



THE TEEN BRAIN
Curriculum for High School Teachers

Module 1: Brain Structure & Function
What do different parts of the brain do?

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Acknowledgments

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YOUR BRAIN

THE TEEN BRAIN

OVERVIEW

As an introduction to this set of modules, Module 1 allows students to brainstorm what they already know about the brain, and begin building a foundation of understanding related to structure and function of the brain.

This module invites students to explore the question:

What do different parts of the brain do?

While exploring this idea, students will:

- Understand the main regions and functions of the brain.
- Examine human and animal brains to study the similarities and differences between them.

The [PowerPoint slides](#) that accompany this module are meant to help guide the lesson, transitioning between activities and providing relevant information when necessary. Frequently engage students in discussion by asking questions, eliciting their prior knowledge, experience, and ideas. Examples of probing and reflective questions are embedded throughout the curriculum guide, to scaffold meaningful and relevant experiences for students.

Time Frame: 2 hours

Activities:

- Brainstorming ideas and myths
- Observe human & animal brains
- Functions of different lobes - brain poems
- Journal Reflections

Preparation:

- Make copies of the observation activity sheet and brain lobe poem sheet.
- Download [PowerPoint slides](#) and load on computer/tablet to project on screen.
- Gather easel with markers & large post-it paper.
- Prepare journal books for students – notebooks or large index cards stapled into a book.

Materials Needed:

Introduction

- Computer/Tablet with PowerPoint slides
- Screen

Exploration 1: Brainstorm Prior Knowledge, Myths, & Curiosities

- Large post-it paper
- Easel
- Markers

Exploration 2: Brain Observations – Human & Animal

- Preserved, plastinated, models of brains, such as: mouse, rat, sheep, rabbit, cat, horse, cow, human (can use images instead at <http://neuroscielibrary.org/index.html>)
- Copies of [brain observation activity handout](#)

Exploration 3: Functions of Different Lobes – Brain Poems

- Copies of [lobe function handout](#)

Journal Reflection

- Journal books or paper for each student
- Extra pens/pencils

Introduction (10 mins)

1. Introduce yourself, and explain to students that they will be exploring how the brain works and how it impacts their lives during middle and high school years.
2. Ask students to introduce themselves, and share why they are interested in the brain. If time allows, ask them to share something they are hoping to learn during the course.
3. Provide an overview of the topics they will explore through these modules.

Brainstorm (15-20 mins)

Driving Question: What do I already know about the brain? What do I want to know more about?

1. Ask students to brainstorm: What do we think we know/have heard about the brain? Record ideas on large chart paper.
2. Ask students to brainstorm questions they have about the brain: What are you curious about when it comes to the brain? Again record ideas on large chart paper. Encourage all students to participate during this brainstorm, to include numerous perspectives and ideas across the group.
3. Leave the chart paper up on the wall for the group to reference throughout the module (or multiple modules) if possible.

Brain Observation – Human & Animal (40 mins)

Driving question: How are human and animal brains similar and different?

1. Use PowerPoint slides to communicate the information below about the regions of the brain. Find opportunities throughout to ask questions, and make connections to students' prior knowledge and experiences to maximize engagement and interest.
2. There are three major regions of the brain:
 - a. Reptilian brain/Brainstem & Cerebellum: Oldest part of brain, largely unchanged through evolution, shared with all vertebrates, controls survival functions like breathing, body temperature, escape response, is the central regulation of movement like balance and posture
 - b. Limbic system (Emotional/Mammalian brain): Recognizes danger, fear, aggression, storing memories, pathways connecting emotional brain to reptilian brain
 - c. Neocortex: Responsible for planning, attention, inhibition, is 85% of our brain mass
 - i. Cortical folding takes place in the cortex
 - d. Other observable regions of the brain include:
 - i. Corpus callosum, which connect the two sides/hemispheres of the brain
 - ii. Olfactory bulbs, which help with our sense of smell

3. Prediction: Ask students to make predictions about human and animal brains: What do you predict is most different about human brains and brains of other species?
4. Observation Activity: Look at a few pictures, models, or preserved specimens of brains from different species and humans. Hand out activity sheet – one per student.
 - a. Identify the three major regions of the brain – brainstem & cerebellum, limbic system, and neocortex.
 - b. Ask students to consider: What are the similarities between species? What are the differences?
 - c. After students have had time to explore several examples of preserved and model brains, hold a discussion about the similarities and differences they noticed.
 - i. Similarities: 2 hemispheres, presence of cortex, cerebellum, corpus callosum
 - ii. Differences:
 1. Size of brain across species
 2. Size of cerebellum
 3. How spinal cord is positioned (quadruped (4 legs) vs. biped (2 legs))
 4. Amount of cortex/distribution of cortex
 5. Degree of cortical folding – number and depth of sulci/gyri (ridges/wrinkles in brain matter)
 - a. Ask students to think about why there might be these differences: Why do you think this is different between humans and animals? More brain matter in less space.
 - b. If time, do a brief demonstration of this phenomenon. Take a piece of paper and crumple up into smaller space. Encourage students to notice how more paper can fit into a smaller space if it's crumpled with ridges/wrinkles, just like the human brain evolved to be.
 6. Olfactory bulbs – dog's brain is 1/10th the size of a human brain, but the dog's olfactory bulbs are 4x bigger than human's. Ask students to think about why.

Short Break (if possible – 5-10 mins)

Functions of Different Parts of the Brain (10 mins)

Driving questions: What do different parts of the brain do? What is the relationship between structure and function of these parts?

1. Explain that there are different lobes in the neocortex are responsible for different functions. The image in the PowerPoint shows only one half of the brain, or one hemisphere. Give students the opportunity to predict or share ideas about what each lobe is responsible for before explaining its actual function.
2. There are two of each lobe they see in the diagram – this is only the left side. Also note: The brain is not actually multi-colored as the picture shows. It is shown this way to highlight the different lobes and regions that work together for certain types of functions.
 - a. **FRONTAL:** planning, problem-solving, judgment, motor function
 - b. **PARIETAL:** processing touch & pain, integrating sensory information
 - c. **OCCIPITAL:** vision (relates to the sensation of getting blurred vision when hitting the back of your head)
 - d. **TEMPORAL:** memory, emotions, auditory processing, comprehending language
3. The cerebellum and brainstem: basic functions like breathing, temperature regulation, balance
4. Corpus callosum connects the two hemispheres of the brain – allows for communication across parts of the brain to coordinate processing and behavior.
5. Identify these regions using human brain models.

Brain Poems (15 mins)

Driving question: Which lobe is being described?

1. Invite students to write a poem that describes one of the lobes for their peers to guess.
2. Give example of one describing the cerebellum, without mentioning its name in the poem. Students can work with a partner or alone.
3. Encourage students to share their poems and have the group guess which lobe they are describing.

Journal Reflection (10 mins)

Driving question: What are you thinking about after today's session?

4. Encourage students to think about what they did and learned today. Ask them to consider and write in their journals about:
 - a. What does that make you think?
 - b. Where do you feel confused?
 - c. What are you still curious to learn more about?