Brain Room – Teacher Guide

LEARNING OBJECTIVES

Different parts of the brain work together to form different types of memory.

The brain processes a lot of information at once.

In order to be stored in long-term memory, information must flow first through sensory and short-term memory

ABSTRACT

In a classroom-sized model, students use color-coded yarn to connect different parts of the brain, building a model that shows how brain regions work together to form different types of memories.

MATERIALS

- One skein of yarn in each color below rolled in to a ball:
    - Red: divide skein in half and roll in to two balls
    - Blue: divide skein in half and roll in to two balls
    - Green, yellow, purple, and orange: one ball each

  Note: You may use other colors as available, as long as you use 6 different colors.
- Flashlight or laser pointer
- Brain parts cards [PDF]
- Masking tape, chalk, or rope (optional)

SET UP

1. In a large space such as a classroom, gym, or parking lot, outline the shape of a brain (lateral view) on the ground with tape, chalk, or rope.

   Alternatively, configure desks or tables to make rough boundaries.

2. Have each student choose a brain region card and stand in approximately the appropriate location within the outlined brain (you may want to mention that areas outined in a dotted line are located inside the brain rather than on the surface).

   Note: Be sure that at least one student is in each of the 16 brain regions included in this activity.

3. Hand a flashlight or laser pointer to one student standing in the prefrontal cortex. The light will represent attention.

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DISCUSS

This is just one way of dividing and naming different areas of the brain. It works for our purposes because we are focusing on types of memory.

There are lots of other ways we could label areas of the brain. Areas can be determined by anatomy, by function, or even to indicate sub-areas within a larger region.

These systems of dividing and naming are important for communication and orientation. It is not important for you to memorize the parts of the brain.

BEGIN

Begin with the first type of memory and example below. Read out the type of memory and example you will be modeling.

Hand the ball of yarn in the indicated color to a student standing in the first area listed.

Instruct that student to hold onto the end of the yarn and gently toss the ball of yarn to a student standing in the next area listed. The result should be a taut line of yarn connecting the two students.

If it is relevant to the example, instruct the student in the Prefrontal Cortex holding the flashlight to illuminate areas as indicated.

Instruct the next student to hold onto the yarn, keeping the line taut, while gently tossing the ball to the student standing in the next region listed. This should result in a continuous line of yarn connecting the three regions.

Repeat as necessary to finish the example.

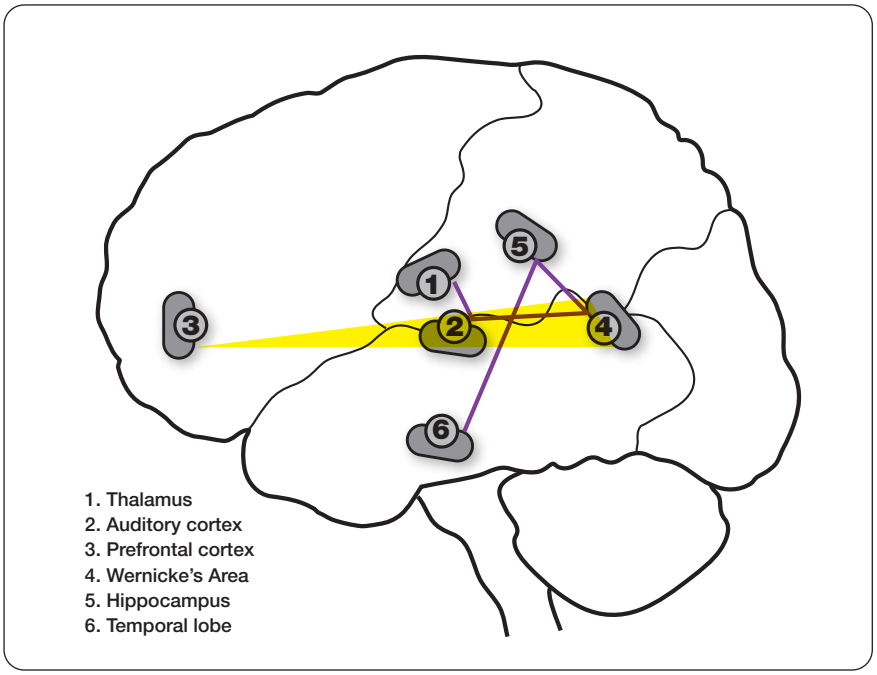

Illustration of Example 6:
Forming the semantic memory that a cow says "moo"

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SENSORY MEMORY

Example 1: Touching a brick

1. Give Red yarn to student with **Thalamus** card
2. Thalamus tosses yarn to **Somatosensory cortex**

Example 2: Hearing a bell

1. Give Red yarn to student with **Thalamus** card
2. Thalamus tosses yarn to **Auditory cortex**

Discuss: Sensory memory is unfiltered. Everything gets in, whether we are aware of it or not.

SHORT TERM MEMORY

Example 3: Seeing and remembering a series of pictures

1. Give Blue yarn to student with **Thalamus** card
2. Give flashlight to student with **Prefrontal cortex** card
3. Thalamus tosses yarn to **Visual cortex**
4. Prefrontal cortex shines light on Visual cortex
5. Visual cortex tosses yarn to **Visual association area**
6. Prefrontal cortex shines light on Visual association area (this represents maintaining informaiton through repetition)

Discuss: Attention is necessary for moving information from sensory memory to short-term memory.

Example 4: Hearing and remembering a series of words

1. Give Blue yarn to student with **Thalamus** card
2. Give flashlight to student with **Prefrontal cortex** card
3. Thalamus tosses yarn to **Auditory cortex**
4. Prefrontal cortex shines light on Auditory cortex
5. Auditory cortex tosses yarn to **Wernicke's area**
6. Prefrontal cortex shines light on Wernicke's area (this represents maintaining information through repetition)

Discuss: Information stays in STM only as long as attention is on it. If the attention turns to something else (distraction), the information in short-term memory disappears.

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EPISODIC LONG TERM MEMORY

Example 5: Forming a memory of the time your sister made cookies with salt instead of sugar

1. Give Yellow yarn to student with **Thalamus** card
2. Thalamus tosses yarn to **Gustatory cortex**
3. Gustatory cortex tosses yarn to **Amygdala**
4. Amygdala tosses yarn to **Prefrontal cortex**
5. Prefrontal cortex tosses yarn to **Hippocampus**
6. Hippocampus tosses yarn to Gustatory cortex

Note: A lot of areas of the brain work at once when forming the memory of an event. These steps highlight some of the areas of the brain that are active, but not all of them, and not necessarily in this order.

SEMANTIC LONG TERM MEMORY

Example 6: Forming the memory that a cow says "moo"

1. Give Purple yarn to student with **Thalamus** card
2. Give flashlight to student with **Prefrontal cortex** card
3. Thalamus tosses yarn to **Auditory cortex**
4. Prefrontal cortex shines light on Auditory cortex
5. Auditory cortex tosses yarn to **Wernicke's area**
6. Prefrontal cortex shines light on Wernicke's area
7. Wernicke's area tosses yarn to **Hippocampus**
8. Hippocampus tosses yarn to **Temporal lobe**

Option: Have students repeat this example, adding a second strand of yarn. Discuss how repetition makes brain connections stronger.

PROCEDURAL LONG TERM MEMORY

Example 7: Learning how to ride a bicycle

1. Give Orange yarn to student with **Thalamus** card
2. Thalamus tosses yarn to **Vestibular cortex**
3. Vestibular cortex tosses yarn to **Somatosensory cortex**
4. Somatosensory cortex tosses yarn to **Prefrontal cortex**
5. Prefrontal cortex tosses yarn to **Supplementary motor area**

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6. Supplementary motor area tosses yarn to **Striatum**

7. Striatum tosses yarn to **Cerebellum**

Option: Have students repeat this example, adding a second strand of yarn. Discuss how repetition makes brain connections stronger.

Note: A lot of areas of the brain work at once when forming a procedural memory. These steps highlight some of the areas of the brain that are active, but not all of them, and not necessarily in this order.

WORKING MEMORY

Example 8: Reading and understanding a sentence

1. Give Green yarn to student with **Thalamus** card

2. Give flashlight to student with **Prefrontal cortex** card

3. Thalamus tosses yarn to **Visual cortex**

4. Prefrontal cortex shines light on Visual cortex

5. Visual cortex tosses yarn to **Wernicke's area**

6. Prefrontal cortex shines light on Wernicke's area

7. Wernicke's area tosses yarn to Prefrontal cortex

8. Prefrontal cortex tosses yarn to **Temporal lobe**

Note: Working memory repeatedly calls on areas of the brain that process information from sensory organs, and there is a lot of back and forth between short term memory and long term memory.

DISCUSS

What similarities and differences do you see in the parts of the brain working together for each type of memory?

What would happen if one of the areas was damaged or failed to make the connection?

Attention is a limited resource. The brain can focus attention on a small number of things at once.

Multi-tasking is not really dividing attention. Rather it is switching it back and forth between inputs.

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