Recency and Primacy Effects

adapted from *Neuroscience for Kids* website and the *Brain Link Activity* books developed by the Baylor College of Medicine

Lesson Summary: The order in which information is learned determines how reliably it will be recalled. Students learn about short- and long-term memory by conducting a memory experiment involving a list of 20 words. The first item in a list is initially distinguished from previous activities as important (primacy effect) and may be transferred to long-term memory by the time of recall. Items at the end of the list are still in short-term memory (recency effect) at the time of recall.

Grade Level 4-12

**Lesson Length
1 class period**

Standards Alignment

Next Generation Science Standards

- 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
- MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
- HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- **Framework for K-12 Science Education**: Science & Engineering Practices 3,4,5,8

National Science Standards – Project 2061: Atlas of Science Literacy reference

a) Graphic representation – graphic displays and related changes (p.115, Atlas Vol. 1)
Research on student learning: "Students of all ages often interpret graphs of situations as literal pictures rather than as symbolic representations of the situations." (p.114, Atlas Vol.1)
b) Scientific inquiry: Scientific theories – making sense of evidence (p.21, Atlas Vol. 1)
Research on student learning: "Although most students believe that scientific knowledge changes, they typically think changes occur mainly in facts and mostly through the invention of improved technology for observation and measurement. They do not understand that changed theories sometimes suggest new observations or reinterpretation of previous observations." (p.20, Atlas Vol. 1)
c) Scientific inquiry: Avoiding bias in science – expectations and explanations (p.23, Atlas Vol. 1)
Research on student learning: "Students tend to look for or accept evidence that is consistent with their prior beliefs and either distort or fail to generate evidence that is inconsistent with these beliefs." (p.22, Atlas Vol. 1)

Objectives—Students will

- engage in a discussion about short-term (STM) and long-term memory (LTM).
- demonstrate these concepts through experimentation.
- develop mathematical and analytical skills through analyzing and interpreting data.
- develop their own experiments.

Assessment Options

- List examples of short-term memory and long-term memory.
- Conduct an experiment with the class using words for the memory test, collecting their data.
- Graph data, calculate percentages (optional), and write up or talk about the results.
- Discuss their results and brainstorm ideas on other items that can be used for memory tests.

Materials

- a blank overhead
- a list of 20 words - Use those in the Explore section below or make up an original list of twenty.
- paper/overhead to graph the results

Engage — Discuss short- and long-term memory.

- short-term memory: an early stage in the processing of information in the brain; information only held for a few minutes. Some of this information will be lost or forgotten, while some will be processed into long-term memory.

- long-term memory: a permanent storage of information/skills; can last for a few hours or a lifetime

Explore

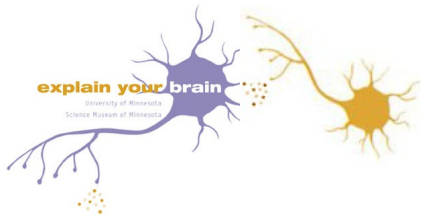Tell your students that you will present a list of words and they are to remember as many of them as possible.

1. Write the words in sequential order on the board or overhead. You can also read them aloud at one word per second. Take the list down after one minute.

2. Now ask your students to write down as many words as they can remember.

3. Collect the data on how many students remembered each word, for example: 10 students for the first word, 8 for the second, etc.

4. Direct the students to create their own graphs to represent this data.

> This sample set of twenty words is from the *Neuroscience For Kids* website:
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> cat, apple, ball, tree, square, head, house, door, box, car, king, hammer, milk, fish, book, tape, arrow, flower, key, shoe

Develop Questions

- Graph the order of words and the number of people who remembered the words. Is there a pattern?

- Ask your students: "Were there some words that were easier to remember than others? If so, why were some of them easier to remember?"

Explore and Explain

This experiment helps explain that there are two kinds of memory happening in order for this task to occur.

- The words read last are still in a person's short-term memory, while the words read first made it into the long-term memory. These are the recency and primacy effects.

- The middle words fall somewhere in between and are not as well remembered. Of course, some words may be easier to remember than others due to associations people already have with them.

Expand

- Discover how distractions affect memory.

  Read another list of words and ask the subjects to count backwards from 50 by fours (50, 46, 42, 38….) for about 20 seconds. After the students count backwards, ask them to write down the words that they can remember from the list. Plot the results on the graph again. Are there any changes?

- Compare the ability to remember items that are heard versus items that are felt.