Explore Senses & Survival

OVERVIEW

Students will explore how the human brain takes in information from our environment using our senses, processes this information, and responds. They will learn that often our brain must resolve a conflict before it can respond to the environment, and this is done by the process of decision-making.

NYS Science Core Curriculum

LE 5.1g: The survival of an organism depends on its ability to sense and respond to its external environment.

BACKGROUND FOR EDUCATOR

The human brain shares some key structures with the brains of other organisms, but it is unique. While the ability to take in signals from our external environment using our senses is shared with other animals, the human ability to then make decisions about conflicting impulses and communicate our responses helps us to survive in a complex world. One structure of our brain that helps with this unique ability is our expanded prefrontal cortex.

BEFORE YOUR VISIT

Activity: Senses, Decision-Making, and Memory: Keys to Survival?

Using the discussion questions below, invite students to explore what survival means to them. While prompting them to answer, have someone (a fellow teacher, school staff person, or student) inconspicuously walk into the classroom, ideally carrying something into the room or getting something from the room. They should just stand around for about 45 seconds without speaking to anyone or drawing attention to themselves, and then walk out of the room.

Plan how your students will explore *Brain: The Inside Story* using the student worksheets. You might choose to have students work in pairs as they explore the exhibition.

Distribute copies of the worksheets to students before coming to the Museum. You may want to review the worksheets and the map of the exhibition with them to make sure they understand what they are to do.

Discussion Questions:

- What parts of your body do you rely on everyday to survive? *(Answers will vary, and may include: heart, lungs, brain.)*
- Which of your senses did you use to get to school today? *(Answers will vary.)*
- What decisions did you make to get to school today?
  (Answers may include: time needed to catch the bus, route taken, when to cross the street)
- What senses would a lost dog use to find its way home?
  (Answer: it would rely more on its sense of smell than sense of vision; humans rely more on our sense of vision than smell)
- What decisions would a dog make to find its way home?
  (Answer: it would not decide which route was best)
- How do your senses help you survive?
  (Answers will vary. Sample answer: I know not to cross the street if I see that the light is red or the cars are coming.)
- How does your ability to make decisions help you survive?
  (Answers will vary. Sample answer: I know not to touch something hot because it's going to burn me.)

After class discussion is over, ask the students if they noticed the visitor and, if so, to list everything they can remember about that person, including what he or she looked like, colors of clothing, what they were carrying, etc. Ask students who saw the visitor if they were able to pay attention to the class discussion at the same time. Tell students that in the *Brain* exhibition, they will explore how our brain works, including how we remember and make decisions.

DURING YOUR VISIT

Brain: The Inside Story Exhibition

3rd floor (45 minutes)

Have students use their student worksheets to investigate brain anatomy and how our brain responds to our environment. You might choose to have students work in pairs as they explore the exhibition. In the *Your Emotional Brain section*, students will build a 3-D model of a human brain by assembling the different parts shared between reptiles, mammals, primates, and humans. Then they will compare and contrast the brains of different species. In the *Your Thinking Brain* section, they will time each other at the word-color test to determine how fast they can reconcile conflicting impulses. The next interactive they will visit is number chunking, where they will need to organize information to recall as many numbers as possible.

Spitzer Hall of Human Origins

1st Floor (20–30 minutes)

Go to the middle of the exhibition and find the four dioramas that depict the lives of our early human ancestors: A New Type of Human, Hyenas vs. Hominids, Neanderthal Campsite, and Life During the Ice Age. Have students work in small groups and select two dioramas to compare and contrast how hominids (early humans) survived in their environments. Have students gather evidence from each scene to answer the following questions:

- How would you describe the environment?
  (Sample answer: In the ice age diorama, it's snowy and cold.)
- What senses are the early humans using in their environments?
  (Sample answer: They might be listening to the environment, looking out for prey, looking at each other for body language, and using sense of touch to make sharp things for defense.)
- What decisions are they making in order to survive in their environment?
  (Sample answer: The people are wearing fur, using fire, using tools, living in shelter, and working together.)

BACK IN THE CLASSROOM

Class Discussion: Making Sense of Your Senses

Divide the class into groups of four. Have each group review their worksheets and discuss the following questions. Then ask each group to share their findings with other groups.

1. Build a Brain & Evolving Emotions

- Looking at the chart you completed, do you think a lizard, dog, or monkey could play the word-color or chunking numbers games? Why or why not?
  (Answer: No, because only humans have a prefrontal cortex. This brain part helps us make plans, predictions, and decisions.)

2. Chunking Numbers

- What decisions did you have to make to group the numbers?
  (Answers will vary, and may include: I grouped the numbers into several "chunks." I thought of 2011 as a year, which is easy to remember.)

3. Word-Color Test

- Was it harder to say the color of the words in Column A, or Column B? Why?
  (Answer: Column B was harder because the color of the words did not match the meaning of the words. When the words and colors conflict, the brain must struggle to ignore competing information.)

ONLINE RESOURCES

Brain OLogy
amnh.org/ology/brain
Hands-on activities and online games help students explore how the brain senses and responds the world around us. They can do the word-color test again in "Trip Up Your Brain."

ScienceBulletins: New Brain Model of Earliest Primate
sciencebulletins.amnh.org/?sid=h.s.memory.20090126
Researchers from the universities of Florida and Winnipeg have reconstructed the brain of *Ignacius graybullianus*, one of the earliest primates known, from a 54-million-year-old fossil skull. It's the most complete brain model of its kind and casts new light on the beginnings of primate brain development.

ScienceBulletins: When Young Brains Become Social
sciencebulletins.amnh.org/?sid=h.s.young_brain.20090713
A brain imaging study from MIT and Yale reveals the neural regions underlying social cognition—the ability to recognize other people's thoughts and feelings—in children aged 6 to 11.

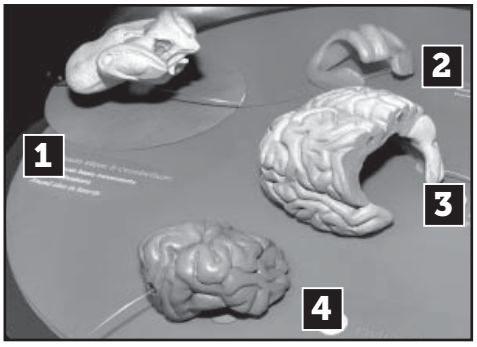
STUDENT WORKSHEET

Grades 6–8

EXPLORE WHAT MAKES US HUMAN

1 Build a Brain

In the *Your Emotional Brain* section, go to the 3-D model of a human brain and assemble it. **Write the name of the brain part in the boxes. Then, draw a line to match the brain part with what it does.**



1.	**Produces emotions and memories**
2.	**Processes senses and thoughts**
3.	**Produces basic movements and motivations**
4.	**Helps humans plan ahead and make decisions**

2 Evolving Emotions

To the left of Build a Brain, look for the wall that displays the brains of a sea snail (mollusk), an iguana (reptile), a raccoon (non-primate mammal), a macaque monkey (non-human primate), and a human. Working with a partner, **compare and contrast the illustrations of different animal brains. Then complete the chart below by indicating the presence (yes) or absence (no) of different parts of the brain in each of the organisms.**

Do these organisms have …..? (Complete with yes or no)	Sea Snail	Iguana	Raccoon	Rhesus Monkey	Human
BRAIN STEM and CEREBELLUM					
LIMBIC SYSTEM					
CORTEX					
PREFRONTAL CORTEX					

3 Chunk These Numbers

Next, go to the *Your Thinking Brain* section and find the area titled "Short-Term Memory." Group the numbers in such a way that you can remember as many as possible. How did you organize them? **Copy the chunks or groups of numbers that helped you remember the most numbers at once.**

4 Don't Read These Words

In the same section, look for the display with a clock. **Working with your partner, time each other to see how long it takes to say the COLOR of the words out loud (don't read the words!).** Record your time and your partner's time.

Try column A once, and column B three times to see if you get faster.

NAME	Column A Time	Column B Time 1	Column B Time 2	Column B Time 3

ANSWER KEY

EXPLORE WHAT MAKES US HUMAN

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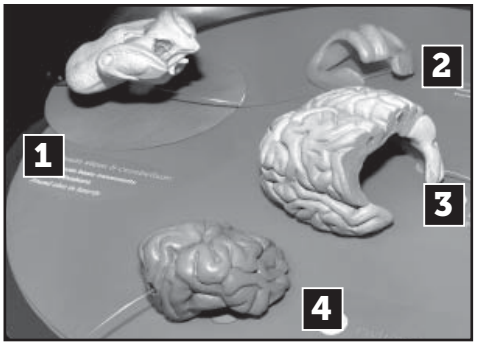

1. *BRAIN STEM and CEREBELLUM*
2. *LIMBIC SYSTEM*
3. *CORTEX*
4. *PREFRONTAL CORTEX*

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Processes senses and thoughts

Produces basic movements and motivations

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Do these organisms have …..? (Complete with yes or no)	Sea Snail	Iguana	Raccoon	Rhesus Monkey	Human
BRAIN STEM and CEREBELLUM	*No*	*Yes*	*Yes*	*Yes*	*Yes*
LIMBIC SYSTEM	*No*	*No*	*Yes*	*Yes*	*Yes*
CORTEX	*No*	*No*	*No*	*Yes*	*Yes*
PREFRONTAL CORTEX	*No*	*No*	*No*	*No*	*Yes*

ANSWER KEY

3 Chunk These Numbers

Next, go to the *Your Thinking Brain* section and find the area titled "Short-Term Memory." Group the numbers in such a way that you can remember as many as possible. How did you organize them? **Copy the chunks or groups of numbers that helped you remember the most numbers at once.**

(Answers will vary)

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