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## Brain and Learning

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### SYNOPSIS

#### Introduction

Learning occurs when people interact, consciously or sub-consciously, with their surrounding environments, and thus this interaction creates learning experiences for them. It is known that as a result of learning experiences the people would have cognitive, affective and psychomotor behavioral changes. However, different views which put forwarded to in various times concerning how the learning occurs have led to different theories about learning. At this point, these theories which are just about to explain the nature of learning and its results can be classified as behaviorist, cognitive, affective and neurophysiologic or brain based theory.

#### The Purpose of the Study

In this study, the aim is to investigate the structure and function of brain, the ideas and models about brain and their reflection to education, learning and the main factors which effect learning with theoretical.

#### Methodology

The document analyses method (Karasar, 1995; Çepni, 2005) was used to discuss and present the existing theoretical knowledge written about the brain and learning in respect to neuroscience view drawn from the related literature. The knowledge mostly comes from major international sources.

#### Theoretical Discussions

##### The Structure and Function of Brain

Briefly stating, brain based theory mainly explains learning as a biochemical change. In order to understand the nature of this theory in a right way, it is regarded that both the structure of brain and its functions should be comprehended, and what the brain could make must be recognized. The brain looks like a web-knitted with neuron cells. The connections of recent and past information, and recalling the past information could be occurred by this web. The more frequent these synaptic connections are made, the more strengthen these are in the brain. If these are not made, then these could fade or be

forgotten. Thus, stimulating the brain with enriched experiences continuously is very important for the development of the brain (Thomas, 2001).

### **The Ideas and Models about Brain**

Many studies have been done by various scientists in order to determine how people use their brain by means of advanced technologies. Based on these studies, various models have been developed about brain's structure. It is thought that if these models are known correctly, then brain research can be adapted to education more effectively. Hebb, Ornstein, Hermann and MacLean are the most acquaintance scholars who have implemented studies into this area recently. Hebb has described learning through neurological perspectives by explaining cell group and phase consecutiveness concepts. He has argued that how learning occurs could be clarified by observing differences in a brain before and after learning. Ornstein has executed researches about which functions are specialized in the left and right brain hemispheres. He has determined that the people who use one hemisphere more than the other are unsuccessful at some works which are related to less used brain hemisphere. Ornstein has observed an augmentation at general capacity of people who were guided to use both brain hemispheres coordinately. Hermann argues that investigating the brain as four different areas is much more suitable from examining it as left and right hemispheres. Hermann has separated the brain into four areas. He has symbolized left-top quarter of brain as A, left-bottom quarter of brain as B, right-bottom quarter of brain as C and right-top quarter of brain as D. Hermann has undertaken many researches with a sample of more than one million people to determine which quarter of brain they used mostly, and what these quarters' functions were specialized. Paul MacLean has offered the triune brain theory. According to this theory, brain were decomposed three areas as reptilian brain, limbic system and neocortex anatomically and chemically. He has stated that although these three layers perform different tasks, they work synchronously and interactively (Foster-Deffenbaugh, 1996; McFadden, 2001; Wortock, 2002; Özden, 2003).

### **Neuroscience and Its' Reflection to Education**

Neuroscience is a branch of biology about brain and nerve system provides various data and related views. Recently, a working human brain could be observed by using advanced technologies such as MRI (Magnetic Resources Imaging), FMRI (Functional MRI), PET (Position Emission Tomography) and NMRI (Nuclear Magnetic Resources Imaging) (Taşcıoğlu, 1994). By these ways, a lot of factors; for example, memory, sensation, attention, patterning and their effects to learning could be scrutinized. Electrical investigation activities, clinic sample and brain imaging studies have generally been applied into electricity and electronic departments of universities and neurology and psychiatry departments of medicine faculties. Educators, particularly, are interested in brain and brain research, because it is a core organ which is directly related to learning.

Recent studies which have been done by different imaging techniques revealed new information that the human brain does not turn into constant situation. In reality, brain continuously changes and adapts renewals contrary to previous ideas. "Neural plasticity" which is developed by Marian Diamond is an important concept for education. Neural plasticity can be defined as the structural and chemical changeable ability of brain's response to its environment (Chudler, 2005). In other words, neural plasticity is the reorganization ability of nerve webs in the brain in response to the new life experiences. New information and skills which are obtained with teaching or experiences cause continually functional changing inside the brain.

### **Learning**

Recent studies on neuroscience provide new description of learning which is different from the other theories. In respect to these studies, learning is to form new dendrites or new brain structure. Putting simply, people learn because brain can change its neural circuits (Weiss, 2000; Strickland, 2003; Wolfe, 2004).

### **Main Factors Effect to Learning**

The main factors which affect learning can be enumerated as memory, patterning, attention, environment, sensation, motivation, nourishment and sleep. Memory is described as storage and re-usage capacity of information. It can be explained as firing of neuron bunches at cell dimension. The studies showed that frequent usage of brain makes neural webs strengthened. Patterning is brain's organization ability of information as categories. Patterning can be described as a great web or connected ways and tracks inside the brain. When newly learned information makes a person remember past information, the connection is built between neurons which consist of past information and other neurons which get new information in brain.

Attention is a basic element in learning and remembering is defined as focusing to think of an object or an event during a definite time. If a person does not exert upon a definite attention biologically, learning materializes difficulty. Learning can be increased with augmentation of attention. A learning environment must be designed in order to keep attention. Environment has very important role in the development of brain. An environment which provides students with sufficient health conditions, safety, regular nourishing, feedback, acceptance of the students as different individuals, giving permission for research and adapting neuroscientific data to learning environment is defined as a brain rich environment or an enriched environment.

Many researches also indicate that sensations have influence on learning and memory. Positive and negative feelings which are lived in learning environment cause different modifications in brain. Learning conditions which consisting of high level stress create fear. The effect of stress and fear in brain can be described as "downshifting". In this situation, someone performs safe behaviors to protect himself/herself instead of improving high level opinions. When someone lives downshifting, s/he does not take a risk, perceive probabilities. S/he feels himself/herself helpless and imagines restricted alternatives for treatment. Motivations and rewards make learning speed up too. It is determined that adequate nourishment abilities influence learning and remembering in positive way. Not only which foods should be eaten but also when these foods should be consumed in a day is also important. To maintain body and brain functions, a definite amount of water have to be drunk. Sleep which organizes cognitive and physical functions of body is basic component of learning. It is known that regular sleep affects the transfer of information into long term memory (Banikowski & Mehring, 1999; Ziyilan, 2001; Strickland, 2003).

### **Results and Suggestions**

Theoretical foundations, models about applications and evaluation principles ought to be clearer for brain based learning. In addition to neuroscientific data, psychological, sociological or philosophical dimensions must be taken into consideration to describe learning. Many teaching strategies which have been applied for many years and defined with experiments were gained a meaning with neuroscience and their reasons could be examined deeply. For this purpose when data provided from neuroscience harmonized with old knowledge could bring new descriptions into learning and discovery of nature of science could be provided.

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