

Unit: Traumatic Brain Injuries
Lesson 3: Building a Brain

Grade: 4

Lesson Time: 1 hour

Lesson Objectives:

Students will...

- Be able to identify major parts of the brain.
- Meet a healthcare worker who assesses patients with traumatic brain injuries.
- Understand that the parts of the brain control everything from breathing to complex thought.
- Use diagrams to explore neuroanatomy.
- Create brain models with the four major lobes.
- Know that any injury to a specific part of the brain results in a specific loss of function.

Overview:

The presenter shares pictures and models of the central nervous system, and the students brainstorm the functions of the parts. Then the presenter explains a diagram of the brain as the students color a similar one. Next the students use modeling clay to create models of the brain. These models show the four lobes of the brain, the cerebellum, and the brainstem. Finally, the students take a test to see if they are right-brained or left-brained.

Key Terms:

- Back lobe: The part of the brain that controls many aspects of vision (a.k.a., occipital lobe).
- Brainstem: The part of the brain that controls basic life functions, such as heartbeat, breathing, and blood pressure.
- Central nervous system: The part of the nervous system consisting of the brain and spinal cord. It controls and coordinates most functions of the body and mind.
- Cerebrum: The largest part of the brain, it includes four lobes that specialize in different functions. The outside of the cerebrum has folds and ridges that increase the total surface area.
- Cerebellum: The part of the brain responsible for coordination of movement, posture, and balance.
- Front lobe: The part of the brain that controls reasoning, planning, speech, movement (motor cortex), emotions, and problem solving (a.k.a., frontal lobe).
- Neuron: A specialized cell that can receive signals and transmit them to other neurons.
- Peripheral nervous system: The part of the nervous system that includes sensory and motor nerves that branch from the central nervous system to the rest of the body.

- Receptors: Nerve cells that detect conditions in the body's environment.
- Side lobe: The part of the brain that deals with hearing and memory (a.k.a., temporal lobe).
- Spinal cord: The thick, whitish cord of nerve tissue that extends from the brain down through the spinal column and from which the spinal nerves branch off to various parts of the body.
- Top lobe: The part of the brain that controls perception of touch, pressure, temperature, and pain (a.k.a., parietal lobe).

Occupations of the Day:

- Neurologist: A neurologist is a medical doctor who is trained in the diagnosis and treatment of nervous system disorders, including diseases of the brain, spinal cord, nerves, and muscles. Neurologists perform neurological examinations of: the nerves of the head and body; muscle strength and movement; balance, walking, and reflexes; and sensation, memory, speech, language, and other cognitive abilities.
- Paramedic: a person trained to assist medical professionals and to give emergency medical treatment.
- Radiologist: A physician specializing in diagnostic techniques for viewing internal organs and tissues without surgery. Radiological methods include X-ray, MRI, computed tomography (CT) scan, ultrasound, angiography, and nuclear isotopes.

Materials:*Per class:*

- 1 overhead of worksheet (front and back)
- 1 worksheet key
- 1 human brain model
- 1 sheep brain
- 1 poster of brain parts and functions
- 1 quiz answer key

Per group of 4:

- 2 MRI images of brain injuries affecting specific regions of the brain
- 1 right brain Jell-O mold
- 1 left brain Jell-O mold
- 2 boxes of crayons
- 2 cups of reusable modeling clay
- 12 colored toothpicks including 2 of each of the following colors: plain, red, blue, yellow, green, and purple

Per Student:

- 1 worksheet
- 1 left-right brain quiz

Procedure:**Question:**

What happens if you injure one part of the brain?

Guest Speaker

1. Pass out the student worksheets.
2. Introduce the guest speaker who treats brain injuries. Describe the speaker's educational history and current occupation. Ask the guest to tell about real cases where patients injured specific regions of the brain and lost corresponding body functions. If possible, ask the guest to share MRI images from the cases.
3. Make sure that the guest mentions at least three of the following brain regions: the front lobe (frontal lobe), back lobe (occipital lobe), side lobe (temporal lobe), the brainstem, top lobe (parietal lobe), cerebellum, and spinal cord. Ask the guest in advance to use the terms "front lobe," "back lobe," "side lobe," and "top lobe." Ask the students to find the parts of the brain mentioned by the guest on their worksheets.
4. Encourage student questions. Explain that scientists know the different parts of the brain and their functions because they have studied people who have damage to different parts of the brain.
5. If MRIs are available, pass one out to each pair of students. Ask the students what they see.

Activity 1: Brain Labeling

1. Show the sheep brain and various brain models, including a completed clay brain. Briefly review the main parts of the nervous system, including the spinal cord, nerves, and brain. Explain that the brain is divided into two halves and both sides have regions that control specific body functions.
2. Display an overhead of the major brain parts. For each part, ask the students to:
 - Perform an action associated with that part.
 - Place their hands on the corresponding part of their heads.
 - Write down the name of the part on the worksheet.
 - Imagine what it would be like to injure that part of the brain.
3. *Brainstem:* Ask the students to find their pulse, placing two fingers on their wrist or just below their jaw line. Explain that basic functions such as breathing, heart rate, and blood pressure are controlled by the brainstem, located at the base of the skull.
4. *Cerebellum:* Ask the students to balance on one foot. The cerebellum, found just above the brainstem, controls coordination and balance.

5. *Back Lobe:* Ask the students to look, roll, or cross their eyes. Explain that vision is controlled by the back lobe at the back of the brain, just above the cerebellum.
6. *Top Lobe:* Ask the students to feel the texture of their clothes, hair, or desktop. Explain that touch, pressure, temperature, and pain are all controlled by the top lobe.
7. *Side Lobe:* List a series of random words and ask the students to remember as many as they can. Explain that the side lobe controls memory and hearing.
8. *Front Lobe:* Give the students a simple math problem. Explain that the front of the brain, or front lobe, controls complex thoughts. The right side of the front lobe controls creativity, intuition, and emotions, and the left side controls language and logic.

Activity 2: Brain Molds

1. When the class is ready, distribute 1 left mold, 1 right mold, and 2 cups of modeling clay to each group of four students. Ask the class to work at the same time, filling in each section of the mold with clay. The sections are marked on the mold with a black permanent marker.
2. Show the students how to remove the brain from the molds. Squeeze each mold gently and pull the sides of the clay away from the edge of the mold. Then shake the mold over a desk until the clay falls out.
3. Guide the students as they insert a color-coded toothpick in the correct sections.
4. Carefully show how to unite the left and right clay brains. Explain that the left side of the brain controls the right side of the body, and the right side of the brain controls the left side of the body. These sides are connected by tissue.
5. Have the students complete a short quiz to see if they are right-brained or left-brained.
6. Review the major points of the lesson as a class.

References:

- Anatomy of Human Nervous System by Dorothy Starnes:
http://idid.essortment.com/anatomynervous_rmej.htm
- Neurology Channel: <http://www.neurologychannel.com>