The pupil is not a structure. The pupil is a hole in the iris that allows light to reach the cornea. The pupil size changes when the iris moves. A big pupil allows a lot of light to the retina, a small pupil allows less light into the eyeball.



Ciliary Muscle

The ciliary muscle helps us to see up close. The ciliary muscle changes the shape of the lens, so that we can focus our eyes to see.



Lens

The lens allows light into the back of the eye. The lens focuses the light so that we see a clear picture, not a blurry picture. The lens changes shape to focus. The lens can only change shape when the ciliary muscle moves. The lens also flips the picture upside down.



Sclera

The sclera keeps the eyeball round. The sclera is strong and protects our eyeball. The sclera is white.



Retina

The retina gathers all the information from the light that comes into the eyeball. There are many cells in the retina, some see color, and some only see black and white. The retina sends the picture seen to the brain.



Optic Nerve

The optic nerve carries all the light that hits the retina to the brain. The brain tells us what we are seeing in front of us.



Lesson Plan #3
Assessment

Name _____

1. Name 3 parts of the eye.

■ _

2.

3.

2. Describe how the eye works.

3. What makes the eye move around?

Unit of Study: The Human Eyes
Lesson Plan #4- How Do We See?
Grades K-3
Ideal grade: 3

Goal: Students will understand that visual information is gathered from the environment and processed by the visual system

Benchmarks: Science Benchmark 1- Forming the question/hypothesis
Analyze scientific information
English Benchmark 1- Use correct spelling, sentence construction
Art Benchmark 1- Apply artistic elements

Objectives:

- To learn that visual information travels through the cornea, to the lens, to the retina, optic nerve, and finally to the brain
- To learn that the brain processes visual information to make sense of it
- To understand that the image entering the brain is inverted and that the brain re-inverts it so it is perceived as right side up

Materials

- Worksheet
- Crayons or colored pencils

- I. Pre-Assessment (3 min)
 - A. Give each student a worksheet. Ask students if they think their brain helps their eyes see. If so, ask students to write a sentence about how they think their brain helps their eyes see
- II. Activity (17-20 min)
 - A. Explain to students that an image enters their eyes and passes through the cornea. Next, the image reaches the lens and becomes inverted. Then the image reaches the retina and finally the optic nerve. The image travels through the optic nerve where it reaches the brain. The brain's job is to process and makes sense of the image as well as turn it right side up so we understand what we are seeing
 - B. Have students look at the image of the house on the top of the worksheet before it enters the eye
 - C. Have students look at the image of the house as it looks inside the eye
 - D. Have students look at the image of the house as their brain makes it look after it has processed the image
 - E. Have students color each image of the house making the roof red and the remainder brown with crayons or colored pencils
 - F. On the bottom of the worksheet have students draw a picture of a tree
 - G. Ask students to draw what the image of the tree would look like while inside the eye

- H. Ask students to draw what the tree would look like after the brain has processed the information about the tree
- III. Post-Assessment (3 min)
 - A. Ask students to write a sentence about how their brain helps their eyes see

Resources:

"Oregon Standards." Oregon Department of Education. Spring 2001.

Name _____

How Our Eyes See

Do you think your brain helps your eyes see? _____

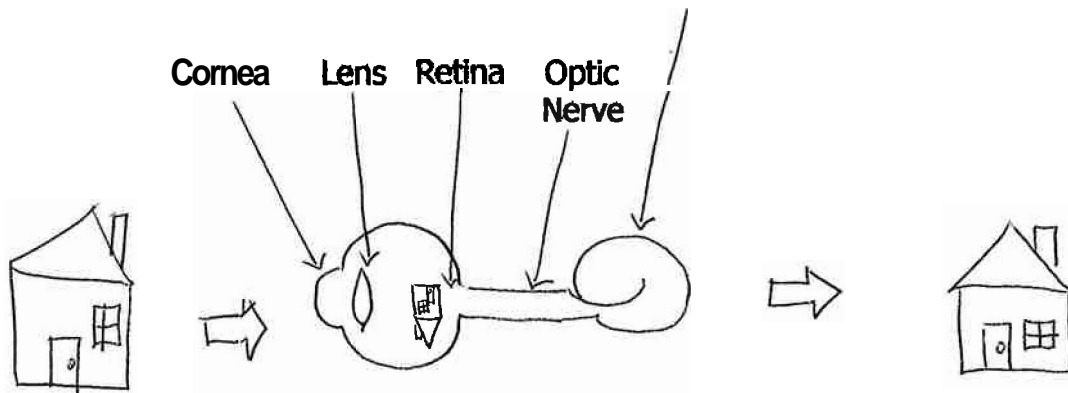
If so, how? _____

HOUSE

EYE

BRAIN

HOUSE

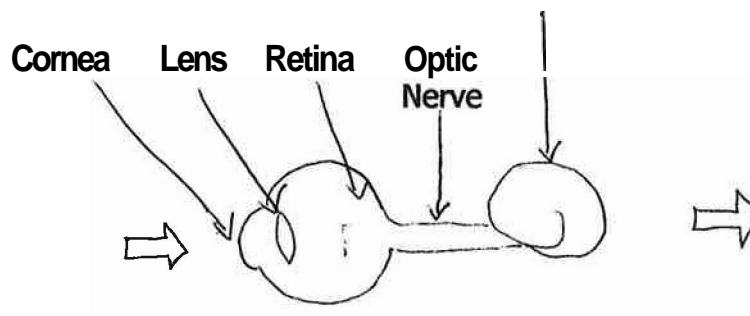


TREE

EYE

BRAIN

TREE



Write a sentence about how your brain helps your eyes see

Unit of Study: The Human Eyes
Lesson Plan #5- Color Vision
Grades K-3
Ideal grades: 2-3

Color vision is an important part of our everyday lives; students will enjoy learning about why and how we can see color.

Goal: The students will understand the two main cell types, rods and cones, and how they are different.

Benchmarks: Science Benchmark 1- Forming the Question/ Hypothesis, Collecting and Presenting Data, Analyzing and Interpreting Results,
English Benchmark 1- Demonstrate Evaluative Comprehension of a Variety of Printed Materials.

Objectives:

- Students will learn that lots of little cells, smaller than we can see, make up the retina (Over 2 million cells)
- Students will understand that only cone cells see color and rods help us to see at night.
- Students will demonstrate how the three different cones help us to see all the colors.

Materials:

- Combining Colors for Vision Activity:
 - 1 handout of cones and rods per student
 - 2 sheets of red and green filter paper, 1 sheet of blue per group
 - 1 flashlight per group
- 1 Pre-Assessment Sheet per student
- 1 Post-Assessment Sheet per student

I. Pre-Assessment (3 min)

- A. Instruct the students to read the instructions (or read aloud).
- B. Ask them to complete the assignment.

II. Retina discussion

- A. Explain to the students that a cell is very small, it can't be seen without a super microscope.
- B. Explain that there are over 2 million cells in the thin layer called the retina.
- C. These cells help us to see. They see the image and send the information to the brain.
- D. Describe that there are two main cells that helps us see, those that see color- cones, and those that see at night- rods. Rods have a flat bottom and a spoon-shaped top, while cones have a cone-shaped bottom and a bumpy top.
- E. The cones can only see three colors, but all combine and see all the colors of the rainbow.

III. Combining Colors for Vision Activity

A. Have the students work in groups of 3-4

B. Each group will use 2 green filters, 2 red filters (because there are more red and green sensing cones than blue) and 1 blue filter and 1 flashlight

C. The students will shine the light on the wall or white paper if the while is not white. Next they will introduce each of the colored filters individually, then they can begin to combine the filters and see what happens to the color of the light on the wall.

D. Each student upon completion of observing the light will individually describe what he/she saw in 2-3 sentences.

IV. Post-Assessment (3 min)

A. Instruct the students to read the instructions (or read aloud).

B. Ask them to complete the assignment.

Resources:

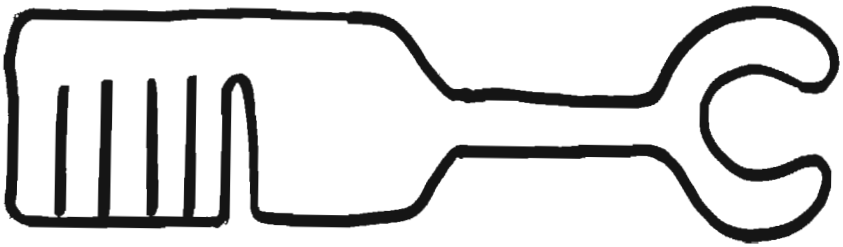
"Oregon Standards." Oregon Department of Education. Spring 2001.

Lesson Plan #5
Assessment

Name _____

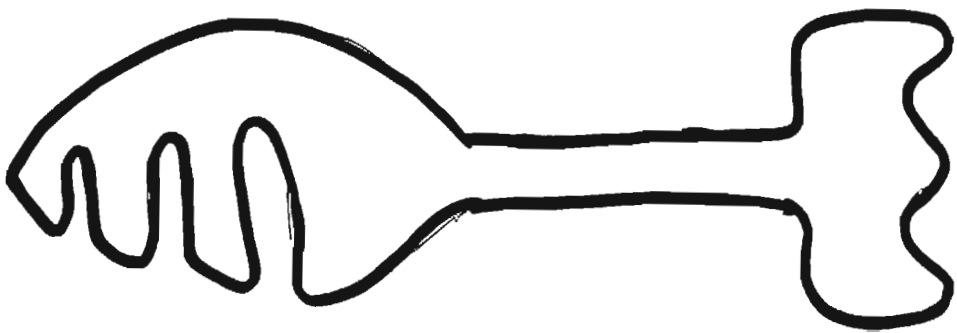
1. What part of the eye sees color?
2. What colors do the cells in the eye see?
3. Draw a picture of the eye.

ROD



NIGHT-TIME
No COLOR

CONE



• COLOR

Unit of Study: The Human Eyes
Lesson Plan #6- Color Vision
Grades K-3
Ideal grade: 1

Goal: The students will understand that they are able to see a variety of colors as a result of only a few colors mixing together

Benchmarks: Science Benchmark 1- Forming the question/hypothesis
 Analyze scientific information
 Interpret data from investigation
English Benchmark 1- Use correct spelling, sentence construction
Art Benchmark 1- Apply artistic elements

Objectives:

- To introduce students to the concept of color vision
- To learn that when colors are mixed they form new colors
- To understand that we are able to see a variety of colors because our eyes are able to mix colors

Materials:

- Worksheets
 3 glass jars
- Water
- Yellow and blue watercolor paints
- Red, yellow, and blue Play Doh

- I. Pre-Assessment (3 min)
 - A. Hand out the worksheet
 - B. Ask students to describe in a sentence how they think their eyes are able to see so many colors
- II. Activity (20 min)
 - A. Class Demonstration: Use watercolor paints to dye water in one jar yellow and another jar blue
 - B. Ask students what they think will happen when the yellow water is combined with the blue water into the empty jar
 - C. Ask students what happened?
 - D. Ask students how they think this happened?
 - E. Have each student list as many colors as they can think of in the blanks at the top of the sheet
 - F. Ask students how they are able to see so many different colors?
 - G. Have each student write their favorite color on the next line
 - H. Give each student 3 quarter sized balls of Play Doh (one of each color)- red, yellow, and blue
 - I. Tell students that they are going to practice mixing colors
 - J. First divide each of the balls into 2 balls for a total of 6

- K. Then using the worksheet as a guide, press the balls of Play Doh on the appropriate labeled square. For the first row, no mixing of the colors is necessary. For the second row, students will mix balls together according to the labeled squares and then press on the paper.
 - L. Ask students what happened when the two different colors mixed?
 - M. Explain to students that our eyes are able to mix colors just like they did with the Play Doh and this is why we are able to see so many different colors
 - N. Let the Play Doh dry overnight so students can **take** the worksheets home when dry
- III. Post-Assessment (3 min)
- A. Ask students to describe in a sentence at the bottom of their worksheet how their eyes are able to see so many different colors

Resources:

"Oregon Standards." Oregon Department of Education. Spring 2001.

Name _____

Mixing Colors

Describe in a sentence how your eyes are able to see so many different colors

Name as many colors as you can:

What is your favorite color?

RED	YELLOW	BLUE
RED + YELLOW	YELLOW + BLUE	BLUE + RED

Write a sentence about how our eyes are able to see so many different colors

Unit of Study: The Human Eyes
Lesson Plan #7- Prisms and Rainbows
Grades K-3
Ideal grade: 2

It is important to understand that white light is composed of several colors

Goal: Students will understand that white light is composed of red, orange, yellow, green, blue, and indigo

Benchmarks: Science Benchmark 1- Forming the question/hypothesis
 Analyze scientific information
 Interpret data from investigation
English Benchmark 1- Use correct spelling, sentence construction
Art Benchmark 1- Apply artistic elements

Objectives:

- Students will learn that white light is composed of several colors
- Students will explore how rainbows are formed using prisms
- Students will understand that prisms separate and bend white light into the colors of the spectrum creating a rainbow
- Students will learn the colors of the rainbow/spectrum are red, orange, yellow, green, blue, indigo, and violet

Materials:

- Prisms
 - Crayons
 - Worksheet
 - Overhead Projector
- Red, orange, yellow, green, blue, and violet markers

- I. Pre-Assessment (3 min)
 - A. Give each student a worksheet
 - B. Ask students how they think rainbows are formed?
 - C. Ask students to write a sentence about how they think rainbows are formed

- II. Activity (15-20 min)
 - A. Ask students if they've ever seen a rainbow before
 - B. Ask students where they saw the rainbow
 - C. Ask students if it had been raining the day they saw the rainbow
 - D. Ask students what colors they saw in the rainbow
 - E. Tell students that prisms separate white light into the colors of the spectrum: red, orange, yellow, green, blue, indigo, and violet
 - F. Explain that these colors are always in the same order
 - G. Have each student hold a prism near a window or light source

- H. **Ask students to Form a rainbow on the classroom wall using a prism**
 - I. **Ask students what colors they see?**
 - J. **Ask students what order the colors were in?**
 - K. **Tell students that sunlight is called white light. Explain that raindrops and prisms separate white light into the colors of the rainbow because when light strikes a surface different from air it bends**
 - L. **Draw a rainbow using colored markers and use an overhead projector to display it on a screen in front of the class**
 - M. **On the handout have each student draw their own rainbow with crayons using the rainbow on the screen as a reference if needed**
- III. Post-Assessment (3 min)
- A. **Have students write a sentence at the bottom of the worksheet explaining how rainbows are formed**

Resources:

"Oregon Standards." Oregon Department of Education. Spring 2001.

Lesson Plan #7
Assessment

Name _____

Rainbows

Write a sentence about how rainbows are formed

Draw your rainbow below

Write a sentence about how rainbows are formed

Unit of Study: The Human Eyes
Lesson Plan #8- Magnification
Grades K-3
Ideal grade: 2

It is important to understand that lenses can be used to make our eyes see things differently

Goal: Students will learn about a magnifier as a type of lens

Benchmarks: Science Benchmark 1- Forming the question/hypothesis
Analyze scientific information
Interpret data from investigation
English Benchmark 1- Use correct spelling, sentence construction

Objectives:

- To introduce students to the concept of magnification
- To learn that magnifiers make objects *appear* larger
- To understand that a magnifier is a type of lens
- To understand that magnifiers work by the speed of light changing as it enters the lens making the light bend
- To understand that our eyes and brain can be "tricked" into seeing something a different way than it actually is

Materials:

- Hand held plastic magnifiers
- Newspaper or magazine pages
- Small "Ziplock" plastic bags
- Water
- Overhead projector
- 8 ½ x 11 white paper

- III. Pre-Assessment (3 min)
 - A. Show students on an overhead projector a newspaper page. Place a magnifier over the print and ask the students how the print changed.
 - B. Ask students to write a sentence about how they think this happened on the handout
- II. Activity (20 min)
 - O. Give each student a page from a newspaper or magazine containing text
 - P. Hand out plastic magnifiers to each student and ask them to place the magnifier over the text.
 - Q. Ask them what happened to the text?

- R. Explain that as the light enters the magnifier its speed changes. As a result of the speed changing, the light is bent making the text appear larger to our eyes.
 - S. Explain to students that a magnifier is a type of lens and that lenses change the way our eyes see
 - T. Explain that the actual text on the newspaper or magazine is still the same size and that our eyes and brain are "tricked" into believing the actual text size has changed.
 - U. Give each student a Ziplock plastic bag filled $\frac{3}{4}$ full with water.
 - V. Explain to the students that they are going to create their own magnifier
 - W. Have students place the bag over the text and look through the bag at the text. Ask students what they see?
 - X. Have students slowly lift the bag off the text while watching the text through the bag
 - Y. Ask students what happened to the text as they lifted the bag further away from the page
- III. Post-Assessment (3 min)
- A. Ask students to write a sentence at the bottom of the handout about how magnifiers work

Resources:

"Oregon Standards." Oregon Department of Education. Spring 2001.

Lesson Plan #8
Assessment

Name _____

Magnification

Write a sentence about why you think the print on the newspaper changed

Write a sentence about how a magnifier works

Unit of Study: The Human Eyes
Lesson Plan #9- Things are not Always What They Seem...Optical Illusions
Grades K-3
Ideal grade: 2-3

It is fun and valid for the children to learn how complex vision and the brain can be, sometimes what we think we see, what the brain believes is in front of us is not actually what is there.

Goal: The students will become familiar with the different ways our eye can "play tricks on us".

Benchmarks: Science 1- Forming the Question/ Hypothesis, Collecting and Presenting Data.
English 1- Reading directions

Objectives:

- Students will understand that the visual system is very complex.
- Students will examine a variety of pictures in exploration of how "tricky" things can appear.
- Students will describe the difference in what they saw and what they discovered to be the "truth".

Materials:

- 1 packet of optical illusions per student (See Appendix)
- 1 measuring device per student (can be paper ruler)
- 1 Pre-Assessment Sheets per student
- 1 Post-Assessment Sheets per student

- I. Pre-Assessment (3 min)
 - A. Instruct the students to read the instructions (or read aloud).
 - B. Ask them to complete the assignment.
- II. Optical Illusions Activity (15-20 min)
 - A. The students will be placed in small groups of 3-4
 - B. Each student will begin his/her examination of the optical illusions
 - C. First they will flip through the packet and examine each illusion, they will need to compare different objects and make assumptions about their relative size or shape. These initial observations should be recorded.
 - D. Next, they will go through the packet with a ruler and measure the different objects and see that perhaps they are the same size and shape, but may look different in different situation as our eyes "play tricks" on us. They will also record this finding, whether the same or different from the initial assumption.
- III. Post-Assessment (3 min)
 - A. Instruct the students to read the instructions (or read aloud).
 - B. Ask them to complete the assignment.

Resources:

"Oregon Standards." Oregon Department of Education. Spring 2001.

Lesson Plan #9
Assessment

Name _____

1. What is magnification?
2. Can you draw a rainbow, with the colors in order?
3. Do you think we should believe everything we see?

Unit of Study: The Human Eyes
Lesson Plan #10- Summary —The Eyeball Game
Grades K-3
Ideal grade: K-3

Now that we have complete several lessons on the eye, lets test the students' knowledge with a fun game.

Goals: The students will recall the information learned in previous lessons to navigate through a board game.

Benchmarks: Science 1- Collecting and Presenting Data
English 1- Reading directions

Objectives:

- Students will recall material presented during the last 9 lessons
- Students will play a game covering all material presented

Materials:

- 1 copy of the board game for every four students
- 1 stack of playing cards for every group of four students (Figures 4-6)
- 1 game marker (penny, eraser, etc) per student

- I. Pre-Assessment (3 min)
 - A. Instruct the students to read the instructions (or read aloud).
 - B. Ask them to complete the assignment.
- II. Board Game Activity (15-20 min)
 - A. Place the students of groups of four each person will need a penny or eraser to mark their place on the game.
 - B. They will begin playing they will play in alphabetically order, or in order of birthdays.
 - C. Each player starts from a different corner of the game and will begin by moving one space at a time and following the instructions on the game cards. They only are allowed to advance if they get the question or activity on the card correct.
 - D. If the player/student lands on an R he/she will correctly identify a picture in order to advance. If the player lands on a G he/she will perform an activity as indicated by the G card on the top of the pile. If the player lands on a B he/she will answer a question read to him/her by another player.
 - E. If the player gets the correct answer, then they draw from the C pile to see how far they can move. If they get it wrong, they stay on that space until they get it correct.
 - F. Once the activity has been completed, the card will be returned to the bottom of the correct pile.
 - G. The game is won when on person makes it to the EYEBALL.
- III. Post-Assessment (3 min)

- A. Instruct the students to read the instructions (or read aloud).
- B. Ask them to complete the assignment.

Resources:

"Oregon Standards." Oregon Department of Education. Spring 2001.

Lesson Plan #10
Assessment

Name _____

1. What is the order of the colors of a rainbow?

- _____ Blue
- _____ Yellow
- _____ Red
- _____ Purple
- _____ Green
- _____ Orange

2. What is the "job" of the lens?

3. How can we protect our eyes?

4. Are things that we see upside down on the retina?

No

Yes

Figure 4- Front **Side** of game pieces

B

B

B

B

B

B

B

B

B

B

B

B

B

B

B

B

G

G

G

G

G

G

G

G

G

G

G

R

R

R

R

R

R

R

R

R

R

Figure 5- Back Side of game pieces

<p>WHAT CELL IN OUR EYE SEES COLOR?</p> <p>ANSWER: CONES</p>	<p>WHAT SHAPE IS THE HUMAN EYEBALL?</p> <p>ANSWER: ROUND WITH A PUMP IN THE FRONT</p>
<p>HOW MANY EYES DOES EACH HUMAN HAVE?</p> <p>ANSWER: 2</p>	<p>WHAT TWO COLORS COMBINE TO MAKE PURPLE?</p> <p>ANSWER: RED AND BLUE</p>
<p>WHAT DOES THE LENS OF THE EYE DO?</p> <p>ANSWER: FOCUSES LIGHT, FLIPS THE PICTURE</p>	<p>WHAT IS THE JOB OF THE CORNEA?</p> <p>ANSWER: PROTECT THE EYE, ALLOW LIGHT THROUGH</p>
<p>WHAT IS THE JOB OF THE RETINA?</p> <p>ANSWER: TO PUT THE PICTURE TOGETHER, SEND THE PICTURE TO THE BRAIN</p>	<p>WHAT IS THE JOB OF THE SCLERA?</p> <p>ANSWER: TO MAKE THE EYE ROUND, TO PROTECT THE EYEBALL</p>

<p>WHAT DOES THE LIGHT PASS THROUGH FIRST? A) CORNEA B) LENS</p> <p>ANSWER: CORNEA</p>	<p>WHAT IS AN OPTICAL ILLUSION?</p> <p>ANSWER: A TRICK OUR EYES PLAY ON US</p>
<p>WHAT DOES A CONE CELL SEE?</p> <p>ANSWER: COLOR</p>	<p>WHAT SHAPE IS A ROD CELL?</p> <p>ANSWER: FLAT ON THE BOTTOM, SPOON SHAPED ON THE TOP</p>
<p>WHAT CELL SEES AT NIGHT?</p> <p>ANSWER: ROD</p>	<p>WHERE IS THE PICTURE WE SEE UPSIDE DOWN?</p> <p>ANSWER: RETINA</p>
<p>WHAT IS THE JOB OF THE PUPIL?</p> <p>ANSWER: TO ALLOW LIGHT INTO OUR EYE</p>	<p>DOES WATER IN A BAG MAKE THINGS BIGGER OR SMALLER?</p> <p>ANSWER: BIGGER</p>

DRAW AN IRIS

DRAW AN EYEBALL

**EXPLAIN WHAT ~~THE~~ LENS
DOES**

**EXPLAIN HOW RAINBOWS ARE
MADE**

**FIND SOMEONE WITH BLUE
EYES**

**FIND SOMEONE WITH BROWN
EYES**

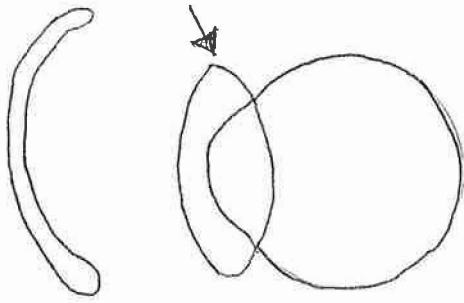
**FIND SOMEONE WITH GREEN
EYES**

**FIND SOMEONE WHO WEARS
GLASSES**

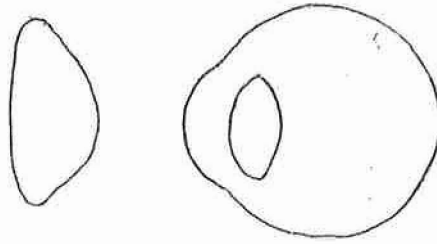
TELL **THE** GROUP HOW TO
KEEP YOUR EYES SAFE

DRAW A **RAINBOW**

DRAW A PICTURE OF A TREE
AS IT GOES THROUGH **THE**
EYE



ANSWER: CORNEA



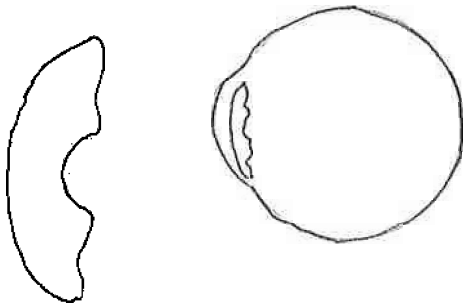
ANSWER: LENS



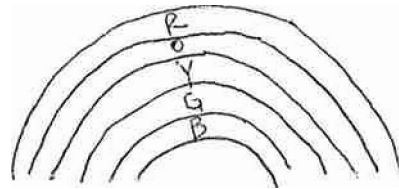
ANSWER: ROD



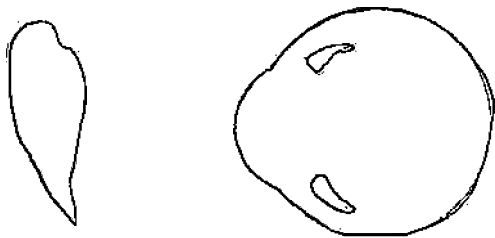
ANSWER: CONE



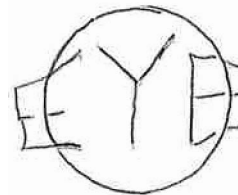
ANSWER: IRIS



ANSWER: RAINBOW

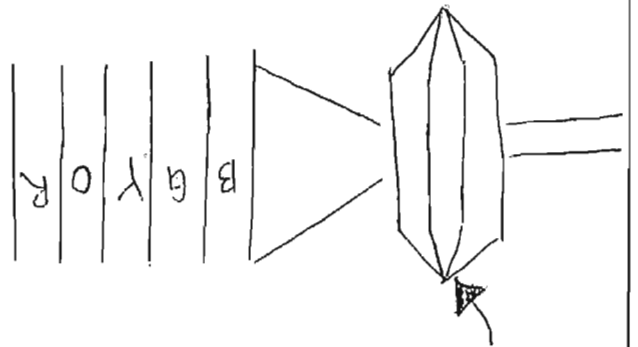


ANSWER: MUSCLE



ANSWER: MAGNIFICATION

ANSWER: PRISM



ANSWER: SUNGLASSES

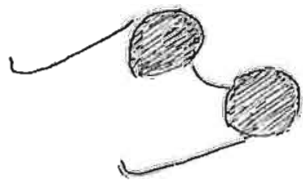


Figure 6- Correct Responses

MOVE AHEAD ONE (1)

MOVE AHEAD TWO (2)

MOVE AHEAD THREE (3)

MOVE AHEAD ONE (1)

MOVE AHEAD ONE (1)

MOVE AHEAD ONE (1)

MOVE AHEAD ONE (1)

MOVE AHEAD TWO (2)



Appendix- Optical Illusions Packet

OPTICAL ILLUSIONS

FLAG ILLUSION

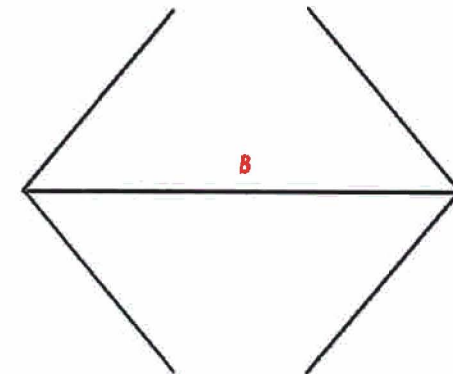
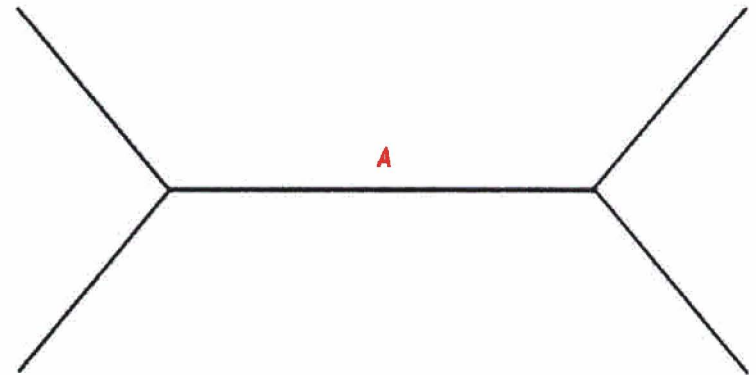
Stare straight at the center of the flag for 30 - 60 seconds. (Make sure there is plenty of light on the object.) Then look at the blank sheet.



LENGTH OF THE LINE

Compare the line in the middle of both objects. Is one line longer? Now meas-

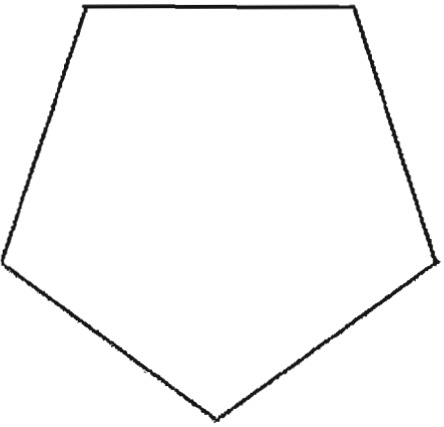
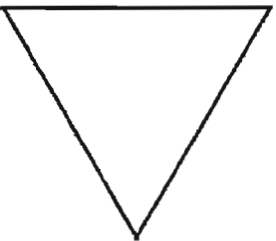
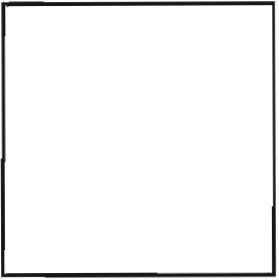
How much longer is line 'A' than line 'B'?



THE SAME SIZE SHAPES?

Look at the shapes below, compare which one has a longer side. Next, measure to see which one is longer.

Which figure has the longest side?

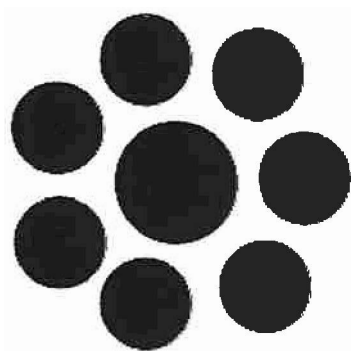
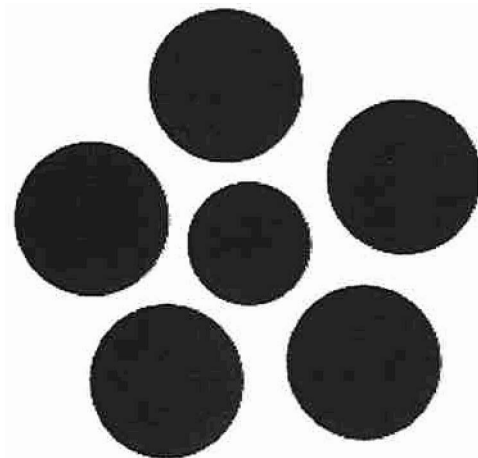


Now, look at the center of this page. Do you see a flag? What color is it? Does it move?

CIRCLE IN CIRCLE

Look carefully at the circle in the middle. Compare which circle is bigger.

Which *inner circle* is *bigger*?



DISAPPEARING CIRCLES

Concentrate *very hard* on a *point in the white field of intersecting lines* for *about 30 seconds*. Then *shift your attention quickly to one of the black squares*. What do you see inside the *black squares*?

