

# Eye Think Eye Can!

**Grade Level:** 3<sup>rd</sup> Grade

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**Length of Unit:** Seven lessons with culminating activity, about 50 minutes each

## I. ABSTRACT

This unit about the human eye gives students a chance to learn the parts of the eye and what they do. It lets the students discover how the parts of the eye work together through scientific investigation. Students will feel like optometrists when they finish this unit. When you are finished, take a field trip to an optometry office or have an optometrist visit your classroom. This will give students a chance to brag about their knowledge plus find out even more. Hopefully you and your students will all learn from “Eye Think Eye Can!”

## II. OVERVIEW

- A. Concept Objectives (science standards from the 1995 Colorado Model Content Standards that align with Crown Pointe Academy’s standards)
  - 1. Students know and understand the characteristics and structure of living things. (Standard 3)
  - 2. Understand how the body functions and factors that influence its structures and functions. (Standard 3.3)
  - 3. Students understand the process of scientific investigation. (Standard 1)
- B. Content from the *Core Knowledge Sequence* page 82
  - 1. Parts of the eye: cornea, iris and pupil, lens, retina
  - 2. Optic nerve
  - 3. Farsighted and nearsighted
- C. Skill Objectives
  - 1. Students will be able to list ways their eyes benefit them.
  - 2. Students will be able to predict what their life might be like without vision.
  - 3. Students will be able to label the parts of the outer eye.
  - 4. Students will be able to list ways the outer parts of the eye protect the eye.
  - 5. Students will be able to label the parts of an eye.
  - 6. Students will be able to give a brief description of each part of the eye.
  - 7. Students will be able to use the scientific method to investigate the eye.
  - 8. Students should be able to describe the process light goes through from the time it reaches the cornea until it is received by the cerebrum.
  - 9. Students will be able to distinguish between an eye that is farsighted and an eye that is nearsighted.
  - 10. Students will be able to choose the type of corrective lens that should be used to help both a farsighted eye and a nearsighted eye.
  - 11. Students will be able to distinguish between what a person with farsightedness and a person with nearsightedness see without corrective lenses.
  - 12. Students will be able to create their own model of an eye.

13. Students will be able to describe what each material in their model represents.
14. Students will be able to explain the job any particular part of the eye.

### III. BACKGROUND KNOWLEDGE

- A. For Teachers
  1. *World Book Encyclopedia* 1998 or 1999 “E Volume 6”
  2. *What Your 3<sup>rd</sup> Grader Needs to Know*, by Hirsch Jr., E.D.
  3. *Seeing*, by Wright, Lillian
- B. For Students
  1. Know that sight is one of the five main senses
  2. Have knowledge from 3<sup>rd</sup> grade unit on the nervous system
  3. Have knowledge from 3<sup>rd</sup> grade unit on light and how it travels

### IV. RESOURCES

- A. An optometrist from your community
- B. *What Your Third Grader Needs To Know*, by E.D. Hirsch Jr.
- C. *My Grain and Senses*, by P. Bennett
- D. *Seeing*, by L. Wright
- E. *Optical Illusion Magic*, by M. Dixpexio
- F. *The Big Book Of The Brain*, by J. Farndon
- G. *World Book Encyclopedia E Volume 6*
- H. *The Human Body for Every Kid*, by J. VanCleave
- I. *Play And Find Out About The Human Body*, by J. VanCleave
- J. *Human Body*, by S. Parker
- K. *Look At Eyes*, by R. Thomson
- L. *The Magic School Bus: Explores the Senses*, by J. Cole & B. Degan

### V. LESSONS

#### Lesson One: Protecting the Eye

- A. *Daily Objectives*
  1. Concept Objective(s)
    - a. Understand how the body functions and factors that influence its structures and functions.
    - b. Students know and understand the characteristics and structure of living things.
  2. Lesson Content
    - a. Cornea
    - b. Parts of the eye
  3. Skill Objective(s)
    - a. Students will be able to list ways their eyes benefit them.
    - b. Students will be able to predict what their life might be like without vision.
    - c. Students will be able to label the parts of the outer eye.
    - d. Students will be able to list ways the outer parts of the eye protect the eye.

B. *Materials*

1. Overhead projector
2. Clear transparency
3. Overhead markers
4. *Optical Illusion Magic* by M. Dispezio
5. A copy of Appendix A for each student
6. A transparency of Appendix A
7. Journal or piece of paper for each student

C. *Key Vocabulary*

1. Eyebrow - the line of hair that grows above each eye
2. Eyelash - one of the short curved hairs that grows on the eyelid and help to keep dust out of the eye
3. Eyelid - the upper or lower fold of skin that covers the eye when it is closed
4. Tear duct - carry tears from the eye into a passageway to the nose
5. Tear gland - makes tears; it is at the upper outer corner of the eye
6. Cornea - clear tissue in front of the iris
7. Sclera - the white part of the outer eye

D. *Procedures/Activities*

1. Ask students to list the five senses. Tasting, touching, seeing, hearing, and smelling are the five senses.
2. For review, ask students to list the system of the body that controls these senses (the nervous system).
3. Tell the students that you will be focusing on one of the senses, seeing.
4. Write the word “seeing” on the overhead projector and circle it.
5. Using what the students already know about the eye create a web from the word seeing. Draw lines out from the word that have anything at all to do with seeing.
6. Ask, “What do you already know about seeing?” Students may list the eye and some of its parts. They may want you to list color, shape, position of the eye, glasses, why people wear glasses, things to see, things you can’t see.
7. Remove the transparency. Later you can make a copy of it to keep in the classroom to compare at the end of the unit with what they know now to what they will know by the end of the unit.
8. To help students get interested in learning about the eye, try some optical illusions from *Optical Illusion Magic* by M. Dispezio or any good optical illusion book.
9. Tell students that by the end of the unit they will better understand how they get tricked by these pictures.
10. Write, “tear gland, tear duct, eye brow, eyelashes, eyelid and sclera” on the board. Say them out loud as you write them.
11. Ask students what they think all these words have in common besides being part of the eye. They all help protect your eye.
12. Have all the students point to their eyebrow. Tell students that the eyebrow is the line of hair that grows above each eye. Ask students if they

know how it protects the eye. It keeps dust and sweat from your forehead from getting in the eye. It sort of works as a filter.

13. Have students point to eyelashes. Ask the same question again. Again, they help filter dust and particles in the air from reaching your eye.
14. Have students point to their eyelid. Ask how it protects the eye. It blinks as a natural reflex and aids as a shield for the eye.
15. Tell students that if it gets past the eyelid there are still more natural protectors. Have students look at another student's eye. Tell them not to touch, but look at the white part of the eye. That is called the sclera. It keeps particles from harming the eye. Have the students repeat the word sclera after you.
16. Have students look at the front of their friend's eye where the sclera ends. There is a clear protective covering over the eye there. Tell students it is called the cornea. Have the students repeat it after you.
17. Ask students if they know how to get objects off the sclera and cornea. Your eye waters or creates tears. Your eye creates tears in a place called the tear gland.
18. Tell students that they can't see the tear gland. Point to the side of your eyebrow that is closest to your ear. Under your skin you have a gland that produces tears. The tears fall down your eye taking the particle with them.
19. Tell the students that if the particles are small enough they will go to the tear duct.
20. Point to the inside corner of your eye next to your nose. This is your tear duct. Your tear duct is a small canal or opening that leads to your nose.
21. Ask the students if their nose ever runs when they cry. This is why.
22. Remind students of the difference between tear glands and tear ducts for this can be a little confusing. Glands produce the tears, and the ducts carry them away.
23. Review all the parts again by pointing to it and reminding the student how it protects.

E. *Assessment/Evaluation*

1. Give each student a copy of Appendix A to fill out. You may wish to take a grade.
2. When grading it fill out a transparency of Appendix A correctly on the overhead projector.
3. Have the students journal what it would be like to lose their vision. How would it affect their life?

**Lesson Two: What's In an Eye?**

A. *Daily Objectives*

1. Concept Objective(s)
  - a. Students know and understand the characteristics and structure of living things.
2. Lesson Content
  - a. Cornea
  - b. Iris

- c. Pupil
  - d. Lens
  - e. Retina
  - f. Optic nerve
3. Skill Objective(s)
- a. Students will be able to label the parts of an eye.
- B. *Materials*
- 1. *The Magic School Bus: Explores the senses*, by J. Cole & B. Degan
  - 2. Transparency of pages 14 & 15 of *The Magic School Bus: Explores the Senses*
  - 3. Appendix B
  - 4. All books from the “resource” section of the overview
- C. *Key Vocabulary*
- 1. Cornea - protective covering for the iris and pupil
  - 2. Iris - colored part of the eye
  - 3. Pupil - opening in the center of the eye
  - 4. Lens - located behind the pupil it focuses the light
  - 5. Retina - back lining of the eye
  - 6. Cones - type of cells located on the retina detect color
  - 7. Rods - type of cells located on the retina detect black and white
  - 8. Optic nerve - nerve that leads from the retina to the cerebrum
- D. *Procedures/Activities*
- 1. Write the words Cornea, Iris, Pupil, Lens, Retina, and Optic nerve on the board.
  - 2. Tell students that today you will study the inside parts of the eye.
  - 3. You might want to review what you learned yesterday about the outside of the eye.
  - 4. Read *The Magic School Bus: Explores the senses* by Cole and Degan out loud to the class. Emphasize pages 6-17.
  - 5. Put a check by each word as you read it from the book.
  - 6. Ask students if they notice any more detail about the eye. Explain to the students that these are put into the eye in a certain order.
  - 7. Using the transparency of pages 14 and 15 from *The Magic School Bus: Explores the senses*, talk and point the students through the order from the outside in and inside out of the eye.
  - 8. Point out that the retina is made of cones and rods. I would give research bonus points if someone researches overnight and can tell us the difference between the jobs of cones and rods the next day.
  - 9. Ask students if they remember which part of the brain the optic nerve goes to. Students should be able to recall from the nervous system unit that the cerebrum controls the senses. Our eyes gather information even faster than our hands because our optic nerve goes directly to our brain and does not have to go through our spinal cord.
  - 10. Pass out a piece of blank paper to each student.
  - 11. Using the overhead picture or books from the research center, students need to draw a picture of an eye and label the parts.

12. Tell the students that they will have a short quiz tomorrow.
  13. I usually ask the students to have their parents sign their notes so I know they studied.
  14. Give students time to buddy read in the research center. Students should fill out Appendix B as they read. I always keep a few blank pages on clipboard there.
- E. *Assessment/Evaluation*
1. Make sure students are copying down the correct information so that they can study correctly for the quiz.
  2. Give students some fun ways to learn such as (C-I-P-L-R-O) which stands for cornea, iris, pupil, lens, retina, and optic nerve

### **Lesson Three: Job of the Eye Parts**

- A. *Daily Objectives*
1. Concept Objective(s)
    - a. Understand how the body functions and factors that influence its structures and functions.
    - b. Students understand the process of scientific investigation.
  2. Lesson Content
    - a. Cornea
    - b. Iris
    - c. Pupil
    - d. Lens
    - e. Retina
    - f. Optic nerve
  3. Skill Objective(s)
    - a. Students will be able to give a brief description of each part of the eye.
    - b. Students will be able to use the scientific method to investigate the eye.
- B. *Materials*
1. Appendix C
  2. Appendix D
  3. Appendix E1
  4. Appendix E2
  5. Overhead projector
  6. Overhead markers
  7. Transparency of pgs. 14 and 15 of *The Magic School Bus: Explores the senses*, by J. Cole & B. Degan
  8. Magnifying glass or lens
- C. *Key Vocabulary*
1. Retina - the back lining of the eye made of cones and rods
  2. Rods - help us see shades of black and gray (help us to see objects at night)
  3. Cones - help us see colors (c for cones, and c for color); help us see objects during the day

4. Iris - the colored part of the eye; it contains two types of muscles that open or close the pupil to let light in or keep it out
5. Sphincter - the muscle in the iris that forms a circle around the pupil; it closes the iris so less light gets in; it makes the pupil appear smaller
6. Dilator - the muscle in the iris that opens the pupil to make it appear bigger; these muscles go from the sphincter to the outer edge of the iris
7. Pupil - opening in the center of the eye that allows light to pass through to the lens
8. Lens - the part of the eye that uses the ciliary muscles around it to focus light rays on the retina by getting flat to focus on objects far away and bulging out to focus on objects near; it is almost round and made up of layers of see-through cells
9. Optic nerve - the nerve that connects the rod and cone cells in the retina to the brain
10. Cornea - the transparent outer layer of the eyeball; the cornea covers the iris and pupil
11. Aqueous humor - the watery liquid between the cornea and the lens
12. Vitreous humor - the jellylike substance that fills the eyeball between the lens and the retina

D. *Procedures/Activities*

1. Pass out Appendix C (quiz) for a grade.
2. After the quiz, you might want to review again the jobs of the outer eye parts.
3. Using the transparency of pgs. 14 and 15 of *The Magic School Bus: Explores the Senses* by Cole & Degan, stop at each place and explain the jobs listed in the vocabulary section of this lesson.
4. Have students fill out Appendix D1 to take notes as you read.
5. Tell the students to make their notes very neat so they can study easier without having to figure out what word they wrote.
6. As you are reading, stop at the cornea. Tell the students that the job of the cornea is to protect the iris and the pupil. It holds in a watery liquid called aqueous humor. Aqueous humor, the liquid, is between the pupil and the cornea.
7. Circle the word cornea on the transparency.
8. Next, point to the pupil. Tell the students that it allows light to pass through to the lens.
9. Circle the word pupil on the transparency.
10. Next, point to the word iris. Tell students that the iris's job is to regulate light that goes into the eye.
11. Circle the word iris on the transparency.
12. Tell the students that the iris has two types of muscles that open and close the iris around the pupil.
13. The first muscle is the sphincter. The sphincter muscle closes the iris and makes the pupil appear smaller.
14. On the transparency, draw a circle in the iris around the pupil. This will show the students where the sphincter is.

15. On the transparency, draw straight lines from the pupil to the outer edge of the iris.
16. Tell students that this is the second muscle. It is called the dilator. It opens the iris to make the pupil appear larger.
17. Tell the students that when the dilator muscle works more light can get through the pupil to the lens. They should be able to predict that the sphincter muscle closes the iris so that less light can get through the pupil to the lens.
18. Pass out Appendix E1 (The Scientific Method).
19. Tell students they are going to do an experiment with their pupils and irises.
20. Tell students they need to write their information clearly so others may see their results. They need to write their answers in complete sentences, and rephrase the steps as much as possible.
21. Appendix E2 is a sample of a completed Appendix E1. You may use this as a guide to help you.
22. You will state the problem or question for them. "If we turn out the lights will our pupils appear larger or smaller?"
23. Ask students to look at a neighbor's eyes and see how big their pupils are to start with. This is what they should record in their background information. "For my background knowledge I will observe how large my partner's pupil appear before we turn out the lights."
24. For step three, students need to make an educated guess. You may scaffold them by starting their sentence for them by saying, "I believe if we turn out the light, my partner's pupil will appear\_\_\_\_. Do you think it is larger or smaller?"
25. Students should be able to fill out the rest of Appendix E1 on their own as you perform the experiment. Remind them again to write neat and organize their thoughts before they write a complete sentence.
26. Tell students that you are going to turn off the lights for the experiment.
27. Tell students to fill in step 4.
28. Tell students to fill in the graph by drawing a picture of now and a picture for when the lights are off.
29. Turn off the lights. Have students look closely at their neighbor's eyes. Give students about two minutes with the lights off to record their results.
30. Tell students to watch their partner's eyes as you turn the lights back on. Turn the lights on. Give students about two minutes to record their results for step 5 and the 3<sup>rd</sup> part of the graph.
31. Collect papers.
32. Ask the students why this happens. Students may be able to answer that your eye is trying to get more light when it is dark to see better, and less light in when it is bright. Your eye is looking for a medium. This is a good time to review the sphincter and dilator muscles in the iris.
33. "Now back to the book and the jobs of each part of the eye."

34. We have now passed the iris and pupil and now the light hits the lens. Tell students that the lens uses muscles around it to make it flat or bulge it out to focus the light.
35. Circle the word lens on the transparency.
36. Using a magnifying lens demonstrate to the students that you are going to try to focus on some words. You may use this lesson to read. Show students that depending on where you are you have to move the lens back and forth until it focuses well enough to read.
37. Tell students that the lens in your eye cannot move back or forth to focus so it changes shape. It uses its ciliary muscles to either make it flat to see objects far away or the ciliary muscles bulge the lens out to see objects close up.
38. Tell the students that the ciliary muscles attach to the lens and are located under the iris. This is why you cannot see them by looking at someone's eye.
39. Tell the students that the light now passes through your eye. Tell the students that a jellylike liquid called the vitreous humor makes up the inside of the eyeball.
40. Tell the students that the light has now reached the back of the retina.
41. Ask the students if they can tell you what the cells are called that make up the retina or the back of eyeball. "Rod cells and cone cells."
42. Ask students, "Who can tell me the difference between rod and cone cells?"
43. If no one knows, tell them that cones allow us to see shades of colors. Think cones and color both start with "c." We use these mostly during the day.
44. Tell students that rods allow us to see shade of gray. We use these cells mostly during the night.
45. Circle retina on the transparency.
46. Now that the light from the objects we see has gotten through the pupil, to the lens, and projected onto our retina and we know what color it is, our sensory nerves carry this information though our optic nerve to our brain.
47. Tell the students that the optic nerve serves as a passageway that connects the information from the rods and cones to our brain (cerebrum).
48. Circle optic nerve on the transparency.
49. Ask students if there is anything on their sheets they did not get filled in. If so, you may have them buddy with a friend, or you may wish to do a quick review to make sure all students have the correct information.

E. *Assessment/Evaluation*

1. Orally review the part of the eye with its job. You may want to read the vocabulary part of this lesson.
2. Take a grade on the scientific method sheet according to neatness, accuracy, and sentence structure.
3. Tell students that they will have a quiz on the jobs of the eye parts tomorrow. Students should study Appendix D1 (filled out) for their quiz.

4. You may want to take a grade as you check to see if the students filled in all the jobs.
5. Tell students that they need to have their parents sign the bottom of Appendix D so you know they studied tomorrow. If my students do not show a signed copy the next day then they may use their recess time to study before the quiz.

#### **Lesson Four: How Does It Work Together?**

##### **A. *Daily Objectives***

1. Concept Objective(s)
  - a. Students know and understand the characteristics and structure of living things.
2. Lesson Content
  - a. Cornea
  - b. Iris
  - c. Pupil
  - d. Lens
  - e. Retina
  - f. Optic nerve
3. Skill Objective(s)
  - a. Students should be able to describe the process light goes through from the time it reaches the cornea until it is received by the cerebrum.

##### **B. *Materials***

1. Appendix D2
2. Research books listed in resource section of overview
3. One spoon for each student
4. *The Big Book of the Brain* by John Farndon
5. Clear glass halfway filled with water
6. Appendix F
7. One ruler for each student
8. Crayons or colored pencils for each student
9. Cup filled with strips of paper with students' names on them

##### **C. *Key Vocabulary***

1. Concave - curved inward
2. Reflect - light is bounced off
3. Refract - light changes direction because it has traveled from one medium into another

##### **D. *Procedures/Activities***

1. Pass out a quiz to each student (Appendix D2).
2. Allow time for them to finish, and collect them.
3. For students that finish much faster, allow them to collect data in the research center.
4. When they are finished, tell the students that they now know the parts of the eye and what each part does. Now they are to put those together to learn how it really works.

5. Students know that the lens is in the eye, and they know it focuses your eyes on the image. But do any of the students know how a lens works.
6. Pass out one spoon for each student.
7. Tell them to turn the spoon so the inside (concave side) is facing them. When students look into the spoon they will see their face upside down.
8. Have them stick their tongues out to the right. They will observe that their tongue goes to the left.
9. Have them stick their tongues out to the left. They will observe that their tongue goes to the right.
10. Tell students, "I wonder why that happens." Ask students to try to put into their own words why this happens.
11. Write their ideas on the board.
12. Have students observe this several times.
13. Have the students pass the spoons in, and set them aside.
14. Tell students that when they see something they are only seeing the light that is reflected off them, this is why when it is completely dark you cannot see objects.
15. Read *The Big Book of the Brain* by John Farndon, pages 26 and 27.
16. Students will be able to recall their own background knowledge from what they have learned already.
17. As you show the picture on page 27 tell students that when the light hits the lens, the light is bent and is reflected on the retina in the opposite side.
18. Tell the students that when the light goes through the top it is reflected on the bottom, and when it goes through the bottom it is reflected on the top.
19. Also, using the picture show them when light goes through the left side it is reflected on the right side, and when light goes through the right side it is reflected on the left.
20. Pass out Appendix F.
21. Give one ruler to each student.
22. Students can use a ruler to draw a line to represent light reflected from an object to the eye.
23. After they draw a straight line to the lens they can draw a straight line from that point to the opposite point on the retina.
24. Tell students that when the light goes through the lens it is refracted or bent.
25. You may wish to demonstrate this by placing a pencil in a clear glass filled with water.
26. The students will notice that the pencil looks bent. The light is traveling through two different mediums so it is refracted.
27. Students will use one crayon for point A and another color for point B.
28. Ask students why we do not see things upside down.
29. Tell the students that we still do not "see" the object when it is reflected on our retina.
30. The retina is merely taking a picture that will be processed in the brain.
31. When our brain gets the message of the upside down object it flips the object right side up and now we see what we see.

E. *Assessment/Evaluation*

1. Students will be grouped into two groups.
2. One group will be called the left eye, and the other group will be called the right eye.
3. Have a cup with the strips of paper or Popsicle sticks with the students' names on them available.
4. Tell the students that our eyes will need corneas, and draw out two names. One student will go to the "right eye" and the other to the "left eye."
5. Try to have a part for every student.
6. As you call out their name just have them go to different parts of the room.
7. Write down who has what part in case anyone forgets.
8. Tell the students that they will be able to act out two eyes.
9. First, give them a 5-minute time limit to get in the correct order.
10. They should be lined up cornea, aqueous humor, iris (dilator, sphincter), pupil, ciliary muscles, lens, vitreous humor, retina (rods, cones), optic nerve, and cerebrum.
11. Next, tell the students that they will be able to act out that part of the eye.
12. Ask students what they have in mind. I have some examples and you will have good ideas too, but let the students try to think of something. Then, if some become frustrated you could first ask them what their eye part does, and then give them some good examples. Some good examples would be have the sphincter and dilator walking to and away from each other to simulate opening and closing of the iris. The cones could be saying colors out loud, and the rods can be saying black, white, and gray. The cornea could act like it's fighting because it protects the eye. The ciliary muscles could move the lens around. The aqueous and vitreous humors can simulate water and jelly in their movements. The Optic nerve can stretch out and reach the cerebrum and they can talk about what colors and shapes the retina detects.

**Lesson Five: Nearsighted and Farsighted: Seeing Eye-to-Eye!**

A. *Daily Objectives*

1. Concept Objective(s)
  - a. Understand how the body functions and factors that influence its structures and functions.
2. Lesson Content
  - a. Nearsighted
  - b. Farsighted
3. Skill Objective(s)
  - a. Students will be able to distinguish between an eye that is farsighted and an eye that is nearsighted.
  - b. Students will be able to choose the type of corrective lens that should be used to help both a farsighted eye and a nearsighted eye.
  - c. Students will be able to distinguish between what a person with farsightedness and a person with nearsightedness see without corrective lenses.

- B. *Materials*
1. Volume “E” of *World Book Encyclopedia*, 1998 or 1999 editions
  2. Appendix G1
  3. Appendix G2
- C. *Key Vocabulary*
1. Concave lens-lens that is bigger in the middle than on the edges
  2. Convex lens-lens that is thinner in the middle than on the edges
  3. Corrective lens-eyeglasses or contact lens that are used to help a person see better
- D. *Procedures/Activities*
1. Students now know what the eye parts are for.
  2. Tell students that just like everyone is unique, everyone’s eyes are unique.
  3. Tell the students that eyes are even shaped different from one person to another.
  4. Turn to volume “E” of *World Book Encyclopedia*, 1998 or 1999 editions.
  5. Show them how some eyes can be elongated and some can be shorter.
  6. Pass out Appendix G1.
  7. Tell students that the shape of our eye determines how well we can focus on objects.
  8. When the lens bends the light it is going to reflect the light on the retina, right?
  9. Draw a picture of an elongated eyeball.
  10. Well, sometimes the retina is too far away for the light to be reflected on it, so it is reflected in front of the retina.
  11. Draw a picture on the board that shows a picture being projected just in front of the retina.
  12. Tell the students that by the time the light reaches the point on the retina it is a little fuzzy.
  13. Tell students that when an eye is too long for the object to be reflected on the retina this is called myopia or nearsightedness.
  14. Tell students that when a person’s eyes are nearsighted they can see objects up close clear, but have trouble seeing objects at the distance.
  15. Tell students that when a person who has good eyesight looks at a far away object their lens becomes thinner in the middle, because the ciliary muscles relax spreading the lens out farther.
  16. Because a person who is nearsighted can’t see clearly far away, their ciliary muscles do not relax as much, and this can cause a person to get frequent headaches from muscle strain.
  17. Review with the students by going over the first line of the graph on Appendix G1.
  18. In square B1 show that the object is being reflected in front of the retina by drawing an upside down image between the lens and the retina.
  19. Tell the students that if we look at an object were up close, our ciliary muscles around the lens contract or become tight which makes the lens a convex lens.
  20. Show the picture of a convex lens in the elongated eye in B1.

21. Tell the students that a nearsighted person's lens is almost always bulged out like this.
22. Tell the students that this person needs glasses.
23. Ask the students what the lens of their glasses might need to look like in order to correct this problem.
24. Tell students that the lens will need to be the opposite of theirs. So instead of bulging out this person would need glasses that were thinner in the middle and thicker on the outside as shown in B5.
25. Have students point to B5 as you draw a picture of a concave lens (thick on the outside and flatter on the inside) on the board and label it concave.
26. Have students look at, and focus on their desk.
27. Tell them that since their desk is something that is close to them their lens is going to be in a thick state. Point to the convex lens in B1, and have the students say, "convex."
28. Ask the students to look at and focus on an object hanging on the wall or outside the classroom window.
29. Ask the students what their lens might look like now. Their lens should be flatter and be concave.
30. Ask students to write "concave" in the empty space in B5.
31. Tell the students that you are going to discuss and look at another kind of eye...one that is too short.
32. When an eye is short, the lens reflects the object behind the retina where your eye is not light sensitive.
33. On D1, draw a picture that is projected behind the retina.
34. Tell the students that when this happens a person has a hard time seeing objects that are up close, but can see okay from far away.
35. Tell them that this is called farsighted or hyperopia.
36. Tell the students that because the lens is trying to focus on the objects far away it is almost always a flat lens.
37. Tell the students to notice how the lens is long and flat in D1 because the ciliary muscles relax when you focus on objects in the distance.
38. Ask the students if they can hypothesize what the corrective lens should look like.
39. They should be able to guess that it would be the opposite because it was the opposite for the nearsighted person. So for this person we would get glasses that are convex.
40. Have the students look at D5, and tell them to write "convex" in the extra space.
41. Tell the students that an optometrist (eye doctor) among other things tries to figure out how convex or concave a person's corrective lens should be for them to see clearly.
42. Show page 465 of the *World Book Encyclopedia* or your own pictures of what someone who was near or farsighted might see without their corrective lenses.
43. Explain to students that column 3 of the table shows a person up close with city buildings in the background.

44. Review each picture by stating which parts are clear and which parts are fuzzy.
  45. Tell students that they will get to fill out their own table.
  46. Ask students if they have any questions.
  47. Have some students share about their own eye and look at their corrective lenses.
- E. *Assessment/Evaluation*
1. Ask students hypothetical questions to review for a quiz.
  2. Call out “elongated eye.” Have students be able to tell you if they are near or farsighted, whether they see better up close or far away, where the image is projected in relation to the retina, and what kind of corrective lens is needed.
  3. Do the same for “short eye.”
  4. Have quiz at the beginning of the following lesson.

### **Lesson Six: The Pupil’s Pupils**

- A. *Daily Objectives*
1. Concept Objective(s)
    - a. Students know and understand the characteristics and structure of living things.
  2. Lesson Content
    - a. Cornea
    - b. Iris (sphincter, dilator muscles)
    - c. Pupil
    - d. Lens (ciliary muscles)
    - e. Retina (cone, rod cells)
    - f. Optic nerve
  3. Skill Objective(s)
    - a. Students will be able to create their own model of an eye.
    - b. Students will be able to describe what each material in their model represents.
    - c. Students will be able to explain the job any particular part of the eye.
- B. *Materials*
1. One 2 liter bottle for each student
  2. One paper towel for each student
  3. Ten 2” strips of red ribbon or yarn for each student
  4. Five 5” strips of red ribbon or yarn for each student
  5. One pair of scissors for each student
  6. Glue or tape available for each student
  7. One 3” x 3” square of construction paper for each student (same color as the student’s eyes)
  8. Two 1” x 2” pieces of aluminum foil for each student
  9. One 2” x 3” oval piece of plastic cut from the bottles
  10. Cup that contains strips of paper with students’ names on them
  11. Research books that are listed in the resource section of the overview

C. *Key Vocabulary*

1. Optometrist - professional who studies eyes and helps people see better

D. *Procedures/Activities*

1. Tell students that today they will get to make their model eyes.
2. Tell them that it is very important to listen to or read the directions from Appendix H.
3. Refer to Appendix F for pictures if you are orally giving the directions.
4. First, they will need to cut the top of the two-liter bottle off by cutting it just above the soda label. There may be sharp points, but not likely to cut. If so, put tape on it just in case.
5. Set the rest of the bottle aside for a while.
6. You could also have those pre-cut by adults. The top portion is going to represent the retina of the eye, and the spout at the top will represent where the optical nerve leads to the brain.
7. At this time you may ask the students what the bottle could represent if it were a part of the eye. At this time students do not know how big the model will be so the bottle could represent a number of parts to them.
8. Tell the students that this will be the retina.
9. Next, students should glue or tape the 10 strips of ribbon or yarn into the inside of the top portion of the bottle. These are to look like red veins in the eye.
10. Next, glue or tape the 5" strips of yarn on the inside of the "retina" or bottle so that they hang out of the spout. These will represent the bundle of optical nerves.
11. Ask students to brief the job of the optical nerves. Ask students if they know where the nerves lead too.
12. Have students fold their paper towel in half and then in half again.
13. With their scissors, have the students cut from one corner to the opposite corner on the open end of the paper towel so that when they open it up it will look circular.
14. Have the students push the middle of the paper towel into the "retina." This will line the bottle, and represent the cone and rod cells that line the retina wall.
15. Let students recall the jobs of the rods and cones.
16. With their scissors, students or adults can cut the oval piece from the 2-liter bottle. This will represent the lens.
17. Students need to tape a piece of aluminum foil to each small point of the "lens."
18. Have the students tape the outer edge of the aluminum foil pieces to the edge of the bottle so that it is like a bridge over the top of the bottle. The aluminum foil represents the ciliary muscles.
19. Tell the students that the lens does not move on its own and need the ciliary muscles to help it focus on the light.
20. Lastly, students will make an iris from the construction paper.

21. They will need to cut a hole in the middle (pupil), and with a pencil, draw the circular sphincter muscle around the hole and the straight dilator muscles from the hole to the outer edge of the iris.
22. Students will tape their iris onto their “lens.”
23. Hang students’ eyes on a bulletin board or from the ceiling. You can call your bulletin board, “The Pupils’ Pupils!”
24. Tell the students that people who studies and takes care of other people eyes are called an optometrist.
25. Write “Optometrist” on the board.
26. Ask students if any of them think they would like to become an optometrist when they grow up.
27. Tell students that they have learned a lot about the eye, but that you know they still have questions.
28. Try to help them generate educated questions about the structure or function of the eye. Some examples might be average sizes of human eyes, problems that can affect the eye, and how to treat them, how to tell if someone needs glasses, or even how tricks are played on the eye.
29. Tell the students that they need to each write two questions about the eye. Tell them that you will check to make sure they have written complete sentences with subject, and verb. You will check that it makes sense, and that most of the words are spelled correctly.
30. If you have arranged for an optometrist to visit your classroom, or a field trip to an optometry office, tell the students they will have the opportunity to get some of their questions and more answered by a real optometrist.

E. *Assessment/Evaluation*

1. Call out a part on the eye or point to a part of the eye.
2. Draw a student’s name from the cup, and have the student point or name that part of the eye and tell what its job is.
3. Have some students list as many parts as they can that are not represented by the model. (Tear glands, tear ducts, eyelid, eyebrow, eyelashes, cornea, aqueous humor, and vitreous humor)
4. You may wish to grade the questions on the sentence structure described in step 28 in the lesson.

**VI. CULMINATING ACTIVITY**

- A. Students will get a chance to meet an optometrist, and maybe even visit an optometrist’s office. Give students time to be able to ask one of their questions that they wrote from lesson 6 of this unit.

**VII. HANDOUTS/WORKSHEETS**

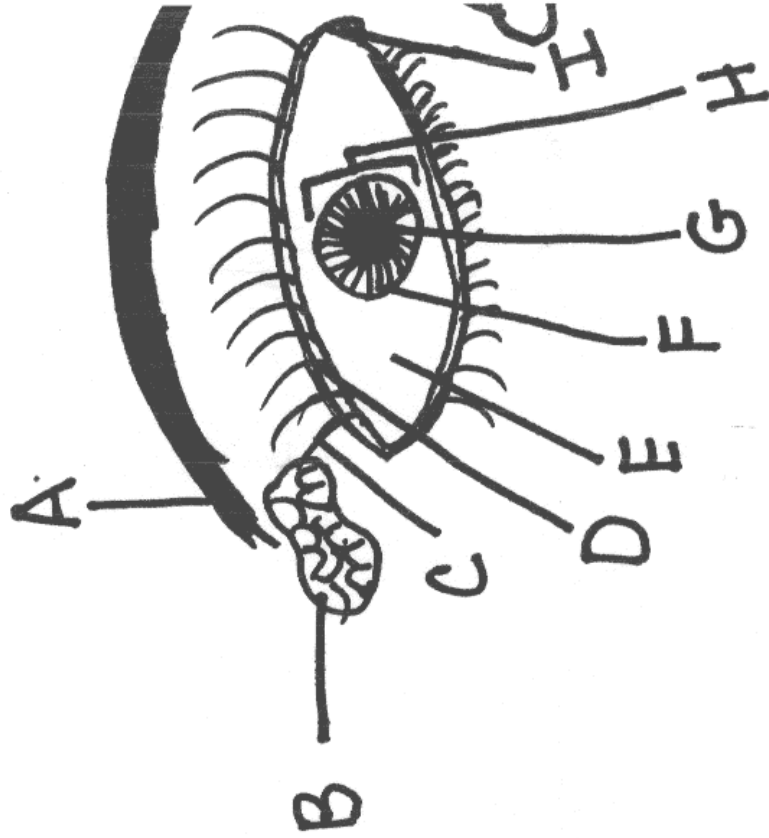
- A. Appendix A: Protecting Your Eyes
- B. Appendix B: Research Facts
- C. Appendix C: Quiz: The Parts of the Inner Eye
- D. Appendix D1: Notes: Jobs of the Eye Parts
- E. Appendix D2: Quiz: Jobs of the Eye Parts
- F. Appendix E1: The Scientific Method (student worksheet)

- G. Appendix E2: The Scientific Method (answer key)
- H. Appendix F: Pictures for Pupils
- I. Appendix G1: Review for Quiz
- J. Appendix G2: Quiz
- K. Appendix H: Directions for Making Pupils

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Appendix A-Eye Think Eye Can!  
Protecting Your Eyes



A  
B  
C  
D  
E  
F  
G  
H

Cornea, Eyebrow, Eyelash, Eyelid, Iris, Pupil, Sclera, Tear duct, Tear gland

Appendix B-Eye Think Eye Can!  
**Research Facts**

**Name:** \_\_\_\_\_

**Interesting Fact:** \_\_\_\_\_

\_\_\_\_\_

**Book Title:** \_\_\_\_\_ **Pg. #** \_\_\_\_\_

**Author(s):** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Interesting Fact:** \_\_\_\_\_

\_\_\_\_\_

**Book Title:** \_\_\_\_\_ **Pg. #** \_\_\_\_\_

**Author(s):** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Interesting Fact:** \_\_\_\_\_

\_\_\_\_\_

**Book Title:** \_\_\_\_\_ **Pg. #** \_\_\_\_\_

**Author(s):** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Interesting Fact:** \_\_\_\_\_

\_\_\_\_\_

**Book Title:** \_\_\_\_\_ **Pg. #** \_\_\_\_\_

**Author(s):** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Interesting Fact:** \_\_\_\_\_

\_\_\_\_\_

**Book Title:** \_\_\_\_\_ **Pg. #** \_\_\_\_\_

**Author(s):** \_\_\_\_\_

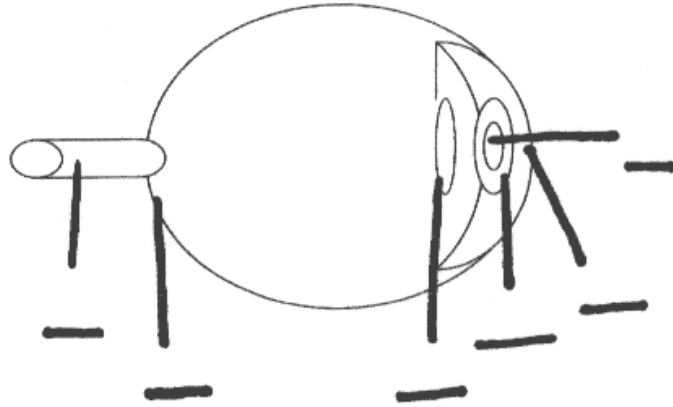
## Appendix C-Eye Think Eye Can!

Quiz: The Parts of the Inner Eye

Name: \_\_\_\_\_

Label the Parts:

- A. Cornea
- B. Iris
- C. Lens
- D. Pupil
- E. Retina
- F. Optic nerve



Bonus:

The cones located in the retina allow us to see shades of \_\_\_\_\_.

The rods located in the retina allow us to see shades of \_\_\_\_\_.

Appendix D1-Eye Think Eye Can!

**Notes: Jobs of the Eye Parts**

**Name:** \_\_\_\_\_

1. Cornea-
  
2. Aqueous humor
  
3. Pupil-
  
4. Iris-
  - a. Sphincter muscle-
  - b. Dilator muscle-
  
5. Lens-
  
6. Ciliary muscles-
  
7. Vitreous humor-
  
8. Retina-
  - a. Rod cells-
  - b. Cone cells-
  
9. Optic nerve-

We studied for a matching quiz

Parent's signature \_\_\_\_\_

Appendix D2-Eye Think Eye Can!

**Quiz: Jobs of the Eye Parts**

**Name:** \_\_\_\_\_

1. Cornea-\_\_\_\_\_
2. Aqueous humor-\_\_\_\_\_
3. Pupil-\_\_\_\_\_
4. Iris-\_\_\_\_\_
  - a. Sphincter muscle-\_\_\_\_\_
  - b. Dilator muscles-\_\_\_\_\_
5. Lens-\_\_\_\_\_
6. Ciliary muscles-\_\_\_\_\_
7. Vitreous humor-\_\_\_\_\_
8. Retina-\_\_\_\_\_
  - a. Rod cells-\_\_\_\_\_
  - b. Cone cells-\_\_\_\_\_
9. Optic nerve-\_\_\_\_\_

- A. Opens the iris to allow light to pass through the pupil
- B. Detects shades of black and white on the retina
- C. Sends the picture image to the cerebrum
- D. Jelly-like substance that fills the eye
- E. Muscles that helps the lens focus
- F. Detects shades of colors on the retina
- G. Protects the iris and pupil
- H. Closes the iris to keep less light from passing through the pupil
- I. The back lining of the eye that is light sensitive
- J. Watery liquid between the pupil and cornea
- K. Opening in the eye that allows light to pass through
- L. Focuses and bends the light
- M. Colored part of eye that contains muscles that control the amount of light that goes into the eye

Answers: Cover when making copies for students

- |      |       |       |
|------|-------|-------|
| 1. G | 2. J  | 3. K  |
| 4. M | 4a. H | 4b.A  |
| 5. L | 6. E  | 7. D  |
| 8. I | 8a. B | 8b. F |
| 9. C |       |       |

**Appendix E1-Eye Think Eye Can!**

## The Scientific Method

Step 1.) State the problem or question.

---

Step 2.) Gather background information.

---

---

Step 3.) Form a hypothesis. (Make an educated guess)

---

---

---

Step 4.) Design and perform an experiment. (Explain what you are going to do).

---

---

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Partners Name	Lights On (picture)	Lights Off (picture)

Step 5.) Report your results. (What is the answer to your problem or question)?

---

---

**Appendix E2-Eye Think Eye Can!**  
**The Scientific Method**

Step 1.) State the problem or question.

If we turn out the lights will our pupils appear larger or smaller?

Step 2.) Gather background information.

We will observe the size of the pupil while the lights are still on.

Also, we will learn why the pupil opens and closes.

It opens and closes to allow different amount of light in.

If the light is out will the pupil need more or less light to pass through it?

Step 3.) Form a hypothesis. (Make an educated guess)

I believe if we turn out the light our pupils will get larger

because we are trying to get more light in our eyes.

Step 4.) Design and perform an experiment. (Explain what you are going to do).

We are going to turn off the lights and see if our partner's

Pupils grow larger or smaller.

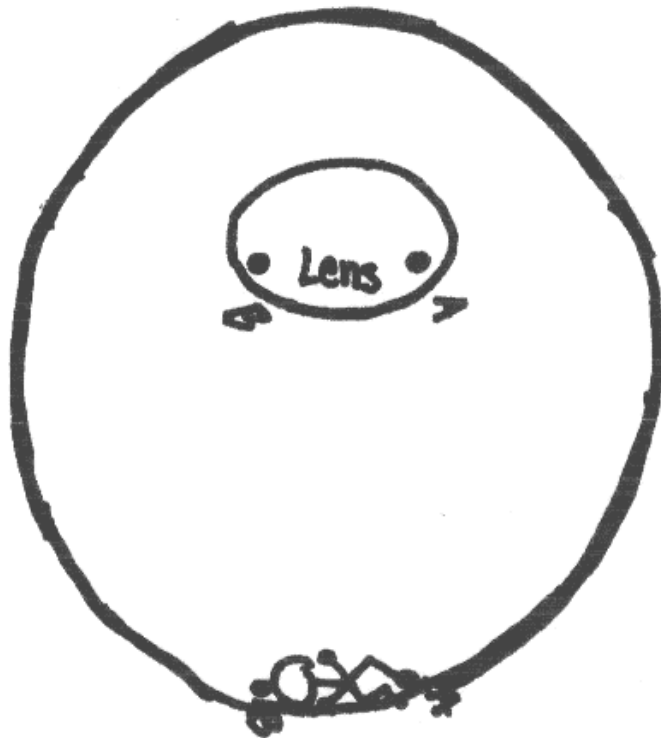
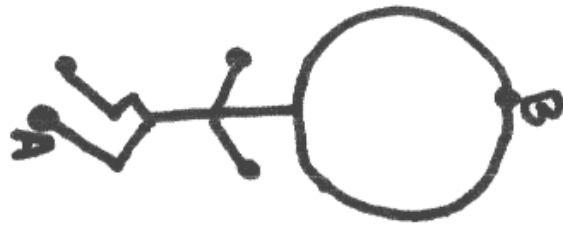
Partners Name	Lights On (picture)	Lights Off (picture)

Step 5.) Report your results. (What is the answer to your problem or question)?


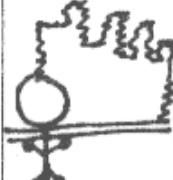


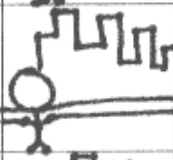



I noticed that the pupil got larger after the lights were turned

Off. My hypothesis was correct.

Appendix F-Eye Think Eye Can!



## Appendix G1-Eye Think Eye Can!



	1	2	3	4	5
A	Eye Shape	Name	What the Person Sees	Where is the object projected in relation to the retina	Corrective lens needed
B		Nearsighted		Object is projected in front of the retina.	
C		20/20		Object is projected on the retina.	None
D		Farsighted		Object is projected behind the retina.	

We have studied for a fill in the blank quiz.

Parent's signature \_\_\_\_\_

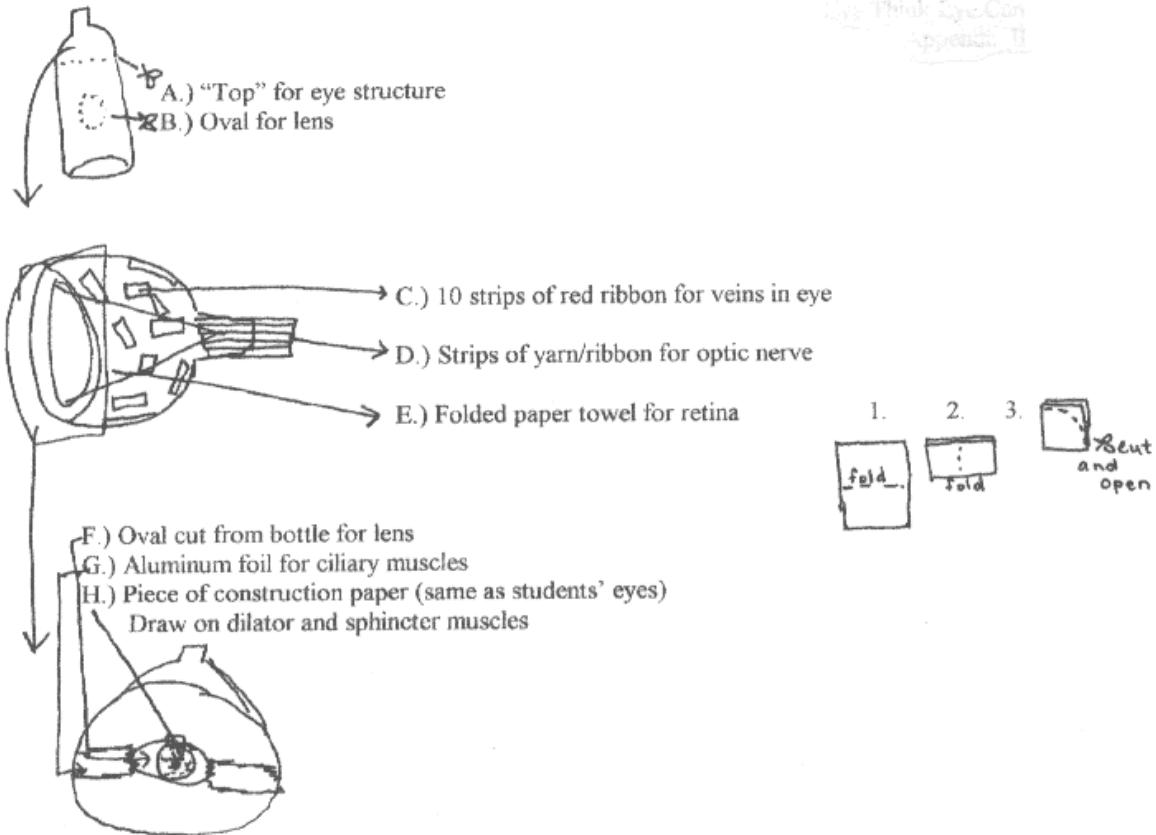
## Appendix G2-Eye Think Eye Can!

Grade 2

Eye Shape	Name	What the Person Sees	Where is the object projected in relation to the retina	Corrective lens needed
	Nearsighted			
	20/20		Object is projected on the retina.	None
	Farsighted			

## Appendix H-Eye Think Eye Can!

Eye Think Eye Can  
Appendix H



- A.) Cut top off a 2-liter bottle
- B.) Cut oval out of 2-liter bottle
- C.) Cut 10 2" strips of yarn/ribbon, and attach to inside of top.
- D.) Cut 5 5" strips of yarn/ribbon, and attach to inside and spout of the top.
- E.) Fold and cut paper towel, and place in the top.
- F. &G.) Attach aluminum foil to oval and to outside edges of top.
- H.) Attach construction paper to the oval, and draw muscles.