Unit 11: Human Anatomy & Physiology

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The Nervous System
A Memorable Experience

OVERVIEW:

Most students understand that the nervous system plays a key role to their everyday existence. Many understand that it controls most of the body's functions, memory making, and learning. Where and how it occurs is a new concept and it is arguable that few understand what life would be like if memory acquisition and recall were impaired. After working a lab that researches memory and learning, it is important to connect the students and their everyday lives to this essential process.

The approach is to make the brain and its signals tangible to the students. Memory is a difficult process to picture. In the Tonegawa lab, I was able to actually see the process occurring through electrical impulses and imaging, and while I cannot provide my students with the identical experience, I can provide them with materials they can relate to.

Memory and learning are active processes that occur in the classroom. Many students struggle with memory acquisition and after using their own memories to explore this process, the goal is to have them apply memory-building techniques to their school lives and improve this skill. They will also observe what happens when the processes of the brain fail, in order to understand how hard our brain works to store incoming information and it is placed.

MA STANDARDS AND COMPETENCIES:

MA Biology Content Standards- Learners will:
4.4: Explain how the nervous system (brain, spinal cord, sensory neurons, motor neurons) mediates communication among different parts of the body
4.4: Explain how the nervous system mediates the body's interactions with the environment.
4.4: Identify the basic unit of the nervous system, the neuron, and explain generally how it works
4.7: Recognize the nerves communicate with electrochemical signals

MA Biology Competencies- Learners will:
S1: Make observations, raise questions, and formulate hypotheses
S1: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories

ESSENTIAL QUESTIONS TO GUIDE THE EXPLORATION:

1. Where do memories come from and how are they generated?
2. Are memories unalterable?
3. Why is memory creation and recollection important to everyday living and how are people with memory problems/loss impaired?
4. Are there ways to improve memory?
5. How does learning about memory help in and out of school?

OBJECTIVES:

Students will:

- Recall their own memories
- Discuss the different types of memories and how/where each is formed in the brain
- Investigate a website using it to explore the structures of the human brain to understand how memory works
- Observe scientific programming that illustrates examples of memory loss and the processes that cause it
- Discuss some neuro-degenerative diseases and what science is doing to help people afflicted

MATERIALS:

- Overhead projector
- Memory Graphic Organizer Transparency
- Students broken up into pairs
- Enough computers for students to work in pairs
- Exploratorium worksheet
- TV or projector connected to computer
- Scientific Frontiers worksheet
- Program quiz
- Neuro-disease worksheet

INSTRUCTION & ACTIVITY:

Session 1

1. Opening: "*Brainstorm*"- Show a list of 5 familiar words to the students at the beginning of class for 15 seconds, tell them to memorize as many words as they can, without writing them down!!
   -Have the class complete the tasks below:
   - Describe your very first memory
   - How old is this first memory?
2. Ask for students to volunteer their memories, sharing your own as well.
3. Place the graphic organizer on the overhead and begin discussion on memory (http://www.readwritethink.org/lesson_images/lesson1055/organizer.pdf)
   Questions to lead discussion:
   - Where did this information come from?
   - Why do some memories stick with us, others slowly fade, and some never seem to form?
4. Explain that we're going to explore how memories are and formed, how they stay/go, and where it happens
5. Handout "Memory and the Brain" worksheet break students into pairs to go to the computers. They need to visit the site: http://www.exploratorium.edu/memory/index.html
6. Lead a class discussion on memory, the different types, and the parts of the brain involved using the competed pages of the worksheet. Go through each question, inviting students to read their answers.
7. Write the definitions for the three types of memory and label where they occur in the brain
8. Handout homework assignment

Session 2

1. Play PBS video on memory and handout worksheet to class. http://www.pbs.org/saf/1402/index.html
2. Have students keep track of the problems that occur in each of the patients, how each affects memory, and where that problem occurs
3. Hand out post-video quiz (http://www.pbs.org/saf/1402/teaching/teach5.pdf)
4. Create a list on the board of what the students wrote down.
    a. After the video, what may be some ways to prevent/treat some of these issues?
    b. How does this affect the patients' day-to-day living?
    c. Why is memory important?
5. Assign homework

Assessment:

Session 1

Performance and participation on the "Memory and the Brain Worksheet"

Session 2

1. Video Quiz
2. Participation in closing activity and list

Homework:

Session 1

Visit the website http://brain.web-us.com/memory/mnemonic_techniques.htm. Use this site to develop a memory device to remember ONE of the following Biology concepts listed below. Your homework paper should include:

- The name and method of the device you chose
- The biological concept you chose
- A description of how you applied the device to the concept

Biology Concepts to Use:

3. The 6 characteristics of life
4. The four organic macromolecules needed for life
5. The steps to mitosis
6. The steps involved in the central dogma AND each steps' product
7. The chambers of the heart in order of blood flow
8. The levels of organization in ecology
9. The organelles of an animal cell

Session 2

Pick one of the memory impairments listed on the board find a current article either researching or discussing a specific case to discuss in class tomorrow

Memory & the Brain Worksheet

Student Name: _____ Date: _____

Go to the website Exploratorium: The Memory Exhibition (http://www.exploratorium.edu/memory/index.html).

-Under Features, click on Sheep Brain Dissection: The Anatomy of Memory

-Answer the questions below as you read through all the slides.

10. What is the cortex of the brain?

11. Explain something you learned about the cortex.

12. What is **working memory?**

13. What is **long-term memory**?

14. What part of the brain processes **skill memory**?

15. On the back of this sheet, draw a picture of a brain showing where the three different types of memory are located and what they are called.