

BUILD-A-BRAIN

LESSON PLAN

Title: Build-A-Brain

Setting: In Classroom

Subject: Biology - Neuroscience

Grade Level: K-5

Time Frame: 1 Hour

Paired Dana Foundation Fact Sheets:

- 3rd-5th Grade Human and Animal Brains: How Do They Compare?
- 3rd-5th Grade How Does the Brain Work?

Next Generation Science Standards:

Meets 3-LS1-1, 3-LS4-2, 3-LS4-3, 4-LS-1, & 4-LS1-2

STUDENT OBJECTIVES

- Explore the structure and function of various parts of the human brain.
- Understand differences between the brains of comparative animal models.
- Utilize knowledge to create the brain of an imaginary animal.
- Refine oral communication skills by presenting work to peers.

BACKGROUND

The “Build-A-Brain” exercise integrates a fun sensory and motor activity with a basic neuroanatomy lesson. The instructor first provides a short explanation of brain structures and the functions they sub-serve. Students are then asked to utilize this information to create the brain of an imaginary animal using Play-Doh.

Students are asked to present and describe their imaginary animal's brain and functions to the rest of the class. This exercise facilitates a broad range of learning styles, and the difficulty level can be adapted to suit a variety of grade levels and educational backgrounds.

MATERIALS

- Printed copies of 3rd-5th grade Dana Foundation fact sheets, “Human & Animal Brains” & “How Does the Brain Work?”
Downloadable here:
www.dana.org/factsheets/
- Audio and visual capacities for a PowerPoint presentation.
- 4-6 different colors of Play-Doh (enough for a class divided into groups of 3)

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TEACHER BACKGROUND INFO

WHAT TO KNOW BEFORE YOU TEACH

* Note: This content is primarily for the instructor's reference; the accompanying PowerPoint presentation will be for the students.

The Human Brain

The cerebral cortex is the wrinkly outer layer of the brain that is responsible for higher cognitive thought and for processing sensory information. The wrinkles maximize the surface area of the brain, allowing for more neurons and increased connections between them.

The cortex is divided into distinct areas called “lobes” that sub-serve different functions:

- **The frontal lobe** - planning, reasoning, speech, movement, and problem-solving.
- **The temporal lobe** - important for memory and learning, hearing, and language.
- **The occipital lobe** - visual processing center of the brain.
- **The parietal lobe** - processes sensory information like touch, pressure, temperature, and pain; integrates this with motor information.

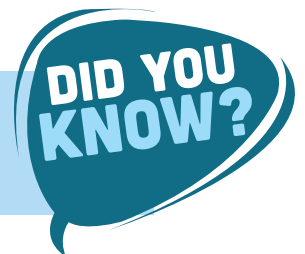
Other very important regions of the brain include the cerebellum and brain stem.

- **Cerebellum** - structure at the base of the brain that regulates balance and coordination. This area receives information from the eyes and muscles to detect where the body is relative to space (proprioception).
- **Brain stem** - also known as “the reptilian brain,” it is the most primitive part of our brain. Regulates basic functions such as breathing, heart rate, and blood pressure.

Comparative Animal Brains

One method to understanding the relationship between brain anatomy and function is to compare the neuroanatomy of different species. By assessing the differences and similarities in brain structure and their adaptive functions across animals, it's easier to understand the relative significance of each area within an organism.

The trophy for the largest animal brain goes to the sperm whale, weighing in at 17 lbs!



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PROCEDURE

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[1] Each student reads 3rd-5th grade Dana Foundation fact sheets "Human & Animal Brains: How Do They Compare?" & "How Does the Brain Work?" (5-10 minutes).



[2] Briefly introduce the exercise and give the accompanying PowerPoint presentation about brain structure and function (10 minutes).



[3] Have class split up into groups of three and distribute at least 4-5 different colors of Play-Doh to each group (5 minutes).



[4] Instructions for students in groups:

- a. Use your knowledge about brain structure and function to design an imaginary animal brain together (15 minutes).
- b. Your animal brain can have super power senses; just make sure the brain regions that regulate those senses are enhanced in your design.
- c. Present your imaginary animal brain to the rest of class as a group and address these questions (20 minutes):
 - i. What is your animal?
 - ii. What does your animal do?
 - iii. How is its brain adapted to perform these various tasks?

ADDITIONAL RESOURCES

- Animation comparing the brains of humans and other species: <https://www.youtube.com/watch/vsspcnRRBcl>
- A National Science Foundation and National Institutes of Health-funded platform for comparative animal brain specimens with high-quality downloadable educational content: <http://brainmuseum.org/>
- A collection of neuroscience puzzles and fact sheets for kids in grades K-12 that are available for download (PDF): <https://www.dana.org/share-science/resources-for-educators/>

* The "Build-A-Brain" activity was originally developed by Melissa Demetrikopoulos, Ph.D., Institute for Biomedical Philosophy, and was adapted by Elizabeth Weaver, M.S. and Linda Qi Beach, Ph.D. for the Dana Foundation.