ALL IN YOUR HEAD: THE BRAIN

Subject Matter: Science – Life Science
Grade Levels: 11-12
Time Allotment: Two 50-minute class sessions
Master Teacher: Susan Daugherty

Overview

The brain processes thousands of pieces of incoming stimuli from the senses. It organizes the stimuli and sends them to the appropriate brain centers for interpretation and response. This lesson provides an introductory look at the basic structures of the brain and the functions certain parts play in the interpretation of stimuli.

Learning Objectives

Students will be able to:

- Locate and identify major parts of the brain.
- Describe the major functions of those parts.
- Identify the senses that pass information from the environment to the brain for interpretation.

Oregon Standards Available at:

http://www.ode.state.or.us/cifs

Science - Life Science

Understand structure, functions and interactions of living organisms and the environment.

Organisms

Understand the characteristics, structure and functions of organisms.

Organisms
- Describe, explain, and compare the structure and functions of cells in organisms.

Media Components

Video

Check the link at http://www.opb.org/edmedia/trs/ to find access to the video(s) from unitedstreaming™ referenced in this lesson plan.

- "Human Body Systems: The Nervous System" (27:00)
  - **Clip:** "A Closer Look at the Brain" (05:23)

Web

- **The Secret Life of the Brain, 3-D Brain Anatomy**
  A three-dimensional tour of the brain using animation to focus on the major structures and functions that those structures carry out.
  http://www.pbs.org/wnet/brain/3d/index.html

- **Neuroanatomy Tutorial**
  Interactive tutorial that presents several brain images. Move the cursor over the brain structure and it lights up, and then click on the structure and the name of the structure appears.
  http://www.gwc.maricopa.edu/class/bio201/brain/brshpx.htm

- **Visual Illusion Activities from Neuroscience for Kids**
  An interactive gallery of visual illusions.
  http://faculty.washington.edu/chudler/flash/nill.html

- **3-D Browser of the Head**
  Provides three different cross-sections of a human brain. If the mouse is dragged on the image it will scroll through different levels of the brain, front to back and side to side. This applet requires a Java 1.1 browser to function and does take time to load.
  http://www.cs.uoregon.edu/~tomc/jquest/SushiPlugin.html

Materials

Per Student:

- The Brain Up Close Worksheet (located at end of lesson plan)

Per Class and/or Group:

- Sheep brain for every two students. (Alternative would be to find an interactive sheep brain dissection Web site.)
- Instructions for sheep dissection
- Dissection tools and tray for each group of two students

Prep for Teachers

When using media, provide students with a **Focus for Media Interaction**, a specific task to complete and/or information to identify during or after viewing of video, Web sites or other multimedia elements.

Prior to teaching this lesson, bookmark the Web sites used in the lesson on each computer or provide a list of the URL addresses that students can type into the address bar. Make sure that each Web site is still available for use before bookmarking. Be sure each Web site displays appropriately by using appropriate plug-ins and media players.

Download the video clips onto the computer that will be used for the classroom presentation. Be sure each video clip displays appropriately by using the most up to date plug-ins and media players. Make sure the screensaver is turned off or is on a long delay.

If a computer lab is available, reserve the lab in advance of presenting this lesson. If a lab is not available, the lesson can be presented on the computer that is used for the classroom presentation, and students can participate as a class.

Order sheep brains for dissection.

Introductory Activity

Step 1: Students will participate in an introductory brain activity from the Web site, Neuroscience for Kids, at http://faculty.washington.edu/chudler/flash/nill.html. Tell students they will be learning more about our brains. The visual illusions on this Web site require us to use different aspects of our nervous systems to interpret the illusions. As a **Focus for Media Interaction**, ask students to create a list of nervous system functions that are utilized to interact and interpret these illusions. If a computer lab is available, have students work by themselves. Allow students approximately 10 to 15 minutes to participate in the illusion activities. If a computer lab is not available, use the classroom system and have the students participate as a class.

Step 2: At the end of the visual illusion activity, have students compare and share the aspects of the nervous systems they think they used when they participated in these activities. The list should include visual senses as well as brain function (memory, reasoning and interpretation).

Step 3: Explain to students that they are going to use the information they just discussed to identify the parts of the brain that were involved in the visual illusion activity.

Learning Activities

Step 1: Have students create a chart with "Part of the Brain" on the left side and "Reason for Involvement" on the right side. (See Brain Structure Identification Activity Sheet at the end of this lesson plan.)

Step 2: Provide students with a **Focus for Media Interaction** by telling them they are going to access a Web site that identifies structures of the brain and their functions. Tell students they are to complete the chart with the information they learn from the Web site.

Step 3: Have students access the Web site, The Secret Life of the Brain, 3-D Brain Anatomy, at http://www.pbs.org/wnet/brain/3d/index.html. Ask students to record information on the chart that they just created.

Step 4: Create a classroom list by having students share their information.

Step 5: Tell students they are going to watch a video clip about the brain. Preview the worksheet, The Brain Up Close, so students know what information they should be looking for. (This worksheet is available at the end of the lesson plan.)

Step 6: Provide students with a **Focus for Media Interaction** by asking them to record information on The Brain Up Close worksheet as they watch the video. **Play** the video clip, "A Closer Look at the Brain" (05:23), from the video, "Human Body Systems: The Nervous System" (27:00).

Step 7: At the end of the video clip, review The Brain Up Close worksheet as a check for understanding.

Culminating Activity

Activity 1:

Step 1: Have students access the 3-D Browser of the head at http://www.cs.uoregon.edu/~tomc/jquest/SushiPlugin.html. Allow students to explore three-dimensional images of the head. Provide students with a **Focus for Media Interaction** by asking them to record features of the brain. Examples should include the coloration of the brain structures, shape, crinkled surface, two hemispheres, medulla and brain stem.

Step 2: Have students share the information that they recorded from their explorations of the brain.

Activity 2:

Step 1: Have students dissect a sheep brain and identify the major structures of the brain.

Cross-Curricular Extensions

Health

- Have students select a brain disorder to research and prepare a classroom presentation about the disorder.

Social Studies

- Have students research and compare the past and present practices of caring for individuals with brain disorders.

Community Connections

- Invite a nurse or doctor into the classroom to answer questions about the brain and addiction or using outward physical visible evidence to determine the part of the brain that has been affected by a stroke or injury.

- Tour a rehabilitation facility to discover the types of activities that take place to rebuild brain function that was caused from a stroke or injury.

Brain Structure Identification Activity

Part of the Brain	Reason for Involvement
Parietal Lobe	Interprets information from the senses, including vision.
Temporal Lobe	Responsible for some kinds of memory. Memory is needed to help interpret the visual clues.
Frontal Lobe	Reasoning abilities are stored in this part of the brain. The ability to reason is needed to draw conclusions about the illusions.
Occipital Lobe	Responsible for processing and interpreting information that is collected visually.
Corpus Callosum	Connects the right and left brains to allow integration of information between the brains.
Limbic System - Thalamus	Thalamus is the relay system to the cerebral cortex for most of the senses. Parts of the limbic system are essential for forming memories.

The Brain Up Close

1. What are the five senses?

2. What are the responsibilities of the senses?

3. What protects the brain?

4. What sense provides the greatest amount of stimuli for the brain?

5. Cerebrum

    -Two Halves:

        Right Half:

        Left Half:

6. Cerebral Cortex

    Frontal Lobe

    Parietal Lobe

    Temporal Lobe

    Occipital Lobe

7. Cerebellum

8. Medulla

9. Midbrain

10. Pons

11. Thalamus

12. Hypothalamus

13. Limbic

The Brain Up Close Answer Key

1. What are the five senses?
   touch, taste, smell, hearing, sight

2. What are the responsibilities of the senses?
   Relay signals to the brain for interpretation
3. What protects the brain?
   Skull
4. What sense provides the greatest amount of stimuli for the brain?
   Sight
5. Cerebrum
   Largest part of the brain
   -Two Halves:

      Right Half:
         controls the left side of the body, artistic, creative, music
      Left Half:
         controls the right side of the body, math, logic, writing
6. Cerebral Cortex
   Four lobes
   Frontal Lobe
      thinking
   Parietal Lobe
      recognizing objects
   Temporal Lobe
      hearing, speaking, remembering
   Occipital Lobe
      what is seen by the eyes is turned into pictures
7. Cerebellum
   balance, coordination
8. Medulla
   involuntary actions, heartbeat, blood pressure
9. Midbrain
   muscles that move and coordinate the eyes
10. Pons
   waking and sleeping
11. Thalamus
   messages from the senses pass through here to other parts of the brain, pain receptors
12. Hypothalamus
   control body temperature, food intake, drink
13. Limbic
   experience emotion and memory