02 Unit Sensory perception and Movement

Content Area: **Science**
Course(s): **Neuroscience**
Time Period: **Semester 1**
Length: **4 weeks**
Status: **Published**

Standards

SCI.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.
SCI.HS.LS1.A	Structure and Function

Enduring Understandings

- Stimuli such as energy and molecules are transformed into electrical signals and are processed by the brain.
- The human eye is a highly specialized organ for perceiving light.
- Ear convert sound energy into electrical energy that is processed by the brain.
- Perceptions of taste and smell result from molecules being converted into brain activity.
- Movement requires coordination between the central and peripheral nervous systems to stimulate muscle contractions.

Essential Questions

- How does the brain interpret stimuli?
- How does the brain process visual information?
- How can visual impairments be treated?

Knowledge and Skills

Knowledge:

- Light passes through the cornea and enters the eye through the pupil. The iris regulates how much light enters by changing the size of the pupil. The lens then bends the light so that it focuses on the inner surface of your eyeball, on a sheet of cells called the retina.

- The retina is home to three types of neurons — photo- receptors, interneurons, and ganglion cells — which are organized into several layers.

- The primary visual cortex, a thin sheet of neural tissue, is located in the occipital lobe at the back of the

brain and consists of many layers of densely packed cells. The middle layer, which receives messages from the thalamus, has receptive fields similar to those in the retina and can preserve the retina's visual map. Cells above and below the middle layer have more complex receptive fields, and they register stimuli shaped like bars or edges or with particular orientations.

- Loss of function or death of photoreceptors appears to lie at the heart of various disorders that cause blindness.
- Sound in the form of air pressure waves reaches the pinnae of your ears, where the waves are funneled into each ear canal to reach the eardrum (tympanic membrane).
- The eardrum vibrates in response to these changes in air pressure, sending these vibrations to three tiny, sound-amplifying bones in the middle ear: the malleus (hammer), incus (anvil), and stapes (stirrup). The last bone in the chain (the stapes) acts like a tiny piston, pushing on the oval window, a membrane that separates the air-filled middle ear from the fluid-filled, snail-shell-shaped cochlea of the inner ear. The oval window converts the mechanical vibrations of the stapes into pressure waves in the fluid of the cochlea, where they are transduced into electrical signals by specialized receptor cells (hair cells).
- The senses of taste (gustation) and smell (olfaction) are closely linked and help us navigate the chemical world.
- Gustatory cells located on taste buds of the tongue contain receptors for five taste qualities: sweet, savory, salty, bitter and umami.
- Receptors in the naval cavities send messages through the olfactory bulbs directly to the cerebral cortex.
- The central nervous system consists of the brain and spinal cord. The peripheral nervous system consists of nerves and small concentrations of gray matter called ganglia. The brain sends messages to the peripheral nerves, which control the muscles and internal organs.
- Voluntary muscles are controlled by the motor cortex, while involuntary muscles are controlled by other regions of the brain such as the hypothalamus.

Skills:

- Describe the anatomy and physiology of the visual system.
- Conduct experiments on factors affecting hearing loss.

Transfer Goals

- Understand the basic functions of sensory systems and their importance.
- Relate anatomical structures of sensory organs to their functions.
- Develop models to show how damage to sensory systems leads to loss of function.

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit?usp=sharing

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit?usp=sharing