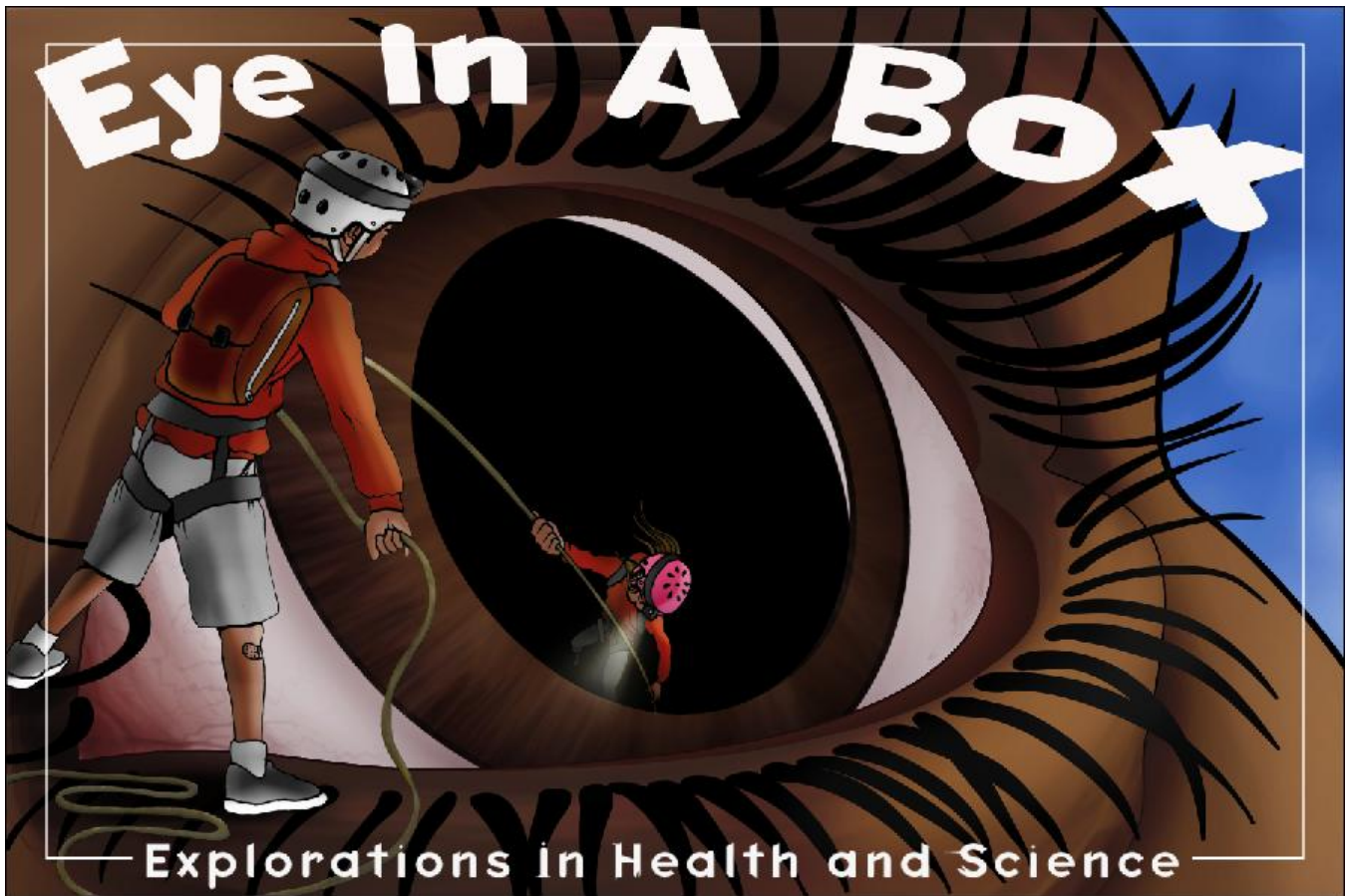


Teacher Handbook



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Welcome to the AHEC “In-A-Box” curricula, created by scientists and educators at Oregon Health & Science University to support Oregon teachers and students! Currently, there are Ear In-A-Box, Guts In-A-Box, Expedition Northwest In-A-Box, Bones and Muscles In-A-Box, and Brain In-A-Box as well. Watch for upcoming topics.

We look forward to your feedback as we launch In-A-Box so that it can be improved from year to year.

Funding for In-A-Box curricula was made possible by the Howard Hughes Medical Institute grant, and greatly depends on your feedback and student surveys for future funding.

Oregon Area Health Education Centers (AHEC) Program office

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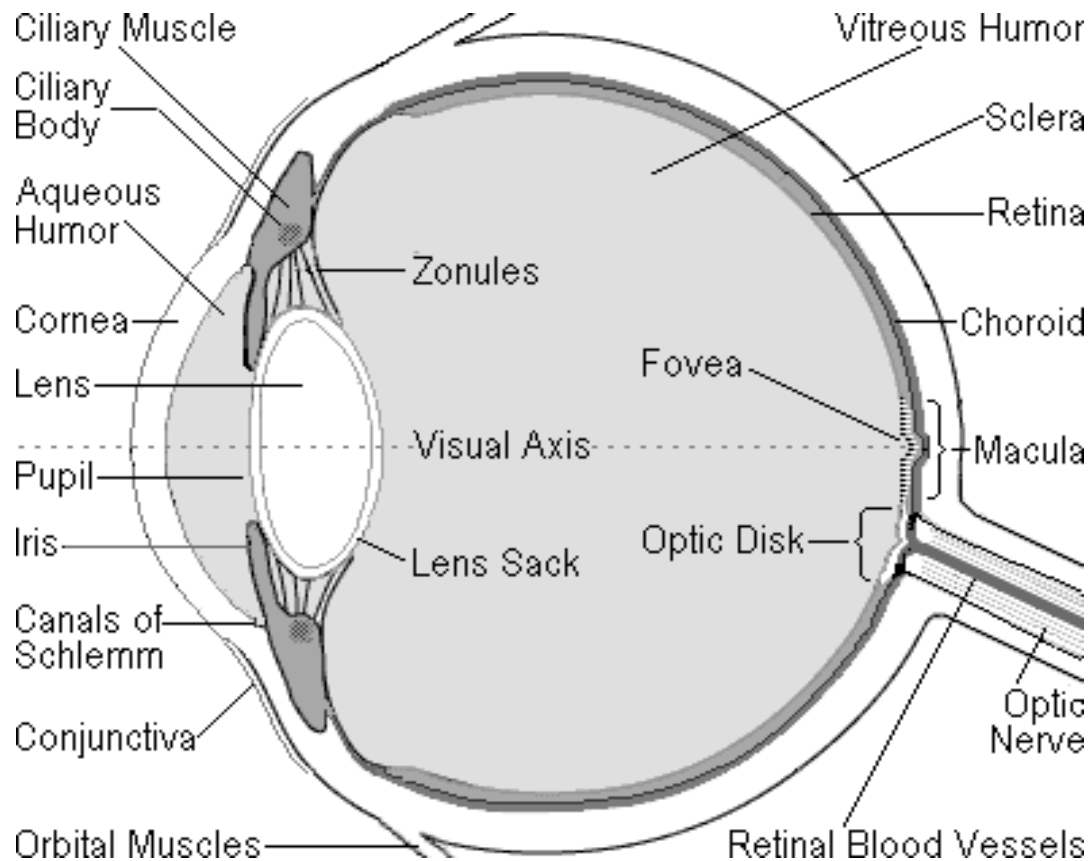
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How to Use the Box...

Background for vision: Before we investigate the many different problems individuals can have with sight, here is how natural sight works-

The eye is like a camera. Light comes in through the cornea, a clear cover that is like the glass of a camera's aperture. The amount of light coming in is controlled by the pupil, an opening that opens and closes a little like a camera shutter. The light focuses on the retina, a series of light-sensitive cells lining the back of the eye. The retina acts like camera film, reacting to the incoming light and sending a record of it via the optic nerve to the brain.



Lesson Structure:

Time as listed below= 1 ½ hours. Alternative schedule structures can include: showing the film days prior to the station activities and guest speaker or having the guest speaker and film prior to station activities.

Activity	Time	Materials
OHSU <i>Eye In-A-Box</i> film of students interviews with eye professionals	30 minutes	DVD player
Guest health professional speaker – if arranged	15 minutes	
Student pre-survey	5 minutes	Surveys in box
Five station activities- 10-15 min. each	50 - 75	Five clear envelopes





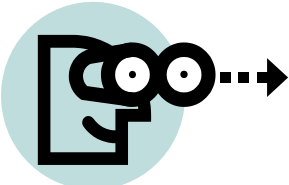
	minutes	
Student and teacher post surveys	5 minutes	Surveys in box
Lesson extensions		
Vision Curriculum 3 lesson plans (the brain connection, the imperfect eye, and eye safety) each with activities	Various times for each activity	folder includes reproducibles
Museum of Vision activities about perception, visual scale, and the eye's anatomy	Various times for each activity	
Wild About Health Vision activities		9 reproducible activities
Animal Eyes- background on how the Eye works, how human and animal eyes differ, night vision, and color vision		
Persistence of vision clock or fan- see description in Box Contents	5 minutes	
Bill Nye <i>Eyeball</i> video Curriculum is included	25 minutes	DVD player
Country Doctors video	60 minutes	DVD player
Research projects about vision or eye health/disease		Web resources for students

Set Up:

A DVD player is needed.

1. Set up the stations around the room. You may want to group the students ahead of time so the students are evenly divided for the 5 stations.
2. Give the student pre survey.
3. Show the film OHSU DVD of Portland middle school students interviewing OHSU eye professionals.
4. If you have arranged for an ambassador (guest speaker), he/she arrives with knowledge of the lesson structure and their role. The ambassadors tell their story of pursuing health science; who their team is; and how they use science & technology to help people. Students can ask questions about the professional's career or journey to the field.
5. Each group is assigned a station to start the rotation. Give each student a sheet for station notes. They will use this at each station. The activities are self explanatory using the material provided. There are wipes included for wiping the ophthalmoscope and goggles.
6. A post survey is completed by each student.
7. Use the check off sheet to ensure all box components are returned to the box.
8. The Box contents, surveys and a teacher feedback sheet are returned to the AHEC education coordinator by mail or special arrangement.

Station Content and Objectives

Stations 1-5	Activity	Resources	Lesson Objective
<p>Eye-identification</p> 	<p>Students view each other's eyes for identification labeling</p>	<p>Eye model Ophthalmoscope Eye template sheet for recording</p>	<p>To identify visible and hidden parts of the eye using professional equipment.</p>
<p>Vision Testing</p> 	<p>Vision testing and experiencing the "blind spot" in normal vision</p>	<p>Test poster Occluders Amsler cards</p>	<p>To learn about the optic nerve connection to the brain and variation in individual vision.</p>
<p>You're are the Professional</p> 	<p>Assume the role of a health professional and make decisions for the patient</p>	<p>Patient scenario, Student role, and Professional treatment cards</p>	<p>To learn the many roles involved in health science, to make team decisions, and to problem solve.</p>
<p>Braille Language</p> 	<p>To unscramble the jumble words using the Braille alphabet</p>	<p>Braille cards and jumble cards</p>	<p>To learn the language of the blind culture.</p>
<p>Eye Diseases</p> 	<p>Simulation of eye diseases in routine settings</p>	<p>Simulation glasses</p>	<p>Empathy, eye health, and eye function.</p>

Station 1 – Eye-identification

In pairs, the students observe each other's eye using the ophthalmoscope and recording what they see on the template of eye anatomy (taken from Activity 2 of Lesson 1 in the Vision Curriculum for duplication). While disassembling the eye model, students record their observations on their station notes page.

Teacher Notes:

The ophthalmoscope has a light - advise students to handle it carefully and read the directions included. 1. Put the eye model with this station; 2. You may need copies of the blank eye template for all students in rotation. 3. The ophthalmoscope has two possible attachments. These fit by pushing down and turning slightly. The light is on the handle. There are batteries inside. 4. Students will pair up and take turns using the ophthalmoscope and recording the parts of the eye they see on the template. The model can be used by group members waiting their turn for the scope. 5. Be sure the scope's light is turned off and the scope is wiped clean with the enclosed wipe at clean up.

Station 2 – Vision Testing

Place the chart 10 feet away from the student being tested. Pair students so that one student stands next to the chart and points for the student who is testing.

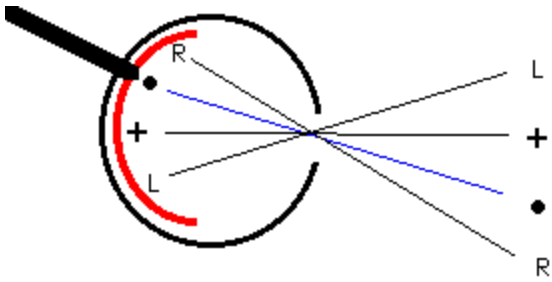
1. If the student wears glasses, then the test is performed using them.
2. Students can use the “occluder” or a hand to cover one eye.
3. The “patient” should then call out the numbers s/he can see on the chart using the other eye, starting first with the big numbers and proceeding to the smaller ones. The student has to identify every number correctly on the line being read.
4. The last line that is read completely tells the level of visual acuity for that eye. For example, if the student can read the 9th line down completely, that eye is 10/10 (see the numbers on the far left side of the chart). This equals 20/20 vision, but because the student is 10 feet away from the chart, not 20, we refer to it as 10/10.
5. Change the occluder to the other eye and proceed again from the 3rd step.
6. What if the student can read the 9th line completely and three numbers on the 10th line? His/her vision would be called 10/10 +3.

Teacher Notes:

The “blind spot”

Most people (even many who work on the brain) assume that what you see is pretty much what your eye sees and reports to your brain. In fact, your brain adds very substantially to the report it gets from your eye, so that a lot of what you see is actually “made up” by the brain.

Some special features of the anatomy of the eyeball make it possible to demonstrate this to yourself. The front of the eye acts like a camera lens, differently directing light rays from each point in space so as to create on the back of the eye a picture of the world. The picture falls on a sheet of photoreceptors (red in the diagram) - specialized brain cells (neurons) which are excited by light.



The sheet of photoreceptors is much like a sheet of film at the back of a camera, but it has a hole in it. At one location, called the optic nerve head, processes of neurons collect together and pass as a bundle through the photoreceptor sheet to form the optic nerve (the thick black line extending up and to the left in the diagram), which carries information from the eye to the rest of the brain. At this location, there are no photoreceptors, and hence the brain gets no information from the eye about this particular part of the picture of the world. Because of this, you should have a "blind spot" (actually two, one for each eye), a place pretty much in the middle of what you can see where you can't see.

Station 3 – You are the Professional!

Students read about the hypothetical patient on the card. At the bottom right are roles of professionals who likely would work with this patient. On the back is the team who would likely work together to help this patient. Divide the group by the number of roles and have them read what that professional does with any new patient. On the station notes sheet, have the role groups write their recommendations for this patient once they agree on a plan.

Teacher Notes:

Keep the Treatment plan cards separate until students are done with their recommendations. The treatment plans are what professionals at OHSU said they would do with those patient scenarios. This can be shared after students share their recommendations. For younger students, have the whole group choose one role to agree on a recommendation plan. One student can be the scribe, one can share with the class, and one can read the professional treatment plan at the end.

Station 4 – Braille Language

Students can learn with their senses how the Braille language works for the visually impaired. Have students choose a jumble card and then decode the word. They can switch cards or create their own by spelling their name in Braille. Be sure to have them try remembering letters by closing their eyes after they are familiar with letters.

Station 5 – Eye Diseases

This station allows three students at a time to experience the eye diseases of macular degeneration, glaucoma, and cataracts. Have students record how they might feel in the scenario situations given each disease on their station note sheets.

Teacher Notes: There are three pairs of goggles and one card with the vision impairment simulations. Have students discuss whether any of their grandparents or other family

members suffer from these vision impairments and what limitations that may put on their daily lives.

Options for different grade levels

- Research projects can take shape from the biological questions about the eye or the career aspects of station 3. Use web links (under Resource section)
- Show the Bill Nye DVD “Eyeball” and engage students with activities in the Bill Nye curriculum.
- Use the OHSU DVD as a springboard for interviewing projects related to career choices.

Oregon Content Standards

Standards for station activities and Museum of Vision are located on the master In-A-Box check sheet.

Assessment Options

Student station notes can be collected to assess student learning. The following questions can also be presented either pre and post activities or at the conclusion of activities.

1. Name two parts of your eye
2. After testing your vision, what numbers represent your vision?
3. Name two health care providers who work with eye problems
4. What language do blind people learn in order to read?
5. Name one eye disease

Restocking and Ordering

The Eye box needs to be returned to the AHEC Education Coordinator for restocking, but we encourage you to share this resource with fellow teachers. Pass along your AHEC Education Coordinator’s phone number or e-mail for ordering. In-A-Box from AHEC also offers Brain In-A-Box, Guts In-A-Box, Bones and Muscles In-A-Box, Expedition Northwest In-A-Box, and Ear In-A-Box for grades 4-8.

Loan periods- You may keep your box for up to three weeks if you would like to explore use of the video *Country Doctors*, utilize the extension lessons, follow the web links (under Resources) for student activities, etc.

Box Contents

- Please use your Contents Check Sheet as you repack the box for return. Some items are replenishable, and AHEC will do this. Please be sure all other materials are checked off and in the box.
- Five station envelopes:
 - Station 1: (Eye model) - laminated picture of the eye, ophthalmoscope.
 - Station 2: Vision test, 4 occluders, and 4 Amsler cards
 - Station 3: Patient scenario cards, student role cards, professional treatment cards
 - Station 4: 6 Braille cards, 1 Braille code & history card, 6 jumble cards
 - Station 5: (3 Simulation goggles), 1 simulation card, 3 scenario cards
- Student pre and post surveys - these help us to evaluate the effectiveness of In-A-Box curriculum and are to be placed in the box at completion or mailed directly to our Portland office.
- Teacher feedback form- Please fill this out at the conclusion of your use with In-A-Box. Our future funding depends on your feedback.

Artifacts:

Eye In-A-Box- The poster is yours to keep for the classroom.

Bill Nye *Eyeball* DVD and curriculum

OHSU interview film – local middle school students interview OHSU eye health professionals an orthoptist, an eye surgeon, and an optometrist among others.

Blueprint for Health Eye chart

Eye Facts poster

“Eye Didn’t Know That” laminated chart

Country Doctors video- This one hour long PBS video was made in rural Oregon about the need for local health care providers.

“Persistence of Vision” clock- or fan- The fan is battery operated and has messages which will display. If your Box has the clock, situate the clock on a stable, level surface.

The persistence of vision activity should not be used until after students have done the station activities. Students will understand the purpose of this exercise after learning about how vision works first.

- It will demonstrate the persistence of what our eyes tell our brain more effectively in a darkened area; computers, window light, and overhead lights will diminish the effect.
- Plug in the clock to a wall outlet and be sure the connection is secure on the bottom of the clock.
- With either the fan or clock, ask students what they read, and how this can be possible when the wand is moving back and forth, not steadily.
- **Persistence of vision** is the phenomenon of the eye by which even nanoseconds of exposure to an image result in milliseconds of reaction (sight) from the retina to the optic nerves. This is because persistence of vision depends on chemical transmission of nerve responses, and this biochemical hysteresis (memory) is much slower than the light transmission.

Three simulation goggles- macular degeneration, glaucoma, and cataracts

Life size eyeballs in a box

Ophthalmoscope

Eye model

Books:

- **Eyes and Ears**
- **She Touched the World** (ages 9-12)
- **Sight**

Wild about Healthy Vision- activities and reproducibles created by the National Eye Institute for learning about eye disease, eye safety, and first aid for eye injuries.

Animal Eyes- Interesting background created by the Foundation of the American Academy of Ophthalmology to share with students about how human and animal eyes differ; seeing in the dark; color vision, how the eye works, multiple eyes, and eye positions.

Museum of Vision: Seeing in 3D- Step by step activities to teach students about the human visual system and visual perspectives using art techniques. Time and material requirements are detailed.

Vision Curriculum- Three lessons created by the National Eye Institute: The Eyes and the Great Brain Connection! The Imperfect Eye and Eye Safety. Reproducibles for the anatomy of the eye, optical illusions, the visual system, eye safety, and eye opening facts are included.

Resources

<http://isee.nei.nih.gov/> National Institute of Health/National Eye Institute

See all you can see- web site for younger students to investigate parts of the eye, optical illusions, eye safety and more.

<http://www.nei.nih.gov/education/> National Institute of Health/National Eye Institute
Many more resources including the Visions curriculum for download.

<http://www.eyecareamerica.org/eyecare/conditions/> American Academy of Ophthalmologists - Eye disease simulators- students can try out the vision problems online.

<http://www.freevisiontest.com/tests.php>
Color, vision, eye knowledge tests, and optical illusions for students to try.

<http://www.sightandhearing.org/sightcenter/>
Vision tests, eye diseases, sports, and a visual 3D eye.

<http://www.allaboutvision.com/conditions/>
Information about eye diseases and problems.

<http://www.lowvisionclub.com/articles/seewhatisee.html>
Vision simulators for eye diseases

<http://www.eyedidntknowthat.info/?pageLoc=/teachers-lounge&index=1>
Free teaching materials about vision

<http://www.aoa.org/x5340.xml> American Optometric Assn.
Teacher resources on vision and reading problems

<http://www.afb.org/braillebug/Games.asp> American Federation for the Blind
Games and activities designed for students to learn about Braille.

Family Involvement Ideas

- Invite families to view *Country Doctors* video to learn about rural health care needs.
- Ask students to invite any relatives to class who have vision loss so that they can tell their story to the class.
- Ask students to invite any relatives to class who work with eye safety risks routinely to share how they protect their eyes. (construction workers, welders, anyone who works with chemicals)

Glossary

Amblyopia - (commonly referred to as **lazy eye**) is the failure of one eye, although apparently healthy, to develop normal vision. It is a treatable vision disorder if discovered and treated early, usually by age 4.

Blind spot - a small area on the retina that is insensitive to light due to the interruption, where the optic nerve joins the retina, of the normal pattern of light-sensitive rods and cones.

Cataracts - the leading cause of blindness worldwide, and the leading cause of vision loss in the United States. By age 80, more than half of all Americans have cataracts. Clouding of the natural lens of the eye, usually caused by aging in conjunction with other risk factors, such as exposure to the sun's UV rays, smoking, steroid intake and diabetes. Symptoms include blurred vision, glare, halos around lights, colors that are less bright, a cloudy spot in your vision and, sometimes, temporary vision improvement.

Cone - a photosensitive receptor in the retina that helps you to see color.

Cornea - the clear part of the eye covering the iris and pupil; it lets light into the eye, permitting sight.

Cranial nerve - one of the 12 pairs of nerves that go from the brain to other parts of the head. Those that affect the eyes and vision are the second cranial nerve (optic nerve), third (oculomotor), fourth (troclear), sixth (abducens) and seventh (facial). The optic nerve carries stimuli from the rods and cones to the brain. The third, fourth and sixth cranial nerves work with the eye muscles to control eye movement. The seventh cranial nerve works with the facial muscles to control facial movement (specifically the closure of the eyelids).

Farsightedness - also called hyperopia. To farsighted people, near objects are blurry, but far objects are in focus.

Glaucoma - it is a group of diseases associated with increased pressure in the eye. The pressure damages the optic nerve, which communicates vision from the eye to the brain.

Iris - a pigmented membrane that lies between the cornea and the lens; it acts as a diaphragm to widen or narrow the opening called the pupil, thereby controlling the amount of light that enters the eye.

LASIK - (Laser-Assisted in Situ Keratomileusis) surgical procedure in which a tiny flap is cut in the top of the cornea, underlying corneal tissue is removed with an excimer laser, and the flap is put back in place.

Lens - the nearly spherical body in the eye, located behind the cornea that focuses light rays onto the retina.

Low vision - also called partial sight. Sight that cannot be satisfactorily corrected with glasses, contacts, or surgery.

Macular degeneration - it is a common eye disease that results in the loss of a person's sharp, central vision - vision required for reading, driving and sewing. Often called age-related macular degeneration (AMD) because of its association with aging, AMD is the leading cause of vision loss and blindness in Americans over age 50.

Nearsightedness - also called myopia. Condition in which visual images come to a focus in front of the retina, resulting in defective vision of distant objects.

Ophthalmologist - a medical doctor (MD) who specializes in the eye. Ophthalmologists perform eye exams, treat disease, prescribe medication, and perform surgery. They may also write prescriptions for eyeglasses and contact lenses.

Optic nerve - part of the eye that carries stimuli from the rods and cones to the brain.

Optometrist - doctors of optometry (ODs) examine eyes for both vision and health problems, prescribe glasses, and fit contact lenses. They can prescribe many ophthalmic medications and may participate in your pre- and post-operative care if you have eye surgery. ODs must complete four years of post-graduate optometry school for their doctorate.

Orthoptics - orthoptics is an ophthalmic field pertaining to the evaluation and treatment of patients with disorders of the visual system with an emphasis on binocular vision and eye movements. Orthoptists commonly work in pediatric ophthalmology settings. Orthoptists serve patients of all ages, but because of the nature of many binocular disorders, the majority of patients are children.

Pupil - the round, dark center of the eye, which opens and closes to regulate the amount of light the retina receives.

Retina - the sensory membrane that lines the eye; it is composed of several layers and functions as the immediate instrument of vision by receiving images formed by the lens and converting them into signals which reach the brain by way of the optic nerve.

Rod - a photosensitive receptor in the retina that helps you to see images in low intensity light. In low light, you can't identify colors because cones require bright light to function.

Strabismus - is a term used to describe eyes that are not straight and parallel. One eye may look straight ahead, while the other turns inward, outward, upward or downward. Strabismus is a serious eye condition that requires early medical treatment if it is to be successfully corrected.

20/20 vision - many eye care practitioners consider this the average visual acuity for human beings, but humans can see as well as 20/15 or even 20/10. People with 20/40 vision can see clearly at 20 feet what people with 20/20 vision can see clearly at 40 feet. In most of the United States, 20/40 is the lowest uncorrected acuity required for a driver's license.