

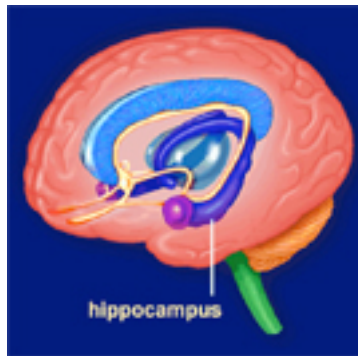
Neuromatrix Lesson

Hippocampus: The Sorting Station for Memories

Introduction:

Students will learn in the Neuromatrix Hippocampus movie (Go into Jeff's Hippocampus) that the hippocampus is part of the limbic region, the most ancient section of the brain. The hippocampus acts as a sorting station for memories. The hippocampus converts short-term memory to more permanent memory and helps us recall spatial relationships in the world around us. The hippocampus is absolutely necessary for making new memories. If we didn't have a hippocampus, we could not live in the present; we would be stuck in the past with old memories.

The hippocampus received its name because its shape resembles that of a seahorse, a fabled sea animal from Greek mythology. The hippocampus resembles a horse with the hind parts of a fish or dolphin. The chariot of Poseidon (Greek god of the sea) was drawn by a hippocampus. The name hippocampus comes from the Greek word *hippokamos*, meaning *hippos*, horse and *kamos*, sea monster. Our modern day seahorse looks like a miniature hippocampus.



The Neuromatrix hippocampus puzzle is a sorting activity that provides practice in sorting the parts of a picture and reassembling those parts. As students put the puzzle together, the narration reminds them that a memory is made up of many little fragments that are stored in different parts of the brain. As the puzzle is almost completed, students hear that the hippocampus acts as a gatekeeper and sorting center for the various pieces that make up a memory. The puzzle acts as a simulation for what the hippocampus actually does in the brain.

Because the hippocampus is one of the most ancient parts of the brain, this lesson is based on sorting and reassembling

pieces of information in the form of an archeological dig. The students assume the part of archeologists. In this type of "dig," students search for information about the hippocampus and its function. They can find the basic information within the hippocampus movie and puzzle. Once they learn the basics, students will search in small groups to find additional information about the hippocampus and how it functions. Ask students to limit their search and findings to the hippocampus only. Encourage students to complete the basic Field Notes questions. Students can search to find out what happens to a person when his/her hippocampus stops functioning properly and what might cause the hippocampus to stop functioning properly. Remind students to focus on information about the hippocampus only.

Students will first watch the Go into Jeff's Hippocampus movie and then complete the memory puzzle. Afterwards students will work in their small groups to find additional information about the hippocampus and how it functions. They can go to the Internet, library, media center or other resources to find out more about the hippocampus. An archeological Field Notes form is provided for students to use as a guide.

Objectives:

Students will:

Investigate the structure and function of the hippocampus as part of the limbic region.
Summarize their findings in the form of archeological field notes.
Demonstrate an understanding of the hippocampus and how it functions in the brain by writing a brief field report.

Standards:

1. National Science Education Life Science Standards Levels 5-8: Structures and functions in living systems
2. NSE Standards: Science as Inquiry: Abilities necessary to do scientific inquiry and understandings about scientific inquiry

California State Language Arts Standards: Grade 6

Writing

1.0 Writing Strategies

Students write clear, coherent, and focused essays. The writing exhibits students' awareness of the audience and purpose. Essays contain formal introductions, supporting evidence, and conclusions. Students progress through the stages of the writing process as needed.

Organization and Focus

1.1 Choose the form of writing (e.g., personal letter, letter to the editor, review, poem, report, narrative) that best suits the intended purpose.

1.2 Create multiple-paragraph expository compositions:

- a. Engage the interest of the reader and state a clear purpose.
- b. Develop the topic with supporting details and precise verbs, nouns, and adjectives to paint a visual image in the mind of the reader.
- c. Conclude with a detailed summary linked to the purpose of the composition.

1.3 Use a variety of effective and coherent organizational patterns, including comparison and contrast; organization by categories; and arrangement by spatial order, order of importance, or climactic order.

Research and Technology

1.4 Use organizational features of electronic text (e.g., bulletin boards, databases, keyword searches, e-mail addresses) to locate information.

1.5 Compose documents with appropriate formatting by using word-processing skills and principles of design (e.g., margins, tabs, spacing, columns, page orientation).

Set:

Ask students to start the lesson with a simple explanation about archeological digs and how archeologists look for sites to find information about the ancient people who lived in a place centuries before. The hippocampus is one of the most ancient parts of the brain, so students will pretend to be archeologists who are digging through information about this ancient part of the brain and its contribution to brain functionality.

Instructional Script:

Archeologists dig up artifacts to find out about ancient civilizations in a region. Scientists research information to find out about different parts of the body. In this

lesson, you are looking for information about the hippocampus section of the brain. You will be watching a movie, playing a puzzle game, and searching for more information about the hippocampus, an ancient part of the brain located in the limbic region that works with memories. The term 'limbic region' comes from the Latin word 'limbus' meaning a border or an edge. The brain parts that make up the limbic region are all located at the inner edge of the cortex in the brain.

You will research how the hippocampus functions and what it does for the whole limbic region. To do that, you will assume the role of an archeologist who is digging for the clues that will give us our answer. We will use our Field Notes Form as a guide since it combines the scientific inquiry method and archeological field notes. Let's get started with the dig!

Activities:

Assign students to small groups of 3-4 archeologists. The groups can work together to complete field notes about their hippocampus "dig" or research findings.

Background and Preparation (Approximately one hour)

1. In small groups, students view the hippocampus movie. Ask groups to review the movie at any time to find specific information about the hippocampus.
2. Students complete the memory puzzle individually. Ask students to complete the attached Memory Puzzle Form as they complete the memory puzzle. Students assume the role of an archeologist and start researching to find out more about the hippocampus and what part it plays in the brain. Gather the groups into a whole class and review how archeologists take field notes. Give the students the attached handout: Field Notes Form. The Field Notes Form provides a note-taking guide. Point out that the process archeologists use is very similar to a scientist taking notes from scientific research and inquiries.

Project (Approximately 2-3 hours)

1. In small groups, students find information about the hippocampus from the Go into Jeff's Hippocampus Movie and the Memory Puzzle. They should focus on the functionality

of the hippocampus and how it works within the limbic region and body.

2. After reviewing the Hippocampus Movie and Memory Puzzle, students work in small groups to find additional information about the Hippocampus on the Internet, library, and other resources in the classroom or media center at school. Allow two or three complete class periods for this activity.

Possible Internet sites:

<http://www.morphonix.com/software/education/science/brain/game/>

[specimens/hippocampus.html](http://www.morphonix.com/software/education/science/brain/specimens/hippocampus.html)

<http://www.psycheducation.org/emotion/hippocampus.htm>

<http://www.memorylossonline.com/glossary/hippocampus.html>

<http://biology.about.com/library/organs/brain/blhippocam.htm>

<http://faculty.washington.edu/chudler/hippo.html>

<http://faculty.washington.edu/chudler/calpyr.html>

<http://faculty.washington.edu/chudler/hipnd.html>

<http://faculty.washington.edu/chudler/jokes.html>

[http://www.wisegeek.com/what-is-the-](http://www.wisegeek.com/what-is-the-hippocampus.htm?referrer=)

[hippocampus.htm?referrer=](http://www.wisegeek.com/what-is-the-hippocampus.htm?referrer=)

[adwords_campaign=hippocampus_ad=029421&_search_kw=hippocampus](http://www.wisegeek.com/what-is-the-hippocampus.htm?referrer=adwords_campaign=hippocampus_ad=029421&_search_kw=hippocampus)

[http://www.brainconnection.com/topics/?main=gal/hippocampus](http://www.wisegeek.com/what-is-the-hippocampus.htm?referrer=adwords_campaign=hippocampus_ad=029421&_search_kw=hippocampus)

3. Students write field notes about their findings. Use the attached Field Notes Form. The group works together to produce one master set of field notes complete with illustrations.

4. The class holds a "research conference" in which each student group presents its findings. Each group presentation should be limited to 15 minutes. As an extension to this activity, students can create presentation tools, such as an electronic slideshow presentation, an animation or a poster session. The research conference can be videotaped and shared online at a "virtual conference" with students around the world.

5. Each student writes a short 2-3 page report about the hippocampus including information about where it is located, how it functions, and what it might be like if it did not function properly. Reports must be illustrated with drawings.

Assessment

Use the final report as the performance assessment.
The following information should be included in the report:

The hippocampus:

Basic:

- Stores memories
- Processes and sorts memories

Advanced:

- Helps find memories
- Affects emotions
- Is part of the limbic region
- Is affected by stress
- Is necessary to make new memories

For further study, students can seek:

- Information about types of cells found in the hippocampus
- Information about the pathways within the hippocampus
- A description of the hippocampus' structure
- A discussion about the physiology of learning and memory

Review:

It is important for students to learn how archeologists disseminate their research findings via conferences, scientific journals, and accredited web sites. Students can post their reports and field notes with illustrations in the classroom and, as resident archeologists, hold poster sessions or a "research conference." If the class has a web site, students may also post their reports and field notes online. If the presentations are videotaped, small video clips of the presentation can be broadcast at a "virtual conference" with students around the world.