SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

Eyeball Optics **Grade 10 Academic – Light and Geometric Optics**

Lesson Plan

Assessment	Discuss, peer assess, quiz
Cross-curricular	Biology

Big Ideas

- Light has characteristics and properties that can be manipulated with mirrors and lenses for a range of uses.

Learning Goals

- Learn the major parts of the eyeball
- Learn how some of these parts behave like optical devices and components

Specific Expectations

B2.6 investigate, through a laboratory or computer simulated dissection of a plant, worm, fish, or frog, the interrelationships between organ systems of a plant or an animal
B3.4 explain the primary functions of a variety of systems in animals
E1.1 analyse a technological device or procedure related to human perception of light
E2.1 use appropriate terminology related to light and optics
E3.5 describe the characteristics and positions of images formed by converging lenses

Description

In this lesson students will dissect a cow/sheep eye. They should have some experience drawing ray diagrams with converging lenses.

Materials

For each group:
1 Cow/Sheep Eye
1 Dissection Kit
Gloves
Eyeball Optics (Write-up, Consolidation, Instructions)
Visuals (PowerPoint PDF)

NOTE: fresh eyes will have clear and flexible lenses. Very old eyes may have lenses that are opaque and hard. If old eyes are the only option, glass or plastic lenses can be used as a substitute for the 'Write-up'.

Safety Notes

Instead of using a scalpel to cut around the eye, use dissecting scissors. This reduces the likelihood of an injury.

Introduction

PREVIOUS TO CLASS

- Inform students ahead of time that you will be performing a dissection.
- Invite students who would like an alternative to physically dissecting to inform you.

BLIND SPOT TEST:

- Teacher "Would you believe me if I told you that you have a blind spot in the middle of your vision where I could place something and you wouldn't be able to see it?"
- Show students slide 2 from the 'Visuals' and have them set up their paper.
- Instruct students to cover their left eye, and look directly at the "X" with their right eye.
    - They should move the paper backwards/forwards/side-to-side until the circle disappears!
    - (Note: Emphasize that they must KEEP looking at the "X" the whole time and not let their eye wander).
- Repeat by covering the right eye and looking at the circle.
- Repeat with coloured paper. Note how the brain fills the circle in with the colour of the paper.
- Repeat with graph or lined paper. Note how the brain fills in the grid or lines!
- Show this video for a quick explanation of the blind spot with visuals of the eye: https://www.youtube.com/watch?v=zjTCbL2wbRk

MAKE A MICROSCOPE

- Give out pencils, sandwich bags (or clear tape), and water to each group.
- Students set up a 'Microscope' as seen on slide 3, placing a paper underneath.
- Have students explore their mini-microscope.
- Go to slide 4. Use this to introduce the lens in human eyes.

Action

DISSECTION:

- Have students sit in their dissection groups.
- Provide copies of eye dissection instructions Eyeball Optics 'Instructions' (these instructions are from Exploratorium) or watch the explanation video as a class found here: https://www.youtube.com/watch?v=0rbCrJoTatE

***SAFETY WARNING!: Instead of using a scalpel to cut around the eye, use dissecting scissors. This reduces the likelihood of an injury.**

- Groups will dissect their eye as seen in the guide.
- Groups will rotate to another group's lab station and, without touching the components, quiz each other by trying to name each significant part (peer assessment).
- Give students Eyeball Optics 'Write-up'. Students investigate and complete in groups.

Dissection Alternatives:

- Many excellent alternatives to dissection exist. Students wishing an alternative should be encouraged to complete the activities below, both recommended by the National Anti-Vivisection Society:
  - http://www.biologycorner.com/worksheets/cow_eye_dissection_virtual.html
  - http://maintenance.hmco.com/gg.dcy.eschoolonline.com/

Consolidation/Extension

- Give students Eyeball Optics 'Consolidation'. Students are to use their dissection guide, textbook, online research, and personal knowledge to match the camera and eyeball parts and describe the common function.

- For further interest on how human see colour, play the Science North video on Optics.