

Activity 2.4.2: Visual Perception

Introduction

Except for your brain, the eyes are the most complex organ you possess. Your eyes are composed of over two million working parts and their coordinated action can instantaneously set in motion hundreds of muscles and organs in the body. Your eyes allow you to track a fly ball into a baseball glove. They can help you pick out the perfect color to paint your room. Your eyes can help you find your best friend at a crowded concert. These amazing organs process light in a way that allows us to perceive color, to judge depth, to sense movement, and to enjoy optical illusions. All these components of a visual scene merge so we have one combined sensory experience.

In Activity 2.4.1, you explored the anatomy of the eye and began to think about the function of each structure you dissected. The cornea and lens of the eye bend or refract light rays as they enter the eye so that focused images fall on the retina. If the eyeball is an abnormal shape, the light will not focus on the correct point in the eyeball and vision may become blurry. Corrective lens can be used to compensate for this change in shape and bring the world back into focus.

In this activity, you will visit eleven different stations that will allow you to explore the physiology of human vision. You will perform a series of tests to explore and assess many characteristics of human visual perception, including visual acuity, depth perception, color vision, peripheral vision and illusions. You will also use a replica of the human eye to explore how the eye focuses light and how corrective lenses can help fix problems with this focus. At each station, think about how the property you are working with is related to the specific structure of the eye.

Equipment

* Computer with Internet access
* *Carolina* Visual Perception Kit
* Snellen Eye Examination Chart
* Astigmatism Test Chart
* Holmgren-type Color Vision Test
* Depth Perception Tester
* Peripheral Vision Test Cards
* Deck of Illusion Cards
* Red and Green Transparent Vinyl

*PASCO* Human Eye Model (2)

* Various lens
* Retina screen
* Water
* Lamp, candle or flashlight
* Metric ruler
* Colored pencils or markers
* Black marker
* Laminated instruction cards
* Laboratory journal
* Discovery Channel *Human Body: Pushing the Limits* DVD or Internet clip
* Activity 2.4.2 Student Response Sheet

Procedure

1. Visit the Discovery Channel – Human Body: Pushing the Limits website at <http://dsc.discovery.com/tv/human-body/explorer/explorer.html>.
2. Click the bottom tab that says “Sight.”
3. Choose video number “3” on the right side of the screen and watch the clip about the remarkable performance of the human eye. Pay attention to the many ways the eye allows us to respond to the world. Your teacher may show this clip to the entire class on DVD.
4. Answer conclusion question 1.
5. Read the article Refractive Errors and Refraction: How the Eye Sees at <http://www.allaboutvision.com/eye-exam/refraction.htm>. Watch the animations on the right hand side that show how light interacts with the eye. Think about the way in which structures in the eye help translate light into images. You may wish to view this site again as you complete station Activity 1 and station Activity 11.
6. Answer conclusion questions 2-3.
7. Obtain a copy of Activity 2.4.2: Student Response Sheet from your teacher.
8. In groups of two or three, visit each of the eleven eye activity stations. NOTE: Station #7 is optional and may not be required by your teacher.
9. Follow your teacher’s instructions to rotate through the stations. All stations (except for Activity 11) should take approximately ten minutes to complete. You may be given time at the end of the activity to revisit particular stations. There are two stations set up for Activity 11. You only need to visit one of the two stations.
10. At each station, follow the directions on the laminated instruction sheet. Read the background information before you proceed to the activity. All materials and instruction cards will stay at the station. You, your partner(s) and your paper move, not the station materials.
11. Take data on the Student Response Sheet. Answer the analysis questions that go with each station. Some of the questions may require you to do a bit of Internet research or may require information from another station. These questions should be completed once you have travelled to each station and have gathered all of your data or when you are waiting for Activity 11.
12. Finish all questions on the Student Response Sheet and answer the remaining conclusion questions.

Conclusion

1. Explain how rods and cones in the eye help the police officer in pursuit of a suspect. What other properties of sight help this officer complete his task?
2. What is refraction? What does it mean when we say that light is refracted as it enters the eye?
3. Which parts of the eye are most important when it comes to focusing light so we can see a perfect image?
4. Lenses are described as convergent or divergent depending on how they refract light. What is the difference between these two types of lenses? Based on what you have learned, do you think the cornea and the eye lens act together as a convergent or divergent lens? Explain.
5. Think about the optical illusions you observed in Activity 10. Explain the relationship between “seeing” with the eye and “perceiving” with the brain.
6. Do you think it is possible for a person to be blind, but have no problems with the structure and function of his/her eyes? Explain your answer.
7. How do our other senses -- taste, smell, touch and hearing -- influence communication within the body? Provide an example for each sense.