03 Unit Memory and Learning

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

Standards

HS-LS1	From Molecules to Organisms: Structures and Processes
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
	Structure and Function
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
	Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

Enduring Understandings

- Sensitive periods are particular stages of development when we are most predisposed to learn certain functions from environmental input.
- There are many different types of memory, each dependent on a unique (though sometimes overlapping) set of brain structures.
- The hippocampus is a key brain region involved in the encoding of long-term memories that are eventually stored in the cortex.

Essential Questions

- How does the brain make memory?
- What factors affect learning and brain plasticity?
- How do we understand learning disorders?

Knowledge and Skills

Knowledge:

- Sensitive/critical periods are thought to be related to phases of increased brain plasticity, when neural connections are flexible and easily strengthened or pruned away.
- The human visual system develops quickly over the first few years of life, and disruption to vision during this time may be later irreversible.
- Sensitive periods for language relate both to the first language we learn as well as our ability to learn a

second language.
- Language is a complex cognitive ability, involving several areas of the brain: Broca's area, which is vital for speech production, and Wernicke's area, which is responsible for understanding others' speech. They and other areas work in tandem for many types of communication.
- The hippocampus is a key brain region involved in the encoding of long-term memories that are eventually stored in the cortex.
- There are many study techniques that make use of what we know about memory to help us better retain information.
- There are 5 stages of sleep, divided into REM and Non-REM sleep, which can be measured using EEG and other techniques.
- Circadian rhythms influence when we feel tired, and these rhythms change over the course of the lifespan—especially during adolescence.
- Sleep is important for learning, both because it helps us stay focused and attentive during the day and because memories are actually strengthened as we sleep.
- The ability of synapses to remodel themselves is called synaptic plasticity. Encoding a new long-term memory involves persistent changes in the number and shape of synapses, as well as the amount of neurotransmitter released and the number of receptors on the postsynaptic membrane.

Skills:

- Collect data on procedural learning.
- Interpret graphs on learning and recall to improve learning strategies.
- Read and analyze data of primary research article on memory and spatial location.

Transfer Goals

- Different regions of the brain are responsible for learning.
- During critical periods, the brain undergoes more rapid changes.
- Plasticity is a key feature of learning and brain development.

Assessments

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

Modifications

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