

Session 1: What is the Brain?

Title: Session 1: What is the Brain?		Subject/Course: BrainReach	Time: 80 Minutes
Strand: Understanding Life Systems: Human Organ Systems			Grades: 5 Science
Lesson Description			
This opening Brain Reach session introduces students to neuroscience and provides a simplified overview of the structure and function of the brain. Students explore what science is, what a neuroscientist does, basic brain anatomy, why the brain has folds, how the brain operates as a part of the nervous system, and how scientists view the brain using MRI. Students engage in discussion, observation, and a brain-matching activity comparing human and a variety of animal brains.			
Stage 1: Desired Results			
Learning Goals			
By the end of this lesson students will be able to: - Explain what the brain is and why it is important. - Show how the brain communicates with the rest of the body. - Understand why the brain has folds. - Acknowledge similarities and differences between human and animal brains. - Understand that scientists can see our brains using MRI.			
Ontario Curricular Overall Expectation			
- 2. Investigate the structure and function of the major organs of various human body systems. - 3. Demonstrate an understanding of the structure and function of human body systems and interactions within and between systems.			
Ontario Curricular Specific Expectation			
- Strand 2.4: Use appropriate science and technology vocabulary, including circulation, respiration, digestion, organs, and nutrients, in oral and written communication. - Strand 3.1: Identify major systems in the human body (e.g., musculoskeletal system, digestive system, nervous system, circulatory system) and describe their roles and interrelationships.			
Key concepts and/or skills to be learned/applied:		Background Knowledge:	
• The Brain is an organ and part of the nervous system. • The nervous system facilitates communication in the body. • Brain folds increase surface area for greater information storage. • There are a variety of brain structures across different species. • MRI allows us to see inside the brain.		• Diversity of life systems (Grade 4 Science). • Basic understanding of organs and body systems. • Have heard of scientists but not neuroscientists. • Know that the brain is responsible for helping us think.	
Stage 2: Planning learning experience and instruction			
Instructional Strategies		Student Groupings	
• Inquiry based questioning during presentation. • Academic conversation through discussions. • Audio and visual representation through slides and videos. • Hands-on matching activity. • Asking students to write down questions during the presentation so that they can save them for the end. • Inform students of the question folder (for broad questions) at the beginning of the presentation.		• Full class discussion during slideshow. • Small groups for matching activity.	
Materials		Considerations	

• PowerPoint Slides • Question Folder • Bill Nye Video and/or Towel (to demonstrate brain folding) • Brain Models • Laminated Matching Cards • Matching Activity Answer Sheets	• Use correct scientific terminology but keep other language simpler and age-appropriate. • Allow time for discussion and questions if students are highly engaged. • Test all videos on school wifi prior to session.
Accommodations (Class Dependent)	
• Be sure to communicate with your host teacher regarding any specific accommodations that need to be made. • Some common factors that need to be accommodated for are: - Colour blindness - Visual or hearing impairment - ELL (English Language Learners) - Simplification - Social anxiety - Multimodal Communication (Students may be selective mutes or have difficulty writing).	
Stage 3: Learning experience and instruction	
Motivational Hook (5 MINS.): Slides 1 - 3	
Introduce yourself to the students and briefly let them know what they will be learning about today. Begin with the <i>What is Science?</i> slide (2). - Explain that you are a scientist - ASK: What do you think scientists do? - Go into further detail on your role as a scientist and explain what their roles will be a BrainReach Investigators throughout the year when you visit them. - Hand out BrainReach folders and explain their purpose. On to the <i>What is a Neuroscientist?</i> slide (3). - ASK: "What do you think neuroscientists study?" - Explain your role as a neuroscientists and that you study the brain!	
Open (15 MINS): Slides 4 - 7	
<i>Homer Simpson's Brain:</i> Slide (4). - ASK: "Do you think this is an accurate representation of the brain?" - Field responses and then move on to the next slide with the actual brain. <i>The Brain</i> Slide (5). - ASK: "What do you know about the brain?" follow up "What have you heard or seen in movies/TV/media about the brain?" - Facilitate brainstorming session to see what students know about the brain. - Students will often ask about dreams, memory, etc. If they mention anything that is false you can start going into more detail and correct them. <i>The Brain is an Organ:</i> Slide (6). - ASK: "Can you name some major organs, what they do, and where they are in your body?" - *See speaker notes on slide for examples* <i>The Nervous System:</i> Slide (7) - ASK: "How do you think the brain communicates with the rest of the body?" - Brainstorm and discuss - ASK: "What is our brain connected to?" - Discuss the spinal cord (CNS) and how it connects to nerves throughout the body (PNS). **Tip** Leave roughly three minutes per question to maintain good timing. If good discussion is happening don't interrupt it.	

Body (40 - 45 MINS): Slides 8 - 15

Why Does Your Brain Have Folds?: Slides (8 & 9)

10 Minutes

- **Slide 8**
 - **ASK:** "In this picture you see many brains, what are some similarities?" then "What about some differences?"
- **Slide 9**
 - **Folding Activity:** Instruct the students to remove their brain models from their skulls. Then provide each student with a piece of paper and instruct them to simply fit the paper into the empty skull **without ripping the paper**.
 - **ASK:** "What did you do and why?"
 - Some students may crumple while others may fold in order to make this happen. When discussing what the students did and why:
 - This quick activity is a fun way to help students understand that folding reduces size while maintaining surface area.
 - **ASK:** "Now looking back at our brains, why do you think many of them have folds?"
- **(Optional)** This slide has a great Bill Nye the Science Guy video. Modern students are starting to lose interest in Bill Nye so as a supplementary activity the presenter can get out a towel to demonstrate how when a towel is folded (much like paper that the students just fit into their skulls) it takes up much less space but still has the same surface area. This could also be skipped if the students did well in understanding the paper folding activity.

Brain Anatomy: Slide (10)

5 - 10 Minutes

- Hand out the brain models but tell the students that they are not allowed to take them apart until you explain the main structures of the brain.
- Go over the main structures of the brain (cortex, cerebellum, and brain stem) and use the diagram on the slide to explain the terms gyrus and sulcus.

Matching Activity: Slides (11 – 13)

15 – 20 Minutes

- Arrange students into groups (possibly with the teacher's help so that they can account for any accommodations) and provide each group with a set of laminated matching cards. The goal of the activity is to correctly match each brain to the correct animal.
- Let the students know that the brains are all the same size on purpose so that the activity was not too easy for them.
- Give students roughly 5 minutes to complete their matching. Remind students of what you just discussed with them in terms of folding within the brain. As brains became wrinklier as species evolved and more wrinkles often means more "intelligence".
- To reveal answers presenters can either simply flip to the next slide **(12)** or point at each brain and have the students vote on which animal they think it belongs to.
- The presenter can then go into further detail as to why each species brain has evolved to be the way it is.
- ***See presenter notes on slide 12***
- If time permits, you can show the students some more animal brains on the next slide **(13)**. This slide can be used to sum up the ideas you just discussed with the students.

How do we see Inside the Brain?: Slides (14 & 15)

5 – 10 Minutes

- **Slide 14**
 - Explain that scientists can visualize the brain, and what is inside it through the use of various imaging techniques.
 - In today's class we will look at MRI which is able to scan the brain in different planes (horizontal, coronal, sagittal).
- **Slide 15**

- This slide contains a 30 second video of a high-resolution brain scan. Be sure to orient students and explain the angles and movement of the scan prior to the video so that they can understand what they are seeing.

Close (10 MINS): Slides 16 - 18

Summary: Slide (16 & 17)

- **Slide 16**
 - Go over slide contents to summarize what was presented.
 - **ASK:** "What do the brain and spinal cord make up?" (Central Nervous System)
 - **ASK:** "What are some of the brain's parts?" (cortex, cerebellum, and brainstem)
 - **ASK:** "What are the brain's folds called?" (gyri, sulci)
- **Slide 17**
 - Go over text on slide and summarize what was presented.
 - **ASK:** "What are features can be different in animal brains?" (size, number of folds)
 - **ASK:** "What are the three planes we looked at with MRI?" (horizontal, sagittal, coronal)
 - **ASK:** "Does anyone remember what MRI stands for?" (Magnetic Resonance Imaging)

Questions: Slide (18)

- Use any remaining time to field questions students have saved in their Question Folder or and new questions they have thought of.

Link to Future Lessons

- This lesson sets the stage for all future lessons by laying down the foundations of brain structure and communication so that its function can be further explored.