

Bay Area Scientists in Schools Presentation Plan

Lesson Name: Feel Dead Brains

Presenters: Berkeley Cognitive Science Student Association

Grade Level: 5th Grade

Standards Connection(s): Multicellular organisms have specialized structures.

Next Generation Science Standards:

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</p> <p><input type="checkbox"/> Develop a model to describe phenomena. (4-PS4-2)</p> <p><input type="checkbox"/> Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2)</p> <p>Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <p><input type="checkbox"/> Construct an argument with evidence, data, and/or a model. (4-LS1-1)</p>	<p>LS1.A: Structure and Function</p> <p><input type="checkbox"/> Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)</p> <p>LS1.D: Information Processing</p> <p><input type="checkbox"/> Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal’s brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)</p>	<p>Cause and Effect</p> <p><input type="checkbox"/> Cause and effect relationships are routinely identified. (4-PS4-2)</p> <p>Systems and System Models</p> <p><input type="checkbox"/> A system can be described in terms of its components and their interactions. (4-LS1-1), (LS1-2)</p>

Common Core Standards:

ELA/Literacy:

RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Mathematics:

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

MP.4 Model with mathematics.

FOSS Connections:

Grade 4-6 Module: Living Systems

Teaser: In this lesson we will learn about the brain, how we think, move, and remember. We'll learn about different ways that we can trick and train the brain and then be able to see and hold brains that have been preserved.

Objective: Students will recognize that the brain is a very complex organ that has many specialized functions that occur in the various regions within the brain. They will have the opportunity to examine real specimens and learn the names of some of the larger regions.

Vocabulary/Definitions: 3 – 6 important (new) words

- Neuroscience – the study of the brain (neurology, neurologists)
- Autonomic Functions – Something your body does automatically without conscious thought like breathing or heartbeats.
- Voluntary Movement – Controlled movements that you do consciously.
- Involuntary Movement – Motions that you do without thinking (i.e. reflexes, ticks)

Some Regions of the Brain:

- Cerebral Cortex – Part of the brain where thought, voluntary movement, language, reasoning, perception occur.
- Corpus Collosum – Connects the left and right hemispheres.
- Thalamus – Receives sensory information and relays it to the cerebral cortex. The thalamus also directs some body movement.
- Midbrain – This region of your brain controls functions in your vision and hearing systems as well as eye movement.
- Cerebellum – Helps with balance, posture, and some movement.

- Medulla Oblongata – Connects the rest of the brain to the spinal cord. Controls autonomic body functions like breathing and heartbeats. Also controls reflexes like vomiting, coughing, sneezing, and swallowing.
- Spinal Cord – Transmits signals from the brain to the rest of the body.

Materials:

What will you bring with you?

- Preserved Brains (Human & Other Animals)
- Trays
- Gloves for handling brains
- Brain Chart
- Wet wipes
- Coloring Sheets (1 per student)
- Stroop Test Cards (2 different sets, 4 sets of each)
- Stopwatch

What should students have ready (pencils, paper, scissors)?

- Pencils/Writing Tools
- Colored Pencils, Markers, or Crayons

Classroom Set-up:

What is needed for the presentation?

- Sink or place for students to wash hands.
- At the beginning of presentation: Students should be seated all together for the introduction.
- During the hands-on portion, they will be split up into 3 to 4 smaller stations (depending on number of volunteers attending):
 1. Coloring Sheet: Table with colored pencils, markers, and crayons
 2. Concentrating/Using Your Brain: Table or Carpet Area
 3. Brain Station #1: Cleared table for presenting brains
 4. Brain Station# 2: Cleared table for presenting brains

Classroom Visit

1. Personal Introduction:

2 Minutes

Introduce each member and interests... We're all studying at UC Berkeley and we're all interested in studying the brain and how it works. Today we're going to talk about the brain and at the end you'll have the chance to look at the real brains that we've brought with us.

Topic Introduction:

10 Minutes

Today we're going to talk about neuroscience or the study of the brain. [It's often helpful to write this word on the board so students can see how it's spelled.]

Can anyone tell me some things that the brain does or helps you do?

[One person can pick out volunteers and someone else can write on the board. Sometimes it's helpful to ask for the teacher's help choosing volunteers so that you don't always call on the same students all the time. This is a great chance to find out what students already know.]

Your brain is very important because it does a lot of these things that you all mentioned earlier. [Mention some of the things that the students said using their own words. Some of those things might be: thinking, remembering, movement, talking, etc]

Did you know that your brain is actually made up of smaller regions that do different things. Scientists have been studying this for a long time and so now we have some idea of which regions so what things but there's still a lot that we don't know about how the brain works.

How do you think that neurologists would find out what the different regions of the brain do? [Pause here to allow students to think and suggest possibilities.]

One way is to look at people who have brain damage or are missing parts of their brain. People can lose parts of their brain in accidents or when they get older some of their brain cells can die. Sometimes the damage is so small that these people are still able to walk around and do normal things but they might be missing one specific function (i.e. the ability to smell, lose certain memories, read, etc). Neurologists can often recognize this and now we can figure out what part of the brain has been damaged.

Another way that neurologists study the brain is to look at what part of the brain is being used when you do a certain thing. Using special machines they can see inside your brain while you're completing a task of thinking about something. [Some kids might know fMRI but it's best not to go into too much depth. If a few students are interested in this topic it's best to talk to them during smaller groups.]

Now, we're going to break up into 4 groups. At one station you will get to talk about some of the larger regions of the brain and color in a sheet. At the second station you'll get to try one test that was developed by a neurologist to see how different regions of the brain communicate with each other.

Finally, at the last 2 stations you will get to look at brains that have been preserved. They smell a little bit gross because of the chemicals we use to preserve them, so you don't have to hold them if you don't want to. But, if you do remember to wear gloves and to wash your hands after you've held the brain!

2. Learning Experience(s):

40 Minutes

Station #1: Coloring Pages

10 Minutes

How do you think that neurologists would find out what the different regions of the brain do? [Pause here to allow students to think and suggest possibilities.]

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Station #2: Concentration

10 Minutes

So, now we know that there are different regions inside of your brain that do different things. We're going to try and test how quickly those different regions communicate with each other. This is something that you can do at home very easily with some paper and markers.

Stroop Test 1: We're going to break into pairs to do this activity and each pair of students will get a set of cards. One person is going read the word that's written on each card and the other person will change the cards and make sure the other person doesn't make any mistakes. If you do, then keep reading until you get it right. I'm going to give you 30 seconds to read as many as you can. Then we'll switch and find out who was able to finish the most number of cards.

Stroop Test 2: Now, I'm going to collect the first decks of cards and give you each a different set of cards and then I'll time you again. Except this time I want you to name the color of the ink that the word is written in. Let's see who can read the most cards in 30 seconds.

What's happening? When you looked at the second deck, your brain got 2 signals from your eyes – the words and the ink color. Reading is very automatic for most people. But, naming a color isn't. To name the color, your mind has to ignore its first reaction – what a word says. But ignoring something can take real mental effort! In fact, when you do something that takes a lot of concentration – like a Stroop test, your brain can get very tired. This makes it hard to stay focuses.

Want to do better? Scientists say that giving yourself a break before trying again helps. Taking a walk outside is a good way to rest the parts of your brain you use for concentrating. This is also good advice if you have to take a hard test at school. It's really helpful if you get a good amount of sleep before you have to do something where you have to concentrate.

What are some other ways that you can think of to help improve your concentration?

Station #3: Human Brains

10 Minutes

At this station we're going to look at human brains that have been preserved. These brains were donated by people after they died so that students could learn about the human body. Remember to be respectful of these specimens.

They smell a little bit gross because of the chemicals we use to preserve them, so you don't have to hold them if you don't want to. But, if you do remember to wear gloves and to wash your hands after you've held the brain!

Let's see if you can find some of the regions that are on this chart.

[Note: It's not terribly important at this age that students memorize each region and their function but it's good for them to practice reading and understanding diagrams. This is really a great chance for volunteers to engage with students one-on-one and answer and questions that they might have. It's perfectly okay to say that you don't know something or refer to a diagram for more information.]

Remember to throw away your gloves and wash hands after holding the brains.

Station #4: Animal Brains

10 Minutes

At this station we're going to look at some different animal brains and compare them to humans. Let's see if we can find some of the same regions that are in the human brains? Do you notice that some of them are smaller or larger?

They smell a little bit gross because of the chemicals we use to preserve them, so you don't have to hold them if you don't want to. But, if you do remember to wear gloves and to wash your hands after you've held the brain!

[Note: It's not terribly important at this age that students memorize each region and their function but it's good for them to practice reading and understanding diagrams. This is really a great chance for volunteers to engage with students one-on-one and answer and questions that they might have. It's perfectly okay to say that you don't know something or refer to a diagram for more information.]

Remember to throw away your gloves and wash your hands after holding the brains.

3. Wrap-up: Sharing Experiences

5-10 Minutes

Now have the students come back together, perhaps sitting on the carpet or at their desks after everything has been put away. Students are typically good with helping to clean up.

Let's review what we've learned today. Tell me one thing that you learned today. [Call on volunteers, list off the things that they say.]

What was your favorite part of today's lesson?

Can anyone name the part of your brain that you use to think?

Which part of your brain helps with balance?

Which part controls eye movement?

Etc...

4. Connections & Close:

5 Minutes

Does anyone have any questions?

Total 50 – 60 Minutes

Differentiated Instruction:

English Learners: Repeat directions, if necessary, and physically model how to perform activity at each station. Write vocabulary words on the board and read words aloud. Vocabulary words can also be visually demonstrated using an illustration or action and redefined in very simplistic terms.

Advanced Learners: Have students make conclusions about different animals' brains based on their strengths, e.g. dogs can smell well.

Follow-up Possibilities

ELA Activity:

Suggest students write a letter explaining "How we learned about neuroscience?"

Reading Connections:

- The Human Brain Book by Rita Carter <http://www.amazon.com/Human-Brain-Book-Rita-Carter/dp/0756654416>
- The Great Brain Book: An Inside Look At the Inside of Your Head by HP Newquist Illustrated by Keith Kasnot with line drawings by Eric Brace. ISBN 0-439-45895-1, \$18.95. Paper ed. A definitive resource on the brain for kids and adults. Content includes history, brain structure and functions, neurons, learning and memory, brain imaging, disease, and future treatment and technology. Excellent photographs throughout. Written in a very readable format with complementary illustrations and sidebars with related information. Introduction, Author's Note, Internet Resources, Index. DTC (IV, VI, VIII) <http://www.amazon.com/Great-Brain-Book-Inside-Look/dp/0439458951>

Mathematics Activity:

Students can weigh and record the mass of different brains. Later, these values can be graphed and used to write equations.

Other:

Draw Your Nervous System:

- <http://www.amnh.org/ology/features/nervoussystem/>

Stroop Test:

- <http://www.pbs.org/parents/fetch/activities/act/act-trainyourbrain.html>
- <http://faculty.washington.edu/chudler/colors3.html>

Test Your Reflexes:

- <http://faculty.washington.edu/chudler/chreflex.html>



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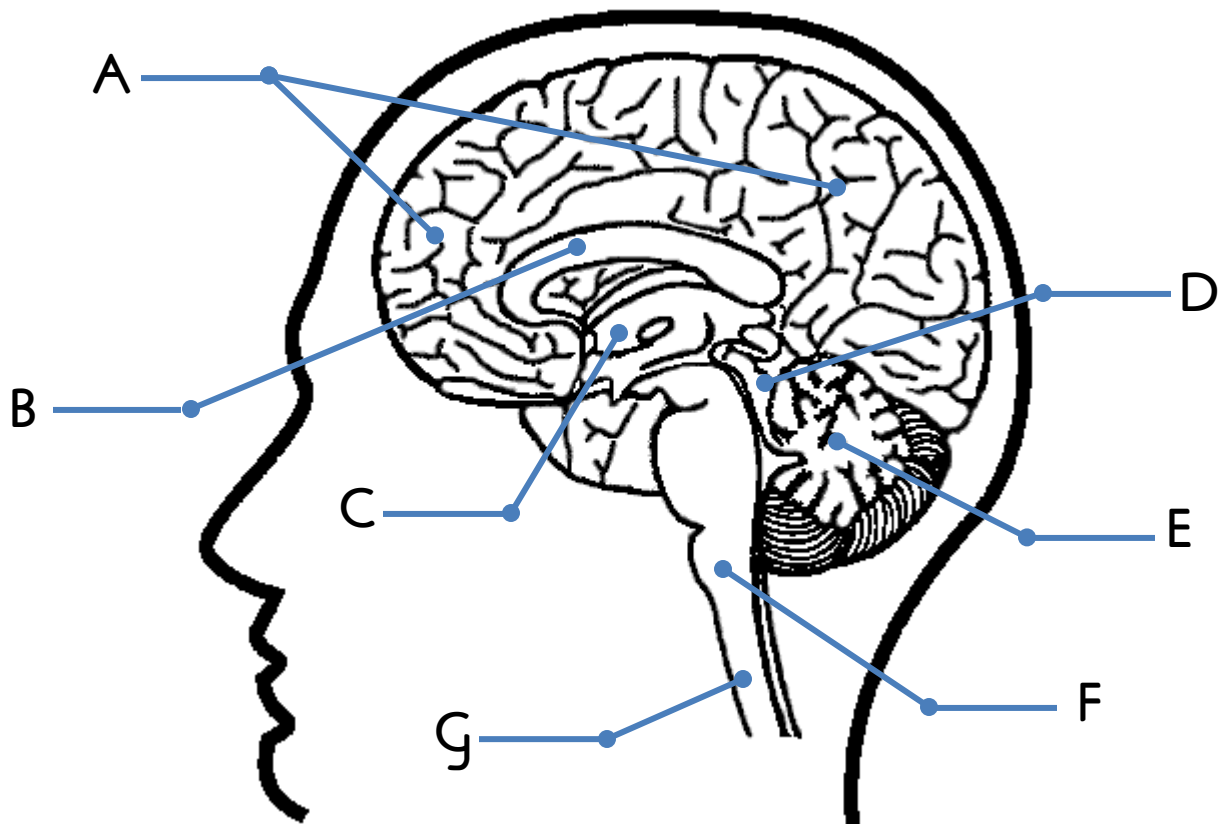
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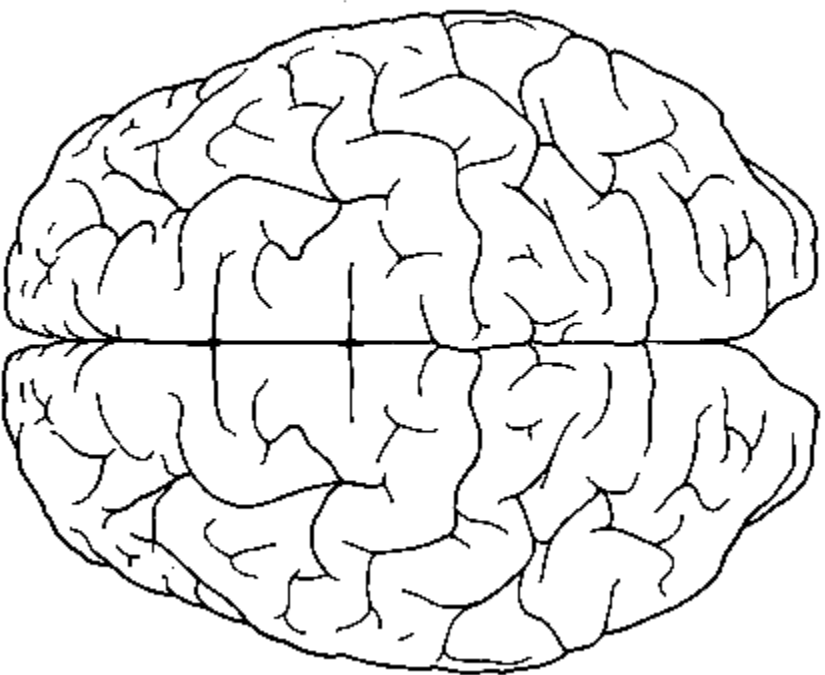
Feel Dead Brains Coloring Sheet

Vocabulary:

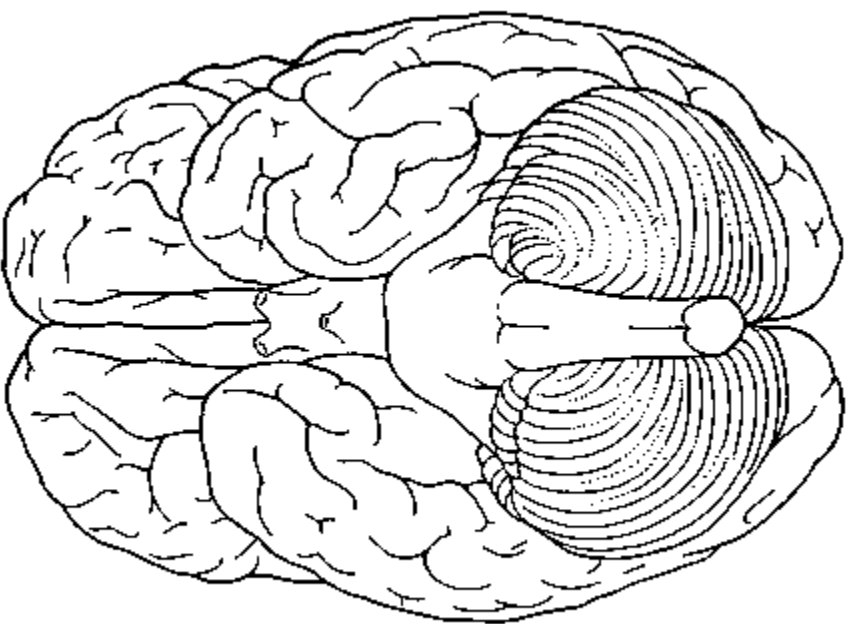
- A. **Cerebral Cortex** – Part of the brain where thought, voluntary movement, language, reasoning, perception occur.
- B. **Corpus Collosum** – connects the left and right hemispheres
- C. **Thalamus** – Receives sensory information and relays it to the cerebral cortex, directs movement.
- D. **Midbrain** – Is the part of your brain that receives information from your eyes and ears. It controls eye movement and some body movement
- E. **Cerebellum** – Helps with movement, balance and posture.
- F. **Medulla** – Connects the rest of the brain to the spinal cord. Controls body functions like breathing and heartbeats. Also controls reflexes like vomiting, coughing, sneezing, and swallowing.
- G. **Spinal Cord** – Transmits signals from the brain to the rest of the body.



Middle View



View from the Top



View from the Bottom