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# Modern Method of Teaching and Learning through Neurocognition: An Innovative Brain Based Strategy for Teachers and Learners

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**Abstract:**

*This paper is an attempt to explore the recent approaches in teaching and learning process through Neurocognitive based teaching and learning and also discusses the significance of various types of nerve cell coordination in the process of learning and impact of biology of learning through neurocognition. The neuronal network is a connection of many nerve cells. Neurocognition in education in mainly associated with one or more specific areas of the human brain with respect to the process of cognition in learning. The paper concludes futurological aspects on the application of recent strategy using biology of learning through neurocognition.*

**Key words:** Biology, Brain, Learning, Neurocognition, Neuron

## 1. Introduction

In the modern era educational system is still struggling to apply the brain researches to human learning in the classroom. Hence first to understand how the human brain learns, what are the results of brain researches on learning, which are the learning principles derived from brain researches and what are the strategies to implement these brain researches in the class room. The human learning process in the brain is a network of many nerve cells. These cells carry information from external environment to internal organ to recognize the concept and storage in the brain.

'Cognition' refers to the process of knowing. "Meta" is derived from the Greek word which means "beyond". Metacognition refers to knowing how we know or how we learn, consciously controlling our learning process and taking ownership for our learning. Metacognition is a goal for students which teachers can encourage so that students take ownership of their own learning. Therefore, Metacognition refers to learners' automatic awareness of their own knowledge and their ability to understand, control and manipulate their own cognitive process. (Pandia Vadivu, 2014).

## 2. Related Literature

Carlos M. Gomez *et al*., (2004) reviewed a neurocognitive model for short-term sensory and motor preparatory activity in humans.

Pandia Vadivu (2010) had used concept mapping as an instructional strategy in a B.Ed Students of Biological science students.

Sridhar Ramachandran and Pandia Vadivu P (2014) reviewed emerging trends in educational neuroscience approaches to teaching and learning. The researchers mainly focused on current trends in the principles of brain-based

learning strategies and also pointed various modern methods of teaching to the present generation learners.

Sridhar Ramachandran and Pandia Vadivu P (2014) had reported the effectiveness of Neurocognitive Based Concept Mapping (NBCM) on students learning in a science subject. The researchers were developed a new strategy of teaching science through advanced concept mapping called Neurocognitive Based Concept Mapping for the first time. They conducted pre-test and post-test experimental studies. In their study an attempt has been made to assess the effectiveness of NBCM strategy on science course among high school students. Primarily, to identity the modern method of teaching and learning for the present generation teachers and students for developing instructional strategy. Secondly, how to construct, develop and learning the science course through NBCM was taught to the students. The major findings are:

i. There is no significant difference between pre-test and post-test of control group.

ii. There is extremely significant difference between pre-test and post-test of experimental group.

iii. The experimental study revealed that extremely statistically significant between pre-test and post-test at 0.01 level of significance.

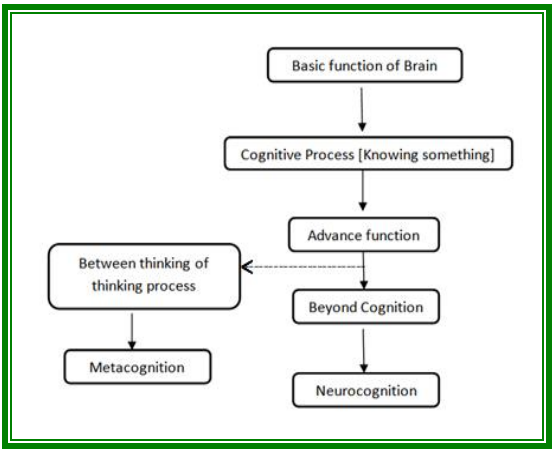
Pandia Vadivu P and Sridhar Ramachandran (2014) had reviewed the role of coding and decoding processes in learning through Neurocognitive based concept mapping.

## 3. Neurocognition

The process of cognition associated to one or more specific areas of the brain is referred Neurocognition. It involves complex neural pathway in human. (Sasikumar *et al.,* 2013).The process of cognition associated to one or more specific areas of the brain is referred as Neurocognition. It involves complex neural

pathway in human. The basic anatomy and function of brain and learning process are the two important aspects in Neurocognition. The outline cognitive process in human brain is mentioned in Figure-1.

**Figure-1: Outline Cognitive process in Human brain**




### 3.1. Neurocognitive functions

Neurocognitive functions are cognitive functions closely linked to the function of particular areas, neuronal pathways, or cortical networks.

- Brain substrate layers of neurological matrix at the cellular molecular level.
- Therefore, their understanding is closely linked to the practice of neuropsychology and cognitive neuroscience.
- Two disciplines that broadly seek to understand how the structure and function of the brain.
- Relates to perception defragmentation of concepts, memory embed, association and recall both in the thought process and behaviour.
- Discussion of general abilities is presented as a background and is followed by analysis of functioning in specific cognitive domains.

- Overall intellectual deficits are indicated by results from both general intelligence tests and composite test battery scores.

### 3.2. Neurocognitive based concept mapping

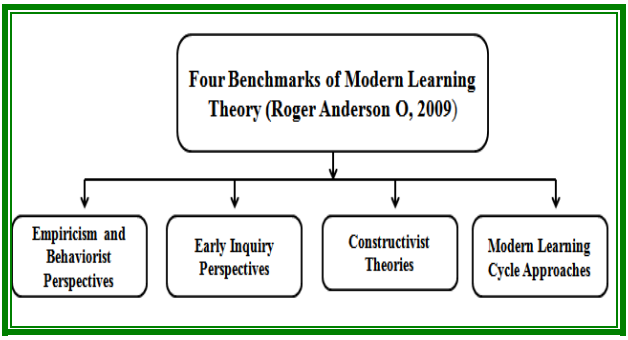
Neurocognitive based concept mapping is an advanced tool for representing knowledge and gathering information by neuronal pathway in human brain. This advanced approach can be inculcated among the learners through keyword repetition techniques, brain based learning, Learning by doing method, information processes model, whole brain technique, color coding method etc. for the enhancement of long term memory.

### 3.3. Neurocognitive Learning Theory

The three important areas in Neurocognitive Learning Theory which was propounded by Roger Anderson O (2009) in mentioned below,

a) Neurophysiology-related to the biological aspects of brain and neural activity
b) Cognitive science –representing the information processing at mental level
c) Learning theory –explains the various strategies of learning principles and methodology

**Figure-2: Four Benchmarks of Modern Learning Theory (Roger Anderson O, 2009)**



## 4. Structure and Functions of Nerve Cell

### 4.1. Nerve cell/Neuron

The nerve cell is the basic unit of nervous system. The brain, spinal cord and nerves are composed of special type of tissue called nervous tissue and are mainly composed of building block of many cells called nerve cells. Nervous tissue is made of neurons that receive and conduct impulses.

The two most important functions every neuron plays in the body are (i) to monitor and relay information or messages from one neuron to another using a combination of what are called nervous impulses and neurotransmitters; and (ii) to 'learn', as it were, by forming sophisticated networks of neuronal patterns with other cells of its type as though they were simple mini-brains.

### 4.2. Main parts of nerve cell

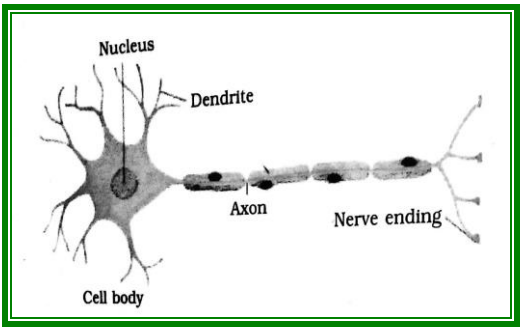
***Dendrite***-The branched part of the cell body which receives information from the external surroundings.

***Cell body***-It also called Cyton which bears dendrite and possess central nucleus (the brain/controller of the cell)

***Axon***-The elongated part of the nerve cell which receives information from Cyton and passes to nerve ending.

***Nerve ending***-The terminal part of the nerve cell and consist of knob

**Figure-3: Structure of Nerve cell-Unit of nervous system**



**4.3. Basic building blocks of human brain** (Pandia Vadivu, P., 2014)

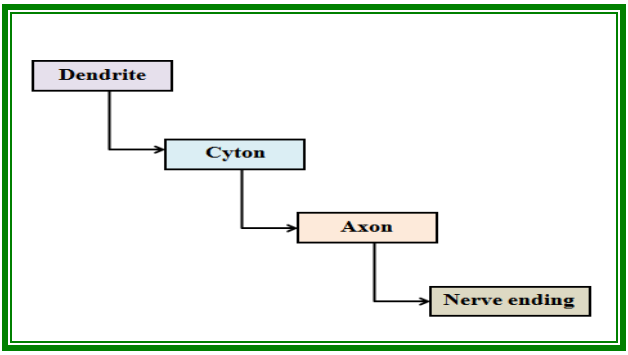
Nerve cells are the structural and functional unit of nervous system and also the basic building blocks of human brain. Since human brain is made up of network of nerve cells. The coding and encoding processes are very unique in human beings.

**4.4. The chemical building blocks of the human brain**

Our brain is composed of a multitude of simple chemical building blocks. If our eyes could look at, say, the very atoms and molecules composing our brains, we would see how the most abundant chemical substance in the human brain is water. The second most abundant chemical substance is protein, then comes the inorganic salts (a chemical mixture of metals and non-metals), lipids (mainly fats), carbohydrates (molecules having only carbon, hydrogen and oxygen in their chemical structure and which act as a source of energy for the brain), and nucleic acids. Chandrakantha Jeyabalan, Pandia Vadivu P, Sridhar Ramachandran *et al.* (2015) had reviewed the significance of biology of learning through neurocognition in the recent method of development of educational process.

These chemical substances come together to form the fundamental biological building blocks in the human brain called *neurons* or *nerve cells*. The flow of information in the nervous system is called impulse, which travels in the form of chemical and electrical impulses. The dendrite of nerve cell receives the information and transferred into nerve ending *via.* Cyton and Axon. The gap found between the nerve ending of one nerve cell and dendrite of another nerve cell is called synapse. The flow of information in term of impulse in the never cell is illustrated in the form of flow chart in the figure-4

**Figure-4: Flow of information in the nerve cell**




### 4.5. Neurons are categorized into three main types

1. ***Sensory neurons*** convey to other neurons information about the external environment i.e. they produce the sensation of sight, sound, smell, taste and touch;
2. ***Motor neurons*** utilize information from other neurons to activate muscle cells and biochemical reactions; and
3. ***Integrative neurons*** transmit information from sensory neurons to motor neurons or other integrative neurons.

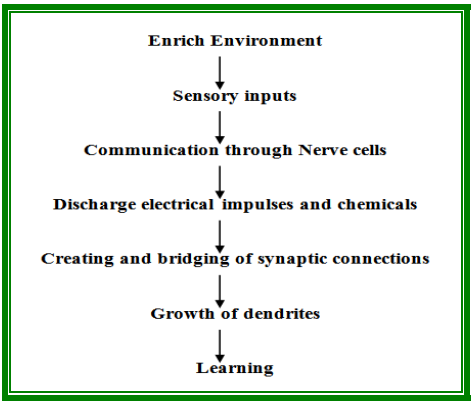
Nervous impulses are merely the flow of charged ions moving through the nerve cell. A charged ion is simply a chemical molecule that has lost an atom or two from its structure (usually temporarily), causing the molecule to develop a strong electrical charge. Neurotransmitters, on the other hand, are uncharged chemical molecules sent out by one nerve cell to the next to help with the transfer of information.

### 4.6. Role of nerve cells in Learning through Neurocognition

Rich sensory inputs enriched environment cause the nerve cells to get fired due to which they discharge electrical impulses and certain chemicals by creating and bridging synaptic

connections: these cause dendrites to grow and create the capacity for new learning.

**Figure-5: Role of nerve cells in Learning through Neurocognition**




## 5. Conclusion

The brain related processes such as coding, encoding, attention, cognition process, consolidation etc. are involved in biology of learning process of human through various aspects of Neurocognitive processes. Each process is interlinked to store the information in the human brain. The Futurological aspects on the application of biology of learning through neurocognition mentioned below,

- Neurocognitive strategy stimulates long term memory
- It is Mainly involved in the easy way of learning the content
- Information can be easily retrieved by the brain.
- It develops creative and higher order thinking skills.

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