Unit 2 Neurological Disorders

Content Area: **Science**
Course(s):
Time Period: **Semester 1**
Length: **5 weeks**
Status: **Published**

Enduring Understandings

- The structure of a synapse allows it to complete its function within the process of neuronal communication and how the process- leads to different pain phenomena
- The nervous system/neural circuit includes many neurons and synapses working together that play a role in language, pain perception, the sleep-wake cycle and behaviors.
- The brain is an extraordinarily complex organ where various regions and networks interact to regulate behavior, cognition, and physiological processes. Understanding neurological disorders requires recognizing how disruptions in these intricate systems can lead to diverse symptoms and functional impairments.

Essential Questions

- What do our brains do?
- What are the building blocks of our brains?
- How do our neurons communicate with each other?
- How do our neurons work together to control behaviors?
- How do our choices change our brains?

Knowledge and Skills

Knowledge:

- Main structures and functions of the brain
- Techniques used to examine the brain
- Understand how different parts of the brain work together to create and control behavior, specifically the creation and comprehension of language.
- Understand the difference between sensation and perception
- Studying cases of brain injury and disease to determine the function of a structure that is affected.
- Name the functions of Broca's and Wernicke's areas
- Structure and types of neurons
- Axons transmit electrical signals
- Neuron Transport
- Disorders affecting specific parts of a neuron
- Describe how Novocain works
- Action Potential
- Steps of synaptic transmission

- The difference between grey and white matter
- Multiple Sclerosis
- Explain why neurons need to signal quickly
- Describe how neurons increase the speed of the action potential traveling down the axon
- Describe why myelination increases the speed of the action potential traveling down the axon
- Neuronal transport
- Postsynaptic cells
- Pain modulation and pathways
- Flow of ions at an inhibitory synapse
- Sleep stages
- Phantom limb pain
- Narcolepsy, seizure disorders, EEG
- Parts of the brain involved in addiction
- Reward pathway in the brain

Skills:

- Explain that we can study the brain by studying cases of injury or disease, as well as studying how the brain behaves in everyday life.
- Diagnose patients with Broca's aphasia, Wernicke's aphasia, and Conduction aphasia.
- Identify the locations of the main structures of the brain during a sheep brain dissection
- Describe the techniques (PET, fMRI, EEG) used to examine the brain and the benefits and drawbacks of each
- Draw and label the primary structures of a neuron and describe the function of each
- Compare and contrast sketches of different types of neurons
- Describe examples of how neuronal structures are specialized for different functions.
- Describe how Na ions flow into the axon to create the action potential
- Describe why myelination increases the speed of the axon potential traveling down the axon.
- Describe how disorders affecting specific parts of a neuron disrupt neuron function
- Describe the difference between sensation and perception
- Identify the areas of the brain critical for resolving conflicts between different incoming sensations and the creation of illusions
- Design possible solutions to increase the speed of axonal conduction
- Debate whether myelination in the teenage brain underlies why teenagers' poor judgment
- Describe how inhibitory synapses change the membrane potential of the postsynaptic cell
- Calculate the energy used to move a synaptic vesicle from a cell body in the base of the spinal cord to the big toe.
- Keep a sleep journal to analyze sleep cycles
- Research the sleep-wake circuit
- Describe how caffeine works and debate whether caffeine is an appropriate treatment for narcolepsy
- Describe how our bodies are able to modulate our perception of pain
- Model the pain pathway
- Compare and contrast different types of seizures
- Diagnose seizure type based on EEG data and patient symptoms

- Provide examples of how expectations and mood modulate the pain pathway
- Investigate and explore the feedback mechanisms that regulate neural circuits and control sleep wake behaviors
- Describe how scientists study addiction
- Explain how all drugs of abuse increase synaptic signaling in the reward pathway citing evidence and data
- Debate a view on the use of animals in scientific research
- Distinguish between drug abuse and addiction
- Describe the role of dopamine
- Apply understanding to the following case studies:
    - The man with no memory
    - What causes Alzheimer's Disease
    - How do placebos work?
    - What causes narcolepsy?
    - What role do cues play in addiction?

Transfer Goals

- Recognize and describe the symptoms of various neurological disorders and understand the diagnostic processes used to identify them.
- Integrate current research and emerging technologies into their understanding of neurological disorders and consider their potential impact on future treatments and patient care.
- Evaluate and compare different treatment options, including medications, therapies, and lifestyle changes, and understand their effects on managing neurological disorders.

Assessments

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

Modifications

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