NEUROPSYCHOLOGY & BRAIN-BASED LEARNING: UNDERSTANDING THE PHENOMENON AND THEIR RELATIONSHIP

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Abstract:　The subject areas of Psychology and Neurology that study the structure and function of brain relation to specific psychological processes, come under Neuropsychology. Hence, it's a branch of psychology that helps us to understand the structure and functions of brain in view of learning. Its totally scientific in nature, however, overlaps few areas of philosophy of mind and psychiatry. It studies brain behaviour relationship and brain based learning. The human brain has approximately 100 billion neurons and the supportive cells are around one trillion. There are trillions of connections that brain make between neurons connecting various parts of the brain (Fierdorowicz, 2005). And, brain-based learning is based on the structure of the brain. Every person is born with a brain that functions just as a powerful processor (Jenson, 2007). Although learning is as natural as breathing for almost all the living beings, it can be inhibited or facilitated by experiences. Researches on brain provide us with many possibilities for education, be it for non-disabled or disabled. Brain-based learning adapts the learning style of each individual. This adaptability of the brain reinforces the fact that children have the capacity to change and grow cognitively. Educators need to combine the findings of brain research to improve their teaching techniques leading to inclusive education A popular saying favours the same: "The brain is what we have; the mind is how we use it". In this paper the researcher tries to bring forth the theories and functions of the brain, the way it works and the areas wherein immediate intervention is required.

Index Terms: Neurology, Psychology, Brain, Neurons, Adaptability, Learning.

I.INTRODUCTION

Philosophers like Kant, Plato and Descartes have contributed enormously towards mind-body relation and well-being of humans. Neuropsychology has progressed from the related fields such as psychology, neurology and biology. Neuropsychology can be stated as a branch of psychology that studies the complex yet very much needed properties of brain which is the controller of behaviour. It is a study of human brain, its various functions, thoughts and their pattern of changes etc., responsible for cognitive integrity. So, it can be understood that the study of neuropsychology shapes our understanding of all human behaviour. Let's see the theory of Brain-based learning and its relation to Neuropsychology. Brain-based learning is the implementation of a significant collection of principles that develop the understanding of how our brain works in the context of education.

Human brain

Human brain is much more developed than any animal. The average weight of brain is 1.4 kg. it is enclosed in cranium made of bones. At birth, the infant brain weighs an average 350 grams. Brain develops almost all its mass in the first few years of life. The neurons develop in the pre-natal stage while neuroglial cells develop from birth up to 2 years of age. The development of neuron and glia cells are the main growth of brain and it may be affected by environmental conditions which can lead to severe injuries causing Intellectual Disability. When one considers the enormous connections and intricacies of the brain, the mere size and complicated parts, it tends to stagger the mind. In the earliest stages of development, the brain reproduces and creates as many as 250,000 cells per minute (Ackerman, 1992).

We shall see now, how certain regions of the brain regulate behaviour and emotions, how these regions develop, and the various influences that shape their development. A brief discussion of these neuro developmental events helps in the understanding of the regulatory systems in the brain and why disruption to this leads to behavioural and emotional deregulations.

II. WHAT PARTS OF THE BRAIN AFFECT LEARNING?

Many parts of the brain are involved in learning process. Each area of the brain develops over a course of time ranging from 2 to 3 years up to eight years. Researchers are constantly trying to learn more about how the brain learns. Actually, the way it works has a substantial influence on what kinds of learning events are most effective. Educators should understand first and help students have appropriate experiences related to learning. Knowing how the brain works best allows them to form an environment that gives the student maximum probability of success in learning.

Brain is divided into three main parts:

1. Forebrain
2. Midbrain
3. Hindbrain

Forebrain

Cerebrum: Cerebrum is divided into two lateral halves called left hemisphere and right hemisphere. Both the hemispheres are responsible for sensation and motor control on the opposite side of the body. Both are connected by corpus callosum.

Four lobes of cerebrum: Each hemisphere has four lobes-

1. **Frontal lobe** – anterior part of the brain, controls and is responsible for motor activity
2. **Parietal lobe** – anterior to occipital lobe, is specialized for body senses including touch, pain, temperature and awareness of the location of body parts
3. **Temporal lobe** – located towards the left and right sides of the head, is the main processing area for hearing and some of the complex aspects of vision (recognition and motion detection)
4. **Occipital lobe** – at the rear of the head, is specialized for vision

Diencephalon – This includes **Thalamus** and **Hypothalamus**

Thalamus is concerned with the reception of sensory impulses from sub cortical level and spinal cord and relayed onto the sensory area of cerebral cortex. It is the broadcasting center of sensory stimuli such as – hearing, visual, taste, temperature, pain etc. It is also responsible for:

a. Recognition and memory
b. Control of emotional state
c. Arousal and state of alertness

Hypothalamus indirectly controls the output of the hormones. Other functions are to control and integrate the activities of the Autonomic nervous system e.g. control of hunger, thirst, body temperature, heart rate, circulatory system etc.

III. LEARNING

Getting the parts and the functions of the brain, let's understand that learning is a process directly associated with brain where a human absorb information, memorizes and process it for further use. There many things and skills that we learn unconsciously or without further thinking for example riding a bike. But there also lot of things that we learn consciously and use different strategies to learn it. (Verkko-tuter 2005). Therefore, learning is a process wherein brain is the director which provokes alteration to the human behaviour through learning from different aspects that contribute to human cognition development. So, brain and learning are the obverse and reverse sides of a coin.

Learning in cognitive domain
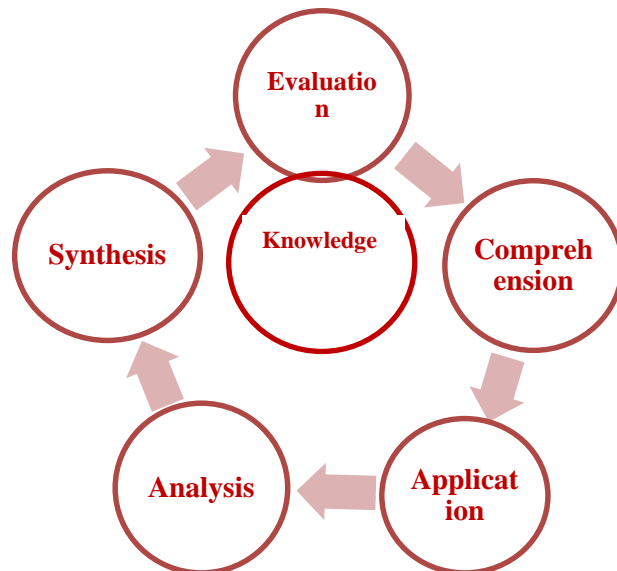
- ✓ **Knowledge** entails the recall of process, configuration, structure and setting
- ✓ **Comprehension** refers to understanding of the phenomena
- ✓ **Application** implies the abstraction in the form of general ideas with accurate procedure
- ✓ **Analysis** is the relation between the thoughts expressed and their inner meaning
- ✓ **Synthesis** involves the process of working with piece, parts, elements and combining them in a meaningful way
- ✓ **Evaluation** is the conclusion about the value

IV.THE PROCESS OF LEARNING

Learning is a process of bringing about relatively permanent changes in the behaviour of an organism, may be classified into a number of categories depending on:

a. Specific area of the behaviour in which changes are introduced
b. Methods i.e. trial and error, classical conditioning, operant conditioning, chain learning, shaping, learning through generalization and discrimination, serial learning, associate learning, insightful learning and so on.

Varied ways of learning

a. **Verbal learning**- refers to the acquisition of verbal behaviour. The language we speak and the communication devices we use are the result of this learning.
b. **Motor learning** – refers to all types of motor skills such as learning to swim, ride, draw etc.
c. **Concept learning** – refers to the mental image formed. For example, when we hear a word tree the mental image throws up into our mind on account of our previous experience, perception and imagination.
d. **Problem solving** – is the highest level in Gagne's classification. This learning requires the use of cognitive abilities like reasoning, thinking, power of observation, discrimination, generalization, imagination, the ability to infer and draw conclusion and try out novel ideas and experimenting etc.
e. **Serial learning** – means learning of things according to the chronological order or sequence in which they are to be learnt.
f. **Paired associate learning** – refers to learn by associating the word to its group or event.

V. LITERATURE REVIEW ON BRAIN-BASED LEARNING

Scientific developments are taking place every day and they keep on bringing changes to the learning approaches. Researches have provided evidence-based acknowledgements of the human brain and a better understanding on how it learns. It has given a wide platform for the several new approaches to arise. With this we need to know that brain-based learning, a student focussed approach is founded on the structure and function of the human brain.

A study conducted by G. Eda (2014) revealed that brain-based learning has a positive effect (d=.640) on students' academic achievement. In addition, it drew the conclusion that there is a significant difference between the groups while there is no difference in any effect sizes in terms of education level, subject matter and sampling size. As

Carolyn (1997) advocates that by knowing how the brain works, brain-based learning supports learning by discovering the ways of maximum learning.

Brain based learning activities have been affective on providing the retention of higher level of learning irrespective of the capability of the child. In addition, efficient communication, understanding on individual differences, open approach, dynamic involvement and the variety approach in appraisal have been established as the positive facets of the approach.

The essential point of brain-based learning is meaningful learning. Mapping is required to maintain meaningful learning. Mapping means that new knowledge is linked to previous knowledge and the new knowledge is put into the current system (Keleş & Çepni, 2006). The phrases of brain-based learning are the ones that make learning meaningful and permanent (Hasra, 2007). These phrases are relaxed alertness, orchestrated immersion, and active processing.

VI. CONCLUSION

Brain based learning environments positively affect the attitudes of students towards understanding so, it must be considered as an approach preferred in classroom. Neurologists and psychologists should come together and conduct brain-based learning researches in much more scientific way, examine how the brains of students work on which activities and can reflect the results to teaching applications. Further, researches where brain-based learning is applied can be conducted in different degrees and levels of teaching and in different areas of discipline.

In recent years, although it is stressed that the brain works as a whole, in order to develop the brain-based learning applications, Neuropsychologist must join together with the regular school system and provide need-based education by stimulating what the student wants and can. So, the strategies formed by that collaboration can be used to boost students' ability to learn in the ways they feel most contented. Brain-Based Learning research affirms that although all students can learn, each brain is unique and each student has his or her own preferred learning style (Armstrong, 2009).To conclude it can be stated that research and applications of brain-based theory for teaching and learning must continue to expand around the world.

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