



***Enhanced Learning  
Educational Services***  
*“the study skills specialist”*

# ALL ABOUT YOUR BRAIN



Understanding your brain can help you make informed choices about the most effective ways to approach your learning.

- You should read each point and **highlight the key phrases** in that point.
- Discuss with a friend or parent as you read through the handout.
- You may like to work through this over a number of sessions.



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## **Enhanced Learning Educational Services Profile**

### Our Organisation:

Enhanced Learning Educational Services (ELES) is the leading provider of study skills resources in Australia. Since 2001 over 500,000 students across Australia have benefited from our study skills worksheets and workbooks. An Australian business based in Sydney, our clients extend throughout Australia and to international schools overseas. We are committed to helping all students improve their ability to learn and study by providing study skills seminars and resources on the topics students need.

### Our Mission:

To provide a worthwhile and effective service to teachers, students and parents, enhancing students' learning skills and abilities through dynamic programs, resources and strategies to unlock the power of the mind and enable greater success at school and in life.

### Our Commitment:

As part of ELES' commitment to education, 5% of all gross income is donated to charities that help and assist children.

## **For further information about ELES or our products or contact details:**

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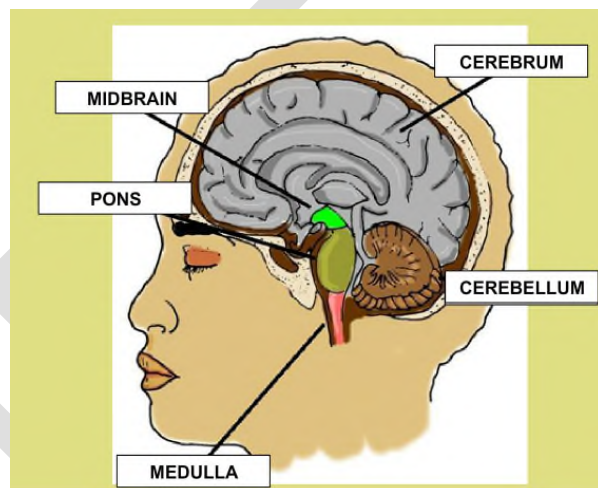
# 1. THE STRUCTURE OF THE BRAIN

## FOREBRAIN, OR CEREBRUM:

- The cerebrum is a soft jellylike substance that makes up a round 85% of the brain's mass.
- Cerebrum is covered by a thin (but tough) laminated cortex (the wrinkled-looking outer tissue), and inside the cerebrum is the limbic system, and the basal ganglia.
- As the forebrain makes up such a large part of the brain, and is critical to memory, it is explained, and shown in further detail, in a later section on the cerebrum.

## MIDBRAIN:

- 2% of the brain's mass.
- Controls sensory processes sending sensory impulses to other parts of the brain.
- Sits on top of the "Pons", a bridging structure that is about 2.5cm in length.



## HINDBRAIN:

- 13% of the brain's mass.
- Consists of the cerebellum (see below), pons (sits underneath the midbrain) and medulla (sits underneath the pons).
- Functions collectively to coordinate balance, physical coordination, posture, equilibrium and motor activity.
- It also manages sleep patterns and regulates unconscious functions such as breathing and blood circulation.
- The cerebellum is sometimes called "little brain" because it looks like a mini-brain inside the brain. Cerebellum is the area of the brain most associated with balance, coordination, posture and motor control. The cerebellum is also important for procedural memory, such as knowing how to ride a bike. Cerebellum takes up one-tenth of the brain by volume, but contains nearly half of all the neurons in the brain. The neurons in the cerebellum are so compacted that they can form an immense number of connections. This part of the brain that processes balance, posture and movement is the same part of the brain that processes much of the learning and is involved in the coordination of cognitive processes.

## Brainstem:

- If you take the pons, medulla and the midbrain, together they are called the "brainstem".
- This is the stalk-like part of the brain connecting the spinal cord and the forebrain.
- The brainstem is really important as every nerve impulse that passes between the brain and the spinal cord has to go through the brainstem.

- The brainstem is sometimes called the "old brain" (as this is the oldest part of our brain) or the "reptilian brain" (this is because an entire reptile brain looks like just this bit of our brain).
- The brainstem is responsible for basic vital life and body functions such as breathing, heartbeat, body temperature, digestion and blood pressure.
- This is where instincts like "flight or fight" come from.



*a. See if you can explain in your own words a little about each of these terms: forebrain, midbrain, hindbrain, brainstem.*

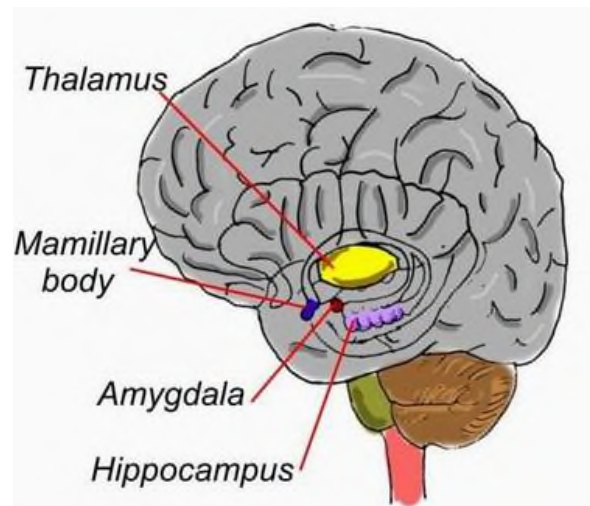
## 2. LOOKING CLOSER AT THE CEREBRUM: LIMBIC SYSTEM

This section focuses on how the brain processes information and forms memories according to the senses or emotions involved. Remember that the CEREBRUM is 85% of the brain's mass. This is where a lot of the action in the brain takes place as it is the most developed part of the brain.

### LIMBIC SYSTEM:

The limbic system (the inside bit of the Cerebrum), sometimes called the "emotional" brain or the "old mammalian" brain, is buried deep within the cerebrum, and has several components:

- **THALAMUS:** All incoming sensory info (except smell) comes here first. Acts as a relay station to the cerebral cortex.
- **AMYGDALA:** Is associated with memory and emotions. Amygdala is Greek for "almond". Smell and taste are inextricably linked and, because we often have a conditioned response to a smell or taste (eg. we may really love or hate it), memories associated with these are processed and formed here. Decides the emotional value of the information coming into the brain and if the info is it important.
- **HIPPOCAMPUS:** Is a seahorse shaped structure in the brain located across both hemispheres. Hippocampus is actually the Greek word for "seahorse". Helps convert short-term memories into long-term memories with lots of cells particularly designed to aid in memory functions. Also has the incredible ability to create new brain cells. The hippocampus works sort of like a mail processing centre, with everything coming in and then deciding where it is sent. So the





hippocampus is not where memories are stored (because they are stored all over the brain), instead it is a processing centre that decides where and how information is stored in your brain. It also "cleans up" the memory a bit before it gets stored, removing unnecessary, non-essential bits.

- **MAMILLARY BODY:** Helps to recall memories, especially smells.

Other components of the limbic system are responsible for functions including hormone production and regulation of sleep and will not be covered in this unit.



*b. See if you can explain in your own words a little about each of these terms: limbic system, thalamus, amygdala, hippocampus, mamillary body.*

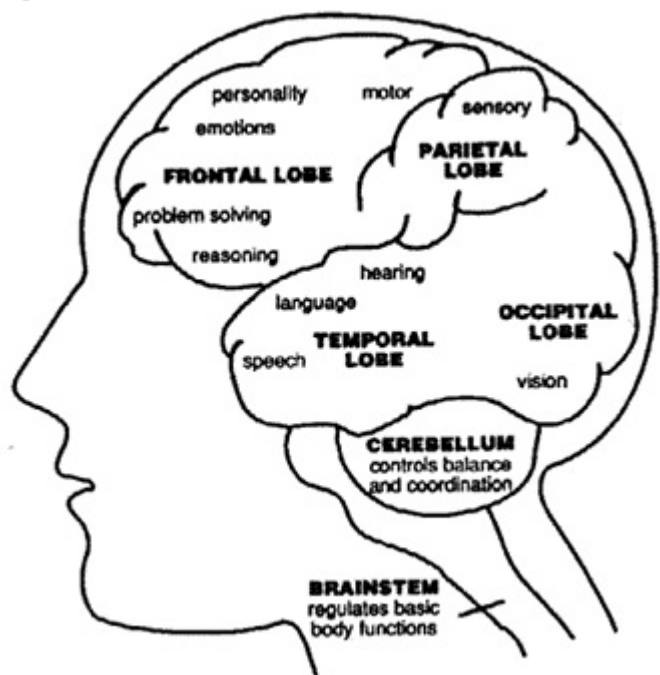
### 3. LOOKING CLOSER AT THE CEREBRUM: CEREBRAL CORTEX

#### CEREBRAL CORTEX:

The cerebral cortex (the outside bits) is the wrinkly looking outer bit of the brain where higher order thinking takes place (cortex is Latin for "tree bark" or "rind"). Both the left and right sides of the cerebral cortex can be broken down into 4 distinct areas or lobes:

- **FRONTAL (front) LOBE** is associated with: higher mental functions (such as reasoning, planning, thinking, problem solving, memory and emotions, judgment, creativity, parts of speech, movement, regulating the excesses of the emotional system, self-will), activating muscles. Most of our working memory is located here, the part just behind the forehead is called the prefrontal cortex.

The frontal lobe, the place of language and reasoning, is not fully developed until the mid 20s, this is why teenagers sometimes seem to make rash ill-thought out decisions (not you of course...). The capability of the frontal lobe to control the excesses of the emotional system is not fully operational during adolescence.



- PARIETAL (top centre) LOBE is associated with: physical sensations and movement, orientation, recognition, perception of stimuli , spatial orientation, also important for aspects of working memory.
- TEMPORAL (side) LOBE is associated with: hearing and sound and music, face and object recognition, memory, speech, also important for aspects of long-term memory.
- OCCIPITAL (rear) LOBE is associated with: vision and sight, visual processing.



c. See if you can explain in your own words a little about each of these terms: cerebral cortex, frontal lobe, parietal lobe, temporal lobe, occipital lobe.

## 4. NEURONS: OUR BRAIN CELLS

### Role of neurons:

- Your brain has 100 billion BRAIN CELLS which are called NEURONS.
- The cerebral cortex is rich in neurons, has a layer of neurons 4mm thick.
- Neurons are the key to your brain and memory. Each neuron may have up to 100 000 connections with other neurons. That's a million billion connections between cells.

*The brain is really composed of two types of cells. "Neurons" which are nerve or brain cells (about 10% of cells in the brain) and "Glial" cells (about 90% of cells in the brain). Glial cells are really like glue (Glial is Latin for glue) that binds all the cells together although they do have a multi-faceted role.*

*They used to be thought of as just support cells, filtering harmful substances out of the neurons, but now we know they may be equal to neurons in their capacity, function and importance. Neurons are the cells we are concerned with here as they are the body's communicators.*

