

Brain Activities and Educational Technology

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Brain Activities:

There are close relationships between brain activities and educational technology. Brain is very important and so complicated part in our bodies. From long time scientists pay attention to that part and did many experiments, but they just reached little information like a drop in the sea. However from time to time they gave us some light to recognize the human brain, Franz Joseph Gall (1758-1828) for example put the based system or Phrenology map for the brain because he believed that the brain was made up of about 30 organs each responsible for a single trait, and his student Spurzheim (1776-1832) continue his work. But the scientists don't accept that system. Wilder Penfield mentioned that phrenology was wrong. New techniques showed us many brain activities during people doing action and thought that may be they will reach like that system in the future. Butterworth & Harris (1994) mentioned that there is a growth spurt of the brain between the age of 5 and 7 years, especially in the region of the frontal lobes. This part of the brain play an important role in planning and in the sequential origination of action and thought. So the techniques showed us many areas of brain activities. For example, (PET) scan illustrate the different areas of the brain that are activities during various tasks involving language such as hearing words; seeing words; speaking words; and generating words. In this case we need to study brain activities more and more in order to find these areas in our brain which is related to our actions. These techniques show that auditory stimulation resting state and language, music, and show various types of brain behavior. These areas used in various aspects of language activities; such as hearing, seeing, speaking, and thinking. Using techniques for recording brain activities by illuminating active parts of the brain, positron emission tomography scan and uses radioactive injections; magnetic resonance imaging uses nuclear scanning techniques. We will discuss these techniques later.

The scientists are using widely electroencephalograph to record brain - wave activity and using computer assisted axial tomography.

How Can We Study the Brain?

We have many methods and brain scanning for studying the brain. They is as follows:

a - Methods:

- 1 - Lesion and surgical ablation.
- 11 - The stimulation method.
- 111 - Electrical recording techniques.
- 1V - Histology procedures.

b - Brain Scanning:

Today the important advances have been made in the study of the brain involving the use of brain scanning techniques. Using these techniques for understanding of the normal functioning of the brain and the diagnosis treatment of brain disease and injuries,

The major scanning techniques as following:

1. The electroencephalogram (EEG) it is used for diagnosis of such problems as epilepsy and learning disabilities.
11. The computerized axial tomography (CAT) which is showing abnormalities in the structure of the brain.
111. The magnetic resonance imaging (MRI) which is improved diagnosis of such ailments as chronic back pain.
- 1V. The super conducting quantum interference device (SQUID). Using research can pinpoint the location of neural activity.
- V. The positron emission tomography (PET). Using to provide a striking picture of the brain at work.

BRIAN Hemispheres:

The Brain divided in to two hemispheres (left-brain and right-brain): This is found by Philip and Joseph, after that Roger, Ronald, Michael had made fascinating experiments on brain two hemispheres activities. So the scientists still do experiments and researches on that in order to find more and more information about brain hemispheres activities.

We know that 80 % of people are using right hand concentrated more in left hemisphere. 20 % of people are using left hand or are using both hands. People are using left hand that they concentrated more in right hemisphere. People are using both hands that they divided equally between left and right hemisphere. If teachers make students to use both hands equally in their work that means encourage them to make both hemispheres may be to work equally. On the other hand there are many differences in the structure of the brain between males

and females. So we have to investment that characteristics for create different job and different actions in the classrooms and schools.

Some scientists mentioned that females onset and fluency of speech, and speech tends to emerge slightly earlier in girls than boys , and the fact that more boys than girls have reading problems in elementary school .

Other scientists mentioned that the brain's corpus callosum is proportionally larger in human females than in males. May be that the reason make females more emotionally than males?

Culture and the Brain Activities:

The culture may cause differences in brain activities. for example Feldman (1997, 65) mentioned that native speakers of Japanese seem to process information regarding vowel sound primarily in the brain's left hemisphere .In contrast North and South America , European , and individuals of Japanese ancestry who learn Japanese later process vowel sound principally in the right hemisphere . So, the brain is working and reacting to the environment in which the individual lives in. Young children who suffer brain damage in the left side of the brain and lose linguistic capabilities often recover the ability to speak, because the right side of the brain pitches in and takes over some of the functioning of the left side.

The functioning of different areas the brain and of which are activates one area of the brain seems to process information about color. Another specializes in motion, while still another area specializes in depth perception.

The functioning of the brain and different areas of it are activated during various tasks involving language. So, we know that each eye received sensory information from both the right and left visual fields. Language requires the left hemisphere; the right hemisphere helps to modulate our speech to make the meaning clear. Even when simply reading a story, both hemispheres are at work, the left understanding the words and finding meaning, the right appreciating humor, imagery, puns, and emotional content. In this case we use human capacities in science or art, in both hemispheres. If students read more and more stories that help their both hemispheres to work at the same time.

Myers (1993, 54) mentioned that Tests reveal that about 95 % of right -handers process speech primarily in the left hemisphere. Left-handers are more diverse. More than half process speech in the left hemisphere, as right do. About one-quarter process language in the right hemisphere, the other quarter uses both hemispheres more or less equally. Such left-handers may therefore require better communication between the hemispheres. This might explain the discovery that the corpus callosum average 11% larger in left-handers. When a person reads a story the right hemisphere may play a special role in decoding visual information, maintaining an integrated story structure, appreciating emotional content, deriving meaning from past association and understanding metaphor. The left hemisphere at the same time play a special role in understanding syntax , translating written words and deriving meaning from complete relations among words, concepts and syntax . Cognitive function involves the collaboration between hemispheres control the side of the body opposite to their location. Generally controls the right side of the body and concentrates more on tasks that require verbal competence, such as speaking, reading, thinking and reasoning.

When the person performs a perceptual task, brain waves, blood flow, and glucose consumption reveal increasing activity in the right hemisphere, when a person speaks or calculates, activity increases in the left hemisphere.

Brain Characteristics:

We mentioned about left-brain and right-brain, we have to know about their Characteristics are as follows:

1 - Left Brain Characteristics: Left hemisphere controls the right side of body and right hand touch, math, language science, writing. It function visual system, letters, words - auditory system, language (speech, reading and writing), movement; memory, spatial processes arithmetic; remembers names and jokes accurately, remembers small details seen or heard, prefers solving problems by breaking them down into parts rather than by approaching the problem sequentially, using logic; prefers multiple choice test, prefers talking and writing, control feelings, includes punch lines, recalls chronological events in history, easily work fraction, percentage; algebra; and statistical math.

2 -Right brain Characteristics:

The right hemisphere controls the left side of the body and strengths in nonverbal areas; recognition of patterns and drawings, emotional expression. Right hemisphere visual system complex geometric, patterns, auditory system non language environmental sounds, somatosensory system tactual recognition of complex patterns; Braille movement memory; visual memory, spatial processes geometry sense of direction mental rotation of

shapes, left hand touch; music appreciation; art appreciation; perception sculpture; fantasy; remembers faces, responds to demonstrated, illustrated; or symbolic instructions, prefers solving problems by looking at the whole or the configurations rather than approaching problems through patterns; using hunches; prefers open-ended questions, writes metaphorically or makes up stories to tell, gets lost in the present moment rather than keeping track of time, acts spontaneously to change plans on the spur of the moment, easily does geometry and graphing, senses moods of individuals and groups quickly and accurately.
Creative and intuitive people were to be used the right hemisphere.

If we recognize these characteristics we can help students to choose their specialization. Some times we can find some students have special or unique abilities if we encourage them may become famous people. For example, the cases of Christopher, Nadia and Simon.

Butterworth & Harris (1994 - 218) reported the case of Christopher, who has an unusual ability to learn foreign languages, although he has a low IQ (scoring between 42 and 75 on a range of intelligence tests); Christopher was able to speak 16 languages in addition to English, many of them fluently. He also was able to learn new languages very quickly and was able to take part in a Dutch television program after only a few days learning Dutch from a book.

Butterworth & Harris (1994 - p 158) mentioned that an autistic child called Nadia who was exceptional gifted in drawing. By the age of 5, Nadia was drawing pictures of horses, cockerels, and cavalymen from memory, in realistic perspective. She was working with her left hand. Nadia lacked language and her gross motor development was very retarded, but she could produce these exquisite drawings and her drawing differed so much from those of normal children by her age.

Another autistic child called Simon who could draw building as complex as the Houses of Parliament in realistic details, both from memory and directly. This belief led to a claim that subject matter and teaching strategies should be developed to educate one hemisphere at a time.

Some researches gave intelligence tests to autistic children and found that 60 % of autistic children have IQs below 50, 20 % have IQs between 50 and 70 and only 20 % have IQs over 70.

Individual differences affect common understanding:

There are many ways that individual differences affect common understanding such as :

- 1 - Differences in attention at the level of the sensory register and working memory.
- 2 - Differences in the quality of working memory.
- 3 - Differences in the strength of semantic long-term memory.
- 4 - Differences in schemes as a basis for attention and reconstruction.
- 5 - Differences in the quality and quantity of episodic recall.

Memory and Brain Activities:

There are many brain structures involved in memory such as: Amygdala, hippocampus, thalamus, mammillary body basal forebrain and prefrontal cortex.

Memory means the process by which people encode, store and retrieve information. Memory divided into three stages. In this three stages model of memory, information initially recorded by the person's sensory system enters sensory memory, which momentarily holds the information. Then it moves to short-term memory, which stores the information for 15 to 25 seconds. Finally the information move into long -term memory, which is relatively permanent. The movement of information from short-term to long-term memory depends on the kind and amount of rehearsal of the material that is carried out.

Iconic Memory: The process that reflects information from our visual system

Echoic Memory: The process that stores information coming from the ears.

Rehearsal: The transfer of material from short-to long -term memory via repetition.

Working Memory: Baddeley's theory that short-term memory comprises three components: the central executive, the visuospatial sketch pad, and the phonological loop,

There are four different types of long term memory:

a- Declarative Memory: Memory for factual information: names, faces, dates, and the like.

b- Procedural Memory: Refers to Memory for skills and habits such as riding a bike or hitting a baseball. Sometimes refers to as non declarative memory

c- Semantic Memory: Memory that stores general knowledge and facts about the world (e, g, mathematical and historical data).

d- Episodic Memory: Memory for information relating to the biographical details of our individual lives.

Explicit Memory: information or conscious recollection of information.

Implicit Memory: Memories of which people are not consciously aware, but which can subsequently perform and behaves.

Kail , (1990) mentioned that children who have learned that rehearsal helps them in remembering information , which results in improvement on tasks requiring memory for large amounts of material .

The children experts had better memory for positions and could remember some situations more than the adults.

Areas of Brain which are Involved in the Learning:

We have to know about some areas of the brain which are involved in the learning time:

- 1 - Cerebral Cortex Extensive, wrinkled outer layer of the forebrain governs higher brain function, such as thinking, learning, and consciousness.
- 2- Hypothalamus governs emotion and stress.
- 3- Cerebellum involves in motor behavior
- 4- Frontal lobes involves in speaking and making plans and judgments.
- 5- The Cerebral Cortex (the top portion of the cerebrum) is divided into two hemispheres which we mentioned above, the right and the left hemisphere which are connected by the corpus callosum.

EDUCATIONAL TECHNOLOGY:

Educational technology can be defined in many ways.

Ellington &his colleagues (1993, 9) gave definitions as follows:

“Educational Technology is the development, application and evaluation of system, techniques and aids to improve the process of human learning.”

“Educational Technology is the application of scientific knowledge about learning, and the conditions of learning to improve the effectiveness and efficiency of teaching and training. In the absence of scientifically established principles, educational technology implements techniques of empirical testing to improve learning situation.”

Ridha (1997; 384-385) and Riza (2000; 40-41) defined educational technology as being “An amalgamation of systems derived from scientific data to be applied in broad areas of education, dealing with specific objectives, contents, instructional methods, audio visual aids, measurement and evaluation, creating a proper environment for learning, aiming at use of teachers and students’ power in a proper way in order to solve the problems of education, raise the quality of learning and highlight the productivity.”

From these definitions seem that educational technology play an important role to improve the process of human learning and applies scientific knowledge in order to achieve this purpose. It is a systematic way of designing of human learning. Educational technology raises the quality of learning and highlights the productivity. So, Educational technology stimulates human brain in different ways.

When we teach the students we use technology. The technology helps us to communicate our ideas to audiences in many ways. So, there are many technological aides such as compute, television, video recorders, films, filmstrips, photographs, audio aids and so on. People are using computer widely in the schools and at home. The computer motivates them to use it more and more because the computer’s program stimulates two hemispheres by movements and different colors and sound.

Thus, **the technology breakthrough associated with the computer comprises the centerpiece of postindustrial society and provide** a unique and particularly relevant insight into both the rate and the direction of change.

Typically, computers in the classrooms have been used for drill and practice, simple programming and educational game. Computers offer the potential of reshaping education, for example could teach foreign language or even give voice lessons on one - to one basis. Many school activities can be conducted on home computers tied to schools electronically.

Perhaps the next breakthrough will be artificial intelligence computers that can counsel us on our professional and personal lives, becoming mechanical advisor and friends. If the pace and direction computer technology continues, whatever shape the next generations of computers takes will undoubtedly have a profound impact on our lives within and beyond the classroom. From day to day commercial computer companies give new design and new capacity of computer programs.

The Use of Technology in Education:

We know that students spend hours and hours at computer on various subjects. Computers become the focus of attention, instructional and learning aid. Computer is more available for use to teach many subjects especially science in different levels from primary school to university and higher education than at any other time. We have to emphasize on knowledge of computer technology about job opportunities associated with computer and so on, understanding computer applications, understanding computer programming that is attractive to children and help them to easy learn and understanding the use of computer in solving problems. For example intellectual thinking and solving problems skills to be gained when a child learns to use LEGO. Computer drills can be used in a number of areas including biology, spelling, arithmetic, foreign languages, social studies and computer acts as a tutor with the students directly interacting with the computer to learn new material.

The computer simulation allows students to perform experiments that cannot be done in the classroom to activity apply knowledge to a problem scenario and to graphically see the results of changing elements of situation.

Computer games have been created for many subjects, including language, mathematics, logic, physics, chemistry, biology, economics, business, medicine, geology, useful as information storage, retrieval systems for students doing research, can improve achievement by focusing students attention on the relative areas of concerning and by reducing the extraneous activities. In that case computer makes two hemispheres to work probably because give to the students chance to choose subjects which is fit with their abilities and motivations.

Recommendations:

1. Encourage your students to use two hemispheres.
2. Try to make your students to us different actions at the same time such as, talking, listing and looking.
3. Encourage your students to use music, painting, and so on.
4. Try to use different colors in the classroom.
5. Encourage your students to solve problems.
6. Let your students to express their opinions.
7. Let your students to read more stories and poems.
8. Discus with your students what they learn from computer and other aides.
9. Try to use different aids and don't use just one aid.
10. Try to use different actions and don't use just one kind of action in the classroom.
11. Teach your students how to use two hands when they won't to write some paragraph.
12. Teachers must know about those brain actions. So they can give their students material and help them to us tow hemispheres as usual.
13. If the teachers know about the students left hemisphere function he can give them information which is related with that action.

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