The Physics of Vision

A Carolina Essentials™ Activity

Student Worksheet

Overview

Understanding vision requires a knowledge of physics, anatomy, and physiology. This activity emphasizes the physics of vision. The location of eyes on an animal's head influences the angles at which light is collected by the eye. Side-facing eyes allow for a wide, panoramic collection of light rays while front-facing eyes have a narrow range of light collection. In the simple activities below you'll investigate **parallax** and **depth perception**, which are phenomena of front-facing eyes. Ray diagrams illustrate the interaction of light rays (physics) with the anatomy of the eye.

SAFETY REQUIREMENTS

MATERIALS

1 drawn, printed, or cut paper strip taped to the wall at eye level

1 unsharpened pencil

1 plastic or glass test tube

Essential Question

How can physics be used to explain vision?

Investigation Objectives

1. Explain the term parallax using appropriate physics concepts.
2. Explain the term depth perception using appropriate physics concepts.

Safety Procedures and Precautions

Use unsharpened pencils only. If using glass test tubes, make sure there are no chips or cracks on the rim of the tubes.

Activity Procedures

Activity 1: Parallax

1. Look at the bar on the wall. Stand 2 to 3 feet in front of the image.
2. Close your right eye and extend your right hand with your thumb up.
3. Position your thumb so that it covers the center part of the bar.
4. Without moving your thumb, open your right eye and close your left eye.
5. Record your observations.

6. Repeat the process but begin with your left eye closed.
7. Still using your right thumb, place it in the center of the bar.
8. Open your left eye and close the right eye.
9. Record your observations.

Activity 2: Depth Perception

1. Work in pairs. One person needs a pencil and the other needs a test tube.
2. Stand opposite each other at arm's length.
3. The person with the pencil needs to close one eye and place the pencil in the test tube without touching the sides of the tube.
4. Switch positions.
5. Make observations.

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Data and Observations

Activity 1: Parallax

Sketch or write a description to explain what happened with your right eye closed and opened.

Sketch or write a description to explain what happened with your left eye closed and opened.

Activity 2: Depth Perception

How many attempts did it take you to get the pencil in the test tube?

Describe the difficulties getting the pencil in the test tube.

Analysis and Discussion

1. Explain how Activity 1 illustrates the concept of parallax.

2. Explain why it was difficult to place the pencil in the test tube.

3. Complete a ray diagram or sketch for both activities and submit separately.

4. Humans and other predators have binocular stereoscopic vision because their eyes are on the fronts of their heads. Rabbits and many other prey animals have panoramic fields of view because their eyes are on the sides of their heads. What advantages does each type of vision provide?