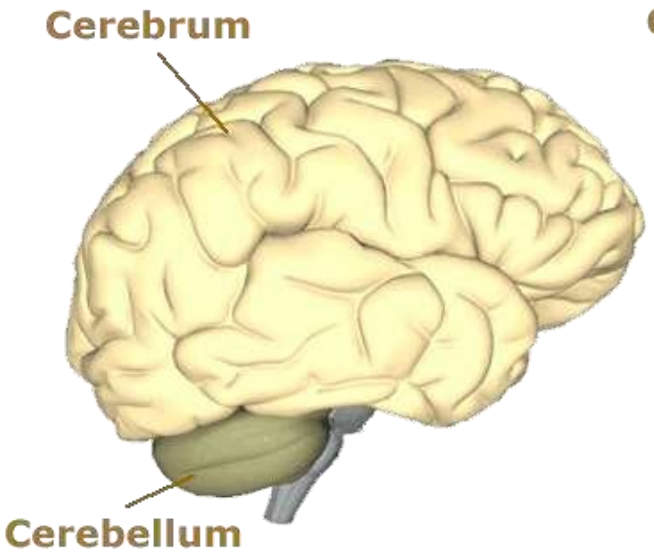
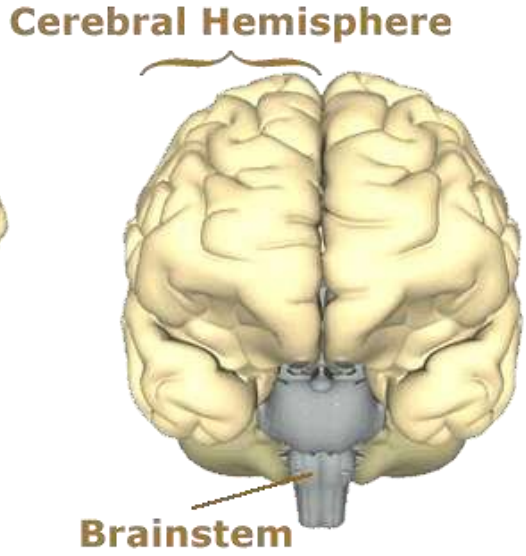
Language and the Brain

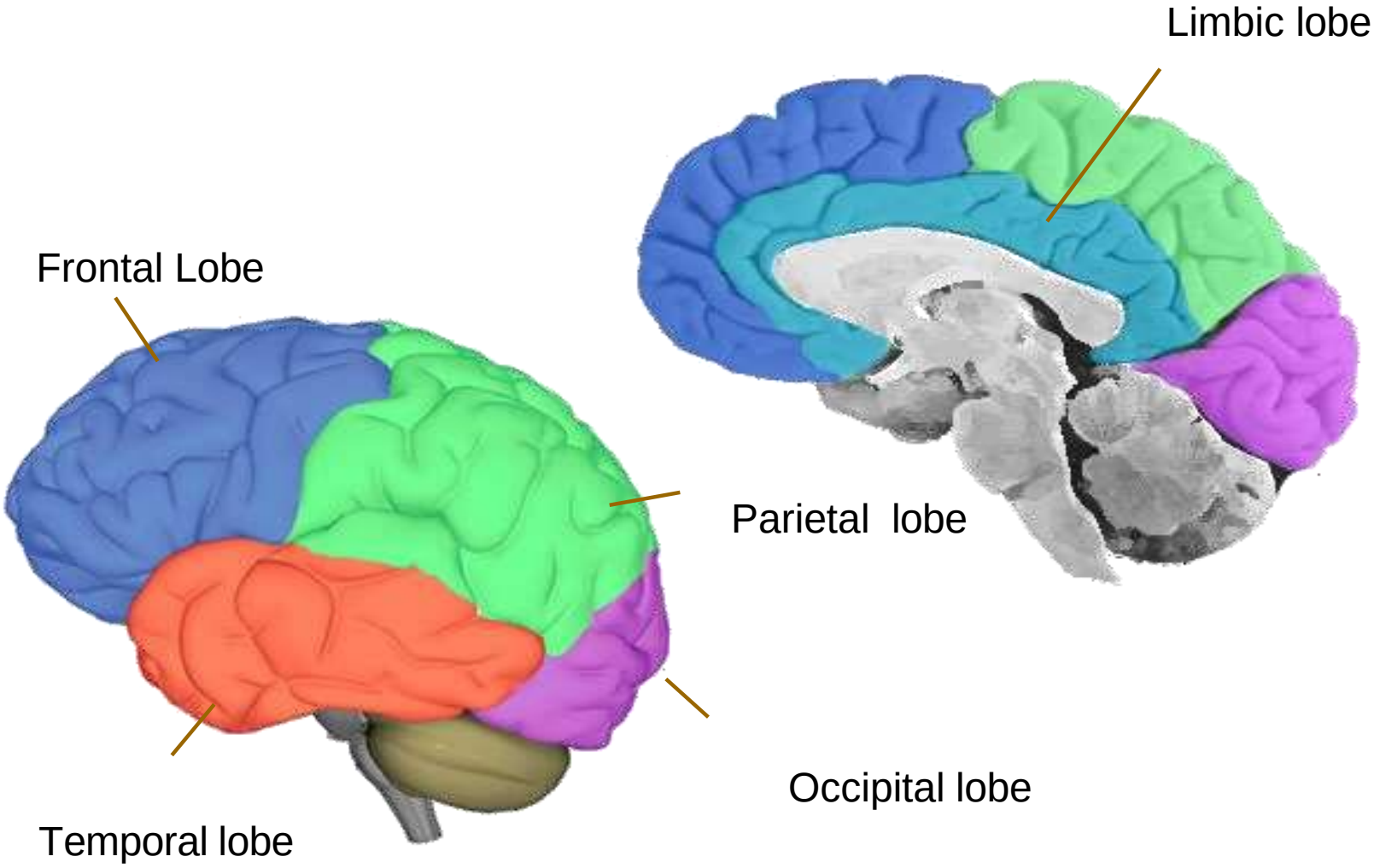
1. Parts of the Brain

1.1. External Brain Structures





1.2. Lobes of the Cerebrum



a. **Cerebellum:** It regulates balance, posture, movement, and muscle coordination.

b. **Frontal Lobe of the Cerebrum:** it is used for reasoning, thinking, emotions, mood, motivation, spontaneity, memory, judgment, problem solving, voluntary movement, language and social behaviour.

c. **Parietal Lobe of the Cerebrum:** it contains important sensory centers. It helps the person to identify objects and understand spatial relations.

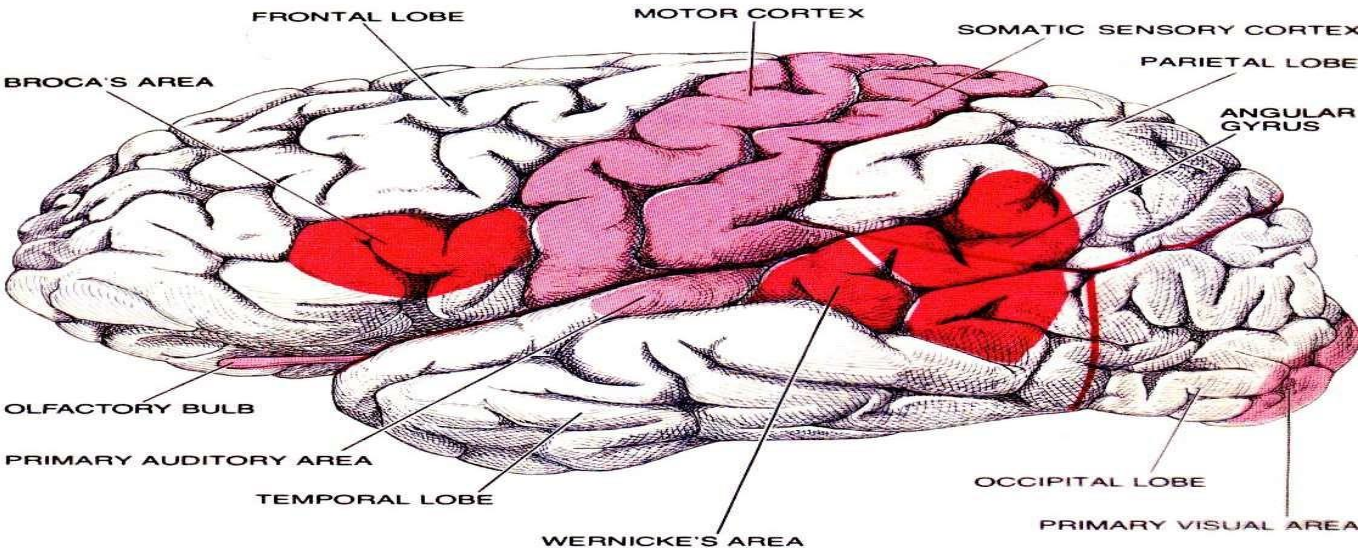
d. **Occipital Lobe of the Cerebrum:** it contains the centers of vision and reading ability

e. **Temporal Lobe of the Cerebrum:** it contains centers of hearing and memory

f. **Corpus Callosum:** it is a large bundle of nerve fibers that connect the left and right cerebral hemispheres.

All information enters the brain in the form of sensory input that is delivered to the brain via the spinal Cord, which is considered as the highway for the nerves. The information travels through the limbic system on its way to cerebral cortex.

2. Localizing Language in the Brain



The brain is proved to be composed of two different hemisphers: left and right. The latter has a bigger, wider and farther extended frontal region. Language is localised mainly in the left hemisphere more priciselly in the following areas:

a. Broca's Area: it is named after Paul Broca who reported in the 1860's that damage in this area would result in an extreme difficulty in speech production. When having Broca's aphasia, one will have a better comprehensin, non fluent speech, problems with naming, monotone intonation and uses more nouns than verbs.

b. Wernicke's area: in 1870s, Carl Wernick reported that the damage in this part of the brain causes difficulties in comprehending speech. Banish proved that people having Wernick's aphasia will produce very fluent speech, yet hardly understandable due to the paraphasias (substituting sounds or words) and poor naming as well.

C. Supplementary Motor Area: Penfield and Roberts(1950) stressed the important role of this area in linking between the comprehension and the production of speech areas.

3. The right Hemisphere and Language

The latest studies proved that damage in the right hemisphere would lead to cognitive-communication problems, impairment in memory, attention problems and poor reasoning (Cherney. L, 2001). These functions are deeply related to language learning and acquisition. Besides, the R.H is able to read concrete words and can make simple grammatical comparisons, and control prosodic features as long as there is a link between the two hemispheres. The right hemisphere is used to componsate for the breakdowns of the left hemisphere.

4. Memory and Language Learning

a. Short Term Memory: it is located in the pre-frontal cortex. It is the system used to remember information that is currently in use. It can hold three to nine items and tend to forget the middle ones when new items are added. It remembers better in chunks and when serious attention is paid.

b. Long Term Memory: it is located in the higher part of the frontal lobe; it can store information up to a time life period.

i. Implicit Memory: it is related to the unconscious recall of motor skills.

ii. Explicit Memory: it is related to conscious learning.

Memories charged with emotions are most likely to go into LTM especially those related to positive experiences.(Vered.M.2010).

c. The Working Memory: it refers to the ability to keep information while solving problems .

Educational Implication: Memory is strengthened through repetition and recalling exercises, visual and oral aids and attention games (Mckay & Solberg, 1990).

5. The Brain Differences and Language Learning

5.1. Male vs Female

Men and women use different processes in language learning in terms of memorizing, associating and creating language items.

The females system of language learning is based mainly on memorization of words hemispheres and items. Besides, they tend to use both the left and the right with larger size of communication neurons. They communicate sooner in the target language.

However, males rely mainly on a system that governs the rules of the language (analogy based processing). They tend to use their cognitive abilities without relating them to their emotional state.

Educational Implication: we cannot change the curriculum, but we can differentiate instruction. Teachers may use boys vs girls language games and allow for both types of processing when introducing the lesson.

5.2. Child vs Adult

As the newborn grows up, the sensory and the cognitive systems of the brain keep developing. This gradual development results in the difference of learning.

a. The Critical Period Hypothesis: based on the work of Eric Lenneberg, Brown (1994) concluded that there is a biologically determined period of life when language can be acquired more easily and beyond which time language is increasingly difficult to acquire. This is mainly due to the plasticity of the brain (Scovel.T,1969). For children, the brain has an initial plasticity where new cell assemblies and neural networks can be formed easily. This ability will be lost in adulthood since the brain becomes less flexible.

b. Children tend to forget all what is not meaningful or what has a negative emotional experience because the brain is not fully mature as to differentiate between what is right and what is wrong. It rather learns in terms of what is meaningful and what is not.

c. The young brains have greater phonetic sensitivity and use wider neural pathways.

d. Adults have more capability for abstractions, formal thinking, and direct perception due to the left hemisphere dominance. By contrast, childern's brains learn in an egocentric way where they associate every learning to their emotions and experiences.

e. L2 learnt in childhood is situated in regions coextensive with the L1. However, the language learnt in adulthood end up in distinct regions of the brain (Ojemann and Whitaker 1978).

Educational Implications:

The syllabus should not be simply designed according to the levels of language learning but also to the capacities of the learner according to his/her age.

Teaching L2 to children should simulate the mother tongue acquisition process since it is the best way for immature brains.

Relate the L2 to the child's everyday life experiences and encourage the use of their senses whenever possible.

Early exposure to L2 causes more connections to grow in the child's brain, which allows for easier learning of both L1 and L2. For this, languages are should be taught in the primary up to the secondary schools (Vered, M. 2010).

The Brain learning Principles What Shall Teachers Do?

1. The Brain is a Parallel Prossessor: it has the capacity to function on many levels and in many ways simultaneously. That is thoughts, imagination, predispositions and physiology operate concurrently and interactively.

Educational Implications:

Teachers should take advantage of this capacity by engaging the learners in the psychological and social aspects of language learning and involve their physiological participation (aural, oral, visual senses).

2. The brain is a pattern seeker and maker: the brain is made up of neurons through which it receives, processes and stores information. These neurons form self-organizing networks which are a sort of dynamic knowledge base. Interaction between neurons results in knowledge forming neural meanings. The latter would be stored as patterns of connected maps of knowledge. Neural connections are built, maintained and enhanced in environments that are sensually stimulating and thoughtfully and safely challenging.

Educational Implications: Learning must make sense in order to allow the creation of new neural networks. Imitate the Process of the mind as to facilitate connections to prior knowledge. Allow for limited choice of topics and provide predictable routines.

References

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