

SAGE: The Brain Unit

Week 1

Essential Question(s): What are the functions of the human brain? What does the anatomy of the human brain look like?

Topics:

	cerebrum cerebellum brain stem	frontal lobe parietal lobe	occipital lobe temporal lobe
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Attachments: Anatomy of the Brain, and Lobes of the Brain

Extras: [Brain Rhyme Time](#) - flexible thinking activity

Week 2

Essential Question(s): How does the human brain control the parts of the body? What does the anatomy of the human brain look like?

Topics

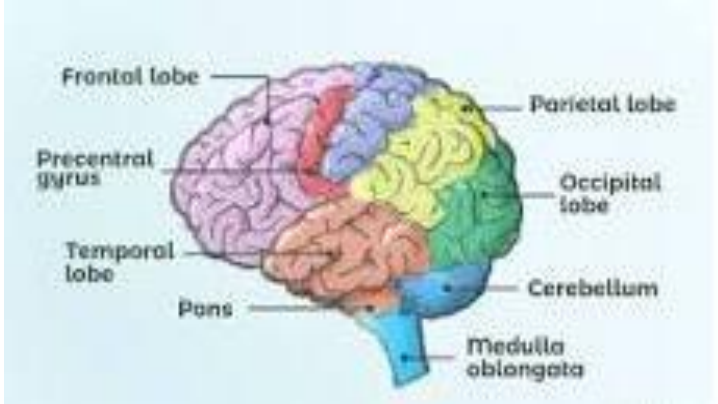
	right/ left hemisphere corpus callosum spinal cord	nerves nervous system motor and sensory nerves
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Attachments:

Brain Review worksheet

Extras:

parts of the brain



Week 3

Essential Question(s): Which parts of the brain are responsible for the different functions of the body?

Topics

	lobes of the brain (review) parts of the brain (review) Introduce the limbic system (amygdala, hippocampus, thalamus, and hypothalamus)	Broca's Area Wernicke's Area Sulci/Gyri Phineas Gage
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Extras:

Make a brain using clay and a Styrofoam ball.

Written Assessment of previous learned material

Brain Structures Dominoes (<http://faculty.washington.edu/chudler/pdf/dominobr.pdf>)

Brain Glossary (to use with Brain Basics Worksheet) <http://faculty.washington.edu/chudler/gloss.html> or

<http://www.enchantedlearning.com/subjects/anatomy/brain/glossary/index.shtml>

A Day in the Life of a Brain <http://brainconnection.positscience.com/BAW/?main=day/home>

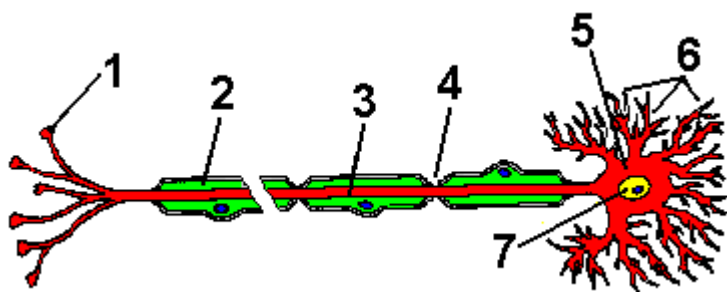
Week 4

Essential Question(s): What is a neuron and how does it allow learning to take place in the brain?

Topics

Neurons

Vocabulary associated with neurons: nerve cell, axon, myelin, dendrites, cell body, nucleus, presynaptic terminal, neurotransmitters, synapse, Node of Ranvier



- | | |
|----|--|
| 1. | Part of the neuron that releases neurotransmitters into the synaptic cleft: the Presynaptic Terminal |
| 2. | Fatty material that surrounds some axons: Myelin |
| 3. | Takes information away from the cell body: Axon |
| 4. | The gaps in the myelin sheath: Nodes of Ranvier |
| 5. | Part of neuron that contains the nucleus: Soma |
| 6. | Takes information to the cell body: Dendrites |
| 7. | Organelle in neuron that contains genetic material: Nucleus |

Neuron Review Test

Name _____

Date _____

Neuron Review Test

Instructions: Match the items in column A with the corresponding items in column B. Write the matching letter in the space provided in column A.

<u>Column A</u>	<u>Column B</u>
1. Junction between two neurons	a. Nissl bodies
2. A type of cell in the nervous system	b. Neuron
3. Groups of ribosomes used for protein synthesis	c. Axon
4. It contains chromosomes	d. Nucleus
5. Membrane bound structure that plays a role in packaging peptides and proteins into vesicles	e. Mitochondria
6. It produces ribosomes	f. Nucleolus
7. Neurons communicate with each other through this type of process	g. Neurotransmitters
8. Important for energy production within cells	h. Golgi apparatus
9. Neurons contain these chemicals	i. Synapse
10. Ribosomes are not found in this part of a neuron	j. Electrochemical

Answers

i., b. h. d. a. f. j. e. g. c.

Week 5

Essential Question(s): The Senses and the Brain (Part 1)

Topics

The Senses –an overview

Introduction: Week five will introduce the senses and look at how the senses relate to the brain.

Objectives: How are the five senses related to the brain? What do I know about the senses? What do my senses tell me about the world around me?

Our senses tell us:

1. What is out in the environment.
2. How much is out there.
3. Is there more or less of it than before.
4. Where is it.
5. Is it changing in time or place

Procedures:

1. If you have access to *Teacher's Helper* from Feb/March 2002, pp. 47-48 have an activity entitled "Sensation Central" that goes along well with the location of the senses on the brain.
2. After introducing the senses and how they relate to the brain, divide students (grades 3-5) into groups and have each group research information about one of the senses. Have groups record their findings in some sort of graphic organizer (possibly a "Describing Wheel")
3. Have groups share finding about their sense with the rest of the class. Resources for students to use for their research can be found at:

- | | | | | |
|---|--|---|--|--|
| 1. Nose  | 2. Taste  | 3. Skin  | 4. Eye  | 5. Ear  |
|---|--|---|--|--|

4. After the research groups present their findings to the class, have students work with a partner to complete the **Sensory Pile On** activity found at: <http://faculty.washington.edu/chudler/envelop.html> . Another activity **Throw it Out!** <http://faculty.washington.edu/chudler/pdf/throw2.pdf> is another good activity to use as a follow up to the research.

5. Choose a sense to investigate more in depth with your class. For example, you might choose to investigate the **eye** using:

The Stroop Test	Blind Spots	Visual Illusion
Hearing:	Smell:	Taste:
Touch:	Vision:	together:

Extras:

[Other activities related to the senses](#)

For some interesting ways in which [animals have developed their senses](#),

Week 6

Essential Question(s): The Senses and the Brain (Part 2)

Topics

The Sense of Touch (Primary Somatosensory Cortex)

Voluntary Movement (Primary Motor Cortex)

Vision (Primary Visual Cortex)

Introduction: Weeks five and six will look at how some of the senses relate to the brain. On day six, the activities investigate how the sense of touch relates to the Primary Somatosensory Cortex. We will also investigate the Primary Motor Cortex (voluntary movement). The Primary Visual Cortex will also be discussed.

Objectives:

1. How does the cerebral cortex and the central nervous system process information related to the sense of touch?

2. How do the Primary Motor Cortex and the Primary Visual Cortex work together to enable individuals to react to situations?

Procedures:

The Sense of Touch (Primary Somatosensory Cortex)

1. Begin with the "[The Functions of the Human Brain](#)" and diagram from the website. As you move your cursor over the words on the chart, it will highlight the different areas of the brain. Review the functions of each area:

1. **Primary Somatosensory Cortex** = receives tactile (sensory or touch) information from the body

2. **Primary Visual Cortex** = detection of simple visual stimuli

3. **Primary Auditory Cortex** = detection of sound quality (loudness and tone)

4. **Broca's Area** = motor area for speech production

5. **Wernicke's Area** = language comprehension

6. **Primary Motor Cortex** = responsible for voluntary body movement

2. Go over the background information entitled "The Primary Somatosensory Cortex" (attachment). This handout is from the website [Neuroscience For Kids](#)

3. Use some of the activities and experiments related to touch from the [touch experiments](#) website .

4. A complete lesson plan (with resources, teacher's guide, and student guide) for an experiment related to two-point discrimination can be found at the [following link](#).

5. **For younger students** you may try to find some books about the senses to share. Some possibilities include: "Hearing," "Seeing," "Smelling," "Tasting," and "Touching" by Rebecca Oliien, Mankato (MN): Capstone Press, 2006 (each book is 24 pages).

6. **Reading level:** Grades 1-3 Capstone Press has recently published a series of five books about the senses for young children (grades 1-3). Each book is filled with large, colorful photographs and illustrations. "Fun Fact" boxes throughout the books provide readers with interesting bits of trivia about the different senses. Each book ends with a simple experiment that can be done to show how the senses work.

Another book to go along with the senses (for younger students) is *The Magic School Bus Explores the Senses* by Joanna Cole and Bruce Degen, New York: Scholastic, 1999, 48 pages, ISBN: 0-590-44698-3.

A video to go along with the senses (smell) entitled *The Magic School Bus: Makes a Stink* can be found on [United Streaming](#)

A list of other books related to the brain can be found [here](#).

	7.	If you have access to Bill Nye videos, you might consider watching the video entitled <i>The Skin</i> . Here's an overview:
		In this episode, the Science Guy explains that skin is the largest organ in the body and protects us from potential harm in many ways. He tells young science students how skin helps keep the body cool or warm, depending on the temperature outside. Without the touch receptors underneath the skin, they wouldn't be able to perform many of their everyday activities.
Extras:		Online crossword puzzle
		Read more about the epidermis
<u>The Primary Motor Cortex (voluntary body movement) & The Primary Visual Cortex</u>		
	1.	Review location of Primary Motor Cortex and the Primary Visual Cortex using "The Functions of the Human Brain" and diagram from the website .
	2.	Use lesson plans " Catch the Ruler " and " Quick Communication " to show reaction time. These lesson plans investigate how the Primary Motor Cortex and the Visual Cortex work together to enable an individual to react to his/her environment.
	3.	Review the Cerebral Cortex with the following quiz . Answer
	4.	Why does backseat driving happen?
Week 7		
<u>Essential Question(s):</u> Right Side/Left Side Dominance		
Topics		
	Brain Disorders	
	Essential Questions:	
	1.	Are you in your right mind? (right brain/left brain)
	2.	What is a neurological disorder and how does it affect the body?
	Procedures:	
	Right Side/Left Side Dominance	
	1.	Review how the brain is divided right down the middle into a right hemisphere and a left hemisphere. Establish that each hemisphere appears to be specialized for some behaviors and that the hemispheres communicate with each other through a thick band of 200-250 million nerve fibers called the corpus callosum . A good source of information on this topic can be found here .
	2.	Consider using the worksheet "Two Brains Are Better Than One" from <i>Teacher's Helper</i> Feb/Mar. 2002.
	3.	Use some of the experiments from this link to test sidedness in your students.
	Neurological Disorders	
	1.	Much of the research connected to right brain/left brain differences is associated to epilepsy. Introduce the term " neurological disorder " (a disturbance in structure or function of the central nervous system resulting from developmental abnormality , disease , injury or toxin). Take the opportunity to educate your students about epilepsy . Information on epilepsy .

	2.	For older students, have them complete a research project on a neurological disorder . A list of some of the neurological disorders (with links) can be found at http://faculty.washington.edu/chudler/disorders.html . Students would be assigned various neurological disorders to research. One possible research project idea is to have students create a “Brain Cube”. Students would begin with a small box. Once they cover the box, the student place information on each side of the box (description of disorder, symptoms/causes, statistics, pictures related to disorder, etc.) about the disorder which he/she researched. Once projects are completed, students can share projects with the class so that students will learn about a variety of disorders.
	3.	For younger students, you may choose to read aloud some books about neurological disorders . A few to choose from are:
	a.	<i>Singing with Momma Lou</i> by Linda Jacobs Altman (illustrated by Larry Johnson), New York: Lee & Low Books, Inc., 2002 ISBN: 1-58430-040-X.
	b.	<i>Remember Me?: Alzheimer’s Through the Eyes of a Child</i> by Sue Glass (illustrated by W. Yunker), Green Bay (WI): Raven Tree Press, 2003, ISBN: 0-9720192-5-1.
	c.	<i>Lou Gehrig. The Luckiest Man</i> by David A. Adler, illustrated by Terry Widener, Orlando (FL): Harcourt Brace & Company, 1997, ISBN: 0152005234.
	d.	<i>I’ll Hold Your Hand So You Won’t Fall. A Child’s Guide to Parkinson’s Disease</i> by Rasheda Ali, West Palm Beach (FL): Merit Publishing, 2005, ISBN: 1-873413-13-0.
	4.	Students can play Neurological Disorders Dominoes using this website.

Extras:

1.	Right-side or Left-side : Do Snakes Have a Preference for Coiling Direction?
2.	Lopsided Stroke
3.	Smelly Research
4.	Differences in Male and Female Brains

Week 8

Essential Question(s): Intelligence

Topics

	Multiple Intelligence
	Memory
	Sports and the Brain
	Essential Questions:
	What is intelligence?
	What does Gardner’s multiple intelligence theory say?
	How does your brain remember things?
	How do sports affect the brain?
	Procedures:
	Intelligence
1.	Begin by having students give their definitions of intelligence. After students have shared their definitions of intelligence, come up with an overall definition of what intelligence actually is. A good source for this topic is <i>It’s All in Your Head: A Guide to Understanding Your Brain and Boosting Your Brain Power</i> by Susan Barrett (pp. 23-43).

	2.	Discuss with students the differences between an intelligence test and an achievement test.
	3.	With older students, you might even want to debate where intelligence “comes from”. <i>It’s All in Your Head</i> introduces the nature vs. nurture controversy.
	Multiple Intelligence Theory	
	1.	You can find an overview of information about the multiple intelligence theory here . The website has a diagram showing suggested ideas for applying the model and theories. The website also provides links to some free multiple intelligence tests that you may want to try with your students. For younger students, you may want to try to find a copy of the Teele Inventory for Multiple Intelligences (TIMI). Your school counselor may have some resources on Multiple Intelligences that he/she could share with you.
	Memory	
	1.	<i>It’s All in Your Head: A Guide to Understanding Your Brain and Boosting Your Brain Power</i> by Susan Barrett (pp. 82-95) discusses memory. It goes into the six types of memory and the characteristics of each.
	2.	This link provides information about the memory and the hippocampus.
	3.	You can find a lot of activities and techniques related to memory at this website .
	4.	Another website with memory activities is here .
	5.	A resource entitled <i>Psychology for Kids</i> by Jonni Kincher contains an activity entitled “How’s Your Memory?” (pp. 99-101) that deals with mnemonic devices.
	Sports and the Brain	
	Establish the need to protect the brain during sporting activities. Remind students about how soft and pliable the brain feels. Discuss the structure we have around the brain to protect it (the skull). Do they think that the brain pushes up right against the skull? Actually, there is a space in between the brain and skull that is filled with fluid (cerebrospinal fluid) to cushion the brain. However, there are limits to how much even the skull and fluid can protect the fragile, ESSENTIAL organ we call the brain. Today they are going to experiment to see what effect a hard impact has on the brain and how that impact can be minimized through protective headgear. A raw egg will model the brain and the challenge is to build a container that will best protect it from damage.	
	1.	Complete the “Mr. Egghead” lesson plan at this link .
	2.	To close the lesson, discuss the container designs that best protected the eggs. How are these like helmets? Press students to be very specific. Here's the place to preach helmet use for bicycles, in-line skating, skateboarding, contact sports, etc!
	3.	Research the Zackery Lystedt law passed recently in Washington State.
	4.	The law was passed to protect the brains of young athletes. The new law states that youth athletes who are suspected of sustaining a concussion or head injury in a practice or game must be removed from the activity immediately. Also, any youth athlete who has been removed from play for this reason must receive written clearance from a health care provider to return to play.

	4.	The law was named after Zachery Lystedt, a 16-year-old football player from Maple Valley, WA, who suffered a life-threatening brain injury in 2006 after he returned to play football after he suffered a concussion. Zachery's injury occurred after he made a tackle during a game. He sat out for a short time, but returned to the game in the fourth quarter. After the game he collapsed, was in a coma for several months and had to have two emergency brain surgeries. Zachery still needs a wheelchair and intensive therapy.
	5.	If you requested and received the free information from <i>The Dana Sourcebook of Brain Science</i> you might want to watch sections 2 & 3 of the DVD that you received. Section 2 is entitled "Sports and the Brain". This section focuses on how the brain learns motor skills related to sports. Section 3 is entitled "The Broken Brain" and goes into sports related concussions.

Extras:	
	Information on the Musical Brain
	Research on mice related to memory

Week 9

Essential Question(s): Which parts of the brain are responsible for the different functions of the body?

Topics

	Learning Style
	Personality
	Creativity
	Essential Questions:
	What is your learning style?
	What factors help to determine your personality?
	How creative are you?
	Procedures:
	Learning Style
	1. A topic we tend to not spend enough time on with students is LEARNING. As students gain better metacognitive skills about their own learning, they become better learners. Introduce 3 most common modalities for learning and guide students to help determine their learning style:
	<u>Visual:</u> Receiving the information best through visual stimulation (reading, pictures, graphs, etc.)
	<u>Kinestheti</u> <u>c:</u> Receiving information best via touch and hands-on activities (craft projects, Cuisenaire rods or other math manipulatives, science experiments, etc.)
	<u>Auditory:</u> Receiving information best through the ears (being read to aloud, listening to songs, audio books, etc.)
	2. The book <i>Psychology for Kids</i> by Jonni Kincher contains an inventory entitled "What's Your Learning Style?" on p. 109-111. This is a good resource for this topic.
	3. Consider using the "Cognitive Control" worksheet from Teacher's Helper Feb./Mar. 2002
	4. A chart to help determine learning styles
	5. An online learning style inventory can be found here

	6.	You may also like to investigate differences in males and females thinking styles. Inventories related to this can be found in <i>Psychology for Kids II</i> by Jonni Kincher on pp. 82-92. The Neuroscience for Kids website recommends the following resource: GEMS (Great Explorations in Math and Science) guide called <i>Learning About Learning</i> . To order it, call (510) 642-7771 or write to GEMS, Lawrence Hall of Science, University of California, Berkeley, CA 94720-5200.
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Personality

	1.	A "fun" (not scientifically based) introduction that you might use for personality is " How Do You Eat Your Oreo? " A lesson plan on how to use this.
	2.	<i>Psychology for Kids</i> by Jonni Kincher contains several inventories related to different aspects of personality that you can use with your students. There are several inventories in each area (attitudes, feelings, social styles) that could be used to investigate personality.
	3.	This website discusses how psychologist use inkblots to determine personality.
	4.	Link to investigate personality with The True Colors Test

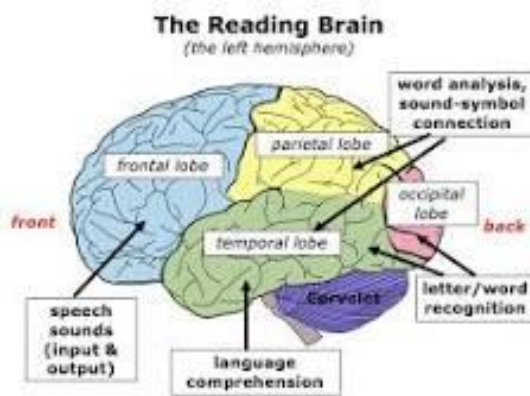
Making Decisions

	1.	Myers-Briggs Personality Test
	2.	Draw a " Myers " Pig
	3.	Decisions! Decisions!
	4.	Odyssey Quest
	5.	Peace Quest

Creativity

	1.	A good resource for information related to creativity is <i>It's All in Your Head</i> by Susan L. Barrett. Pages 96-114 contain a lot of interesting information about creativity.
	2.	<i>Psychology for Kids</i> by Jonni Kincher contains two inventories related to creativity on pp. 83-87.
	3.	SCAMPER is a creative thinking checklist. The following resource relate to SCAMPER: Consider having your students use SCAMPER to create something new. SCAMPER

Extras:



[How the brain reads](#)

The angular and supramarginal gyrus serve as a "reading integrator" a conductor of sorts, linking the different parts of the brain together to execute the action of reading.

Week 10

Essential Question(s): Dreams/Deep Drugs TLC for your brain

Essential Questions:

	1.	What does your brain do when you sleep and dream?
	2.	How do drugs affect your brain?
	3.	How can you take care of your brain?

	Procedures:	
	Dreams/Sleep	
	1.	A set of lesson plans on sleep can be found at these sites: Electrical Rhythms , Dream Journaling , Brain Electricity , Sleep Graphs , Sleep Cycle , What Do We Know?
		Easy to understand information about sleep can be found here .
	2.	It also includes information about a sleep experiment that students can conduct and there is an online sleep puzzle .
		Discuss how lack of sleep can affect schoolwork.
	Drugs	
	1.	Depending on the age of your students, you might want to have them research how some of the following drugs affect the brain. Information about how the following drugs affect the brain can be found for these drugs: Alcohol , Amphetamines , Barbiturates , Caffeine , Cocaine , Ecstasy , Heroin , Inhalants , LSD , Marijuana , Nicotine , Rohypnol , PCP , GHB , and Hallucinogenic Mushrooms
	2.	If you ordered the free information from <i>The Dana Sourebook of Brain Science</i> , Sections 7 & 8 of the DVD is about drugs. Preview before using.
	TLC for the Brain	
	1.	<i>It's All in Your Head</i> by Susan L. Barrett contains an interesting section with tips for TLC for your brain on pp. 115-122.
	2.	Information about nutrition and the brain can be found here .
	3.	Consider having students design their own cartoon style posters giving tips about how to take care of their brain.
Extras:		
	To recap the unit on the brain, you might want to play Brain Bingo. Directions (and resources) for this activity can be found here . .	