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# Effects of conditions on learning and brain

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**Abstract**

Hart (1983) called the brain "the organ of learning." He advocated learning more about the brain in order to design effective learning environments. How learning occurs in the brain? Learning occurs when we construct meaning and understanding of our experiences. Construction of meaning is the natural function of the human brain. We integrate and synthesize new information into our existing understandings to make sensible meaning. The brain appears to become more active in its search for meaning when it encounters information and experiences that fail to fit its existing patterns of meaning. So, we can perform education with brain-compatible situations. Learning is getting better way in these situations. In this context, the purpose of this study is examine to effects of the situations (for example: environment, stress, music, food, water, movement) on learning.


*Keywords:* Brain; learnin; brain compatiple learnin; learning condition;, effective learning.

## 1. Introduction

Learning in general meaning is the change of thought, behaviour and perception of the person due to his interaction with environment. But there are different opinions that how it occurs. The theories that analyze the nature of learning and its effects split into four groups:

1) Behaviorist , 2) Cognitive, 3) affective, 4) Neurophysiologic

Behaviorist theories consider that learning is formed by the way of setting a net between stimulator and behavior also the change of behavior occurs due to stiffening. According to the cognitive theories learning is a non-observable process. Affective learning theories are more interested in effects of learning than its nature. Hebb, who systematized Neurophysiologic learning theory, which is also known as Neurophysiologic learning theory, claims that nature of learning cannot be explained unless it is not known how the circuits at the brains works. Brain is the centre of human being's mind, motivation and learning. (Ozden,2003, p. 21-46).

For many aspects, brain is also an organ such as lungs or heart. Every organ has its own process. Brain learns, because learning is its function. What is more, brain has an endless learning capacity. Regardless of age, gender, race or cultural background, every healthy brain is equipped with many perfect diagnostic qualifications. These are:

- Revealing connections and making appropriate guesses
- Factual capacity of various types of memory

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- Learning due to the experiences by the way of analyzing out-data and with the ability of thinking on its own. Correcting ourselves by this way
- Endless creating ability

Considering that everyone has these capacities we should ask that why we struggle with our edification faculty so much. One of the main reasons for that is we have still not able to explain brain's learning system in detail. We can reach our brain's hidden capabilities and we can perform effective learning when we comprehend all of the possibilities and all of the processes. With Hart's sentences (1983), we can talk about "the education which goes along well with brain" and "the education which conflicts with brain". It is very important to be apprehended the difference between them. (Caine and Caine, 2002, p. 3-4).

Through the brain is one of the most important organs which are related to learning process, it gives us a hint of learning process to know how it works. Human brain does not work as in the way the television or the radio does. The input, its source, its length, its usage is interrogated by associated with previously learnt data. The brain not only receives the information but also processes it. To explain more technically, the researches having done on brain show that it is parallel processor and able to perform countless transactions simultaneously. The fact that brain learns in complex processes emphasizes the importance of multiple, complicated and concrete experiences for expressive learning and teaching.(quoted by Açıkgöz,2003, p. 2).

## 2. Method

In this study document analysis method is used (Karasar, 1995). In this context besides the information of brain structure, the issues which effect learning process (environment, stress, music, food, water, action) and how to perform more efficient and effective learning is also dedicated.

*2. 1. Environment and Brain:* Today it is agreed among experts that the brain's performance is genetically installed at the rate %30 to %60 and it is constructed by the effect of the environment at the rate %40 to %70. (Jensen, 2006, p.30).

Carol Venolia (1988) states "Disharmonious environments can be sources of physical and mental stress". So any environment in which you are planning on spending time should include the key elements that promote health, relaxation, and positive emotional feelings. The environment should encourage interaction, be aesthetically pleasing, and above all else, do no physical harm. (Kaufeldt, 1999, p.21).

The environmental factors which affect teaching are; clean air (oxygen), colours, smell, lighting, plants, noise and etc.

Though the brain has a seventieth of the body's weight, it consumes a fifth of the oxygen that is needed for the body. In clear and high quality area there is more oxygen than carbon dioxide. The researches have confirmed that breathing clean air affects well both mental activities and remembering. In fact, the feature of the medicine which is claimed to raise attention and memory performance is just to raise the amount of the oxygen which goes to the brain. While the dolphins change %80 percent of the oxygen inside at every breath, this rate at human beings is only %20 percent. Oxygen is the energy source of body. Sleazy or moldy air does not give energy. Should we pay more to raise the amount of the oxygen which goes to the students' brain at the classes? No. To open the class windows will always be enough for that. Advise to your student taking a deep breath whenever you open the windows. Or develop a game for that. Say them you will look at the ones who take deeper breath. (Erlauer, 2005, p.20).

Lighting is an environmental factor that effects the whole class also learning process. At a research on this subject it is confirmed that students who studied at a lightened class outperformed the students who studied at a dim class (mathematics %20, reading %26). Moreover it found some evidences that fluorescent light may have detrimental effects. (Jensen&Dabney, 2000, p.27).

Color is a truly powerful medium; and one that is generally underestimated. A recent study (Vuontela, et al. 1999) measured the relative value of verbal cues versus color cues in learning and memory. In testing memory for verbs and memory for colors, learners better recalled color. And when objects were tested against color, once again, color memory was stronger. Even an intention to remember did not affect the outcome of the experiment. You might wonder, "Why does color have such an impact on our brain?" Consider this: Color is part of the spectrum of electromagnetic radiation. Other electromagnetic radiation forms include x-rays, infrared, heat, and microwaves'-pretty powerful mediums. Color is no different. In his book, *The Power of Color* (1991), Morton Walker cites research conducted by Robert Gerard, PhD. of University of California, Los Angeles who studied the physiological effects of color on anxiety, pulse, arousal and blood flow. His finding suggest that every color has a wavelength; and every wavelength, from ultraviolet to infrared (or red to blue) affects our body and brain differently. How a color affects you depends on your personality and state of mind at the moment. If you are highly anxious and stressed, for example, red can trigger more aggressiveness. But if you're relaxed, it can trigger engagement and positive emotions. (Jensen, 2000a, p.56). For the best learning, yellow, light orange, beige or light grey types of colours should be preferred.

Researches done in recent years note that the colors have amazing qualities which are also learnt by the brain and effects mood and efficiency. For example the wonderful smell of a delicious meal, the smell of a perfume or a frowzy book can easily recall our past memoirs. When you are teaching at the class or carrying out an experiment, you can raise your students' attention by using vanilla or mint scents. Moreover there may be allergic student against cigarette or perfume. You should be careful against these situations. (Jensey and Dabney, 2000, p 31)

Choice may be the most important variable when it comes to classroom temperature. There is a wide variety of perceptions as to what constitutes a warm or cool room, say Rita and Kenneth Dunn (1992). The optimal is not always 68 to 72 degrees Fahrenheit for all learners, says P.G. Murrain (1982). Preference difference exists among individuals in and across the same age groups; and they can change from day to day depending to mood, weather, and numerous other factors. Having said that, however, 70 degrees (give or take a few degrees) is still a good baseline for optimal temperature in the learning environment (quoted by Jensen, 2000a, p. 64).

Scientists at the National Aeronautics and Space Administration have discovered that the use of plants creates a better learning and thinking environment for astronauts (Wolverton 1996). Could this research also apply to other indoor learning environments? Dr. Wolverton, who headed up NASA's Environmental Research Laboratory in the 1980s, says that certain plants have improved life for the astronauts (and he adds, his own personal life at home) by removing pollutants from the air, increasing the negative ionization in the atmosphere, and charging the indoor air with oxygen. In fact, Federal Clean Air Council studies (ibid) found that plant raised indoor oxygen levels and increased productivity by 10 percent. A single plant may impact 100 square feet of space. (quoted by Jensen, 2000a, p. 65). One easy way to create an enriched natural environment is to bring in a variety of plants. Several varieties are hardly enough to live under the fluorescent lights and chalk dust found in many classrooms: coleus, spider plants, fichus, and of course, many succulents and cacti. Hanging plants near windows can be a beautiful addition to a classroom. (Kaufeldt, 1999, 27).

*2.2. Pressure, stress and brain:* At Hippocratic Oath it is emphasized that the first rule at the medicine is never to damage patients. This is so valid for educationalists, too. The excessive pressure and stress factors are among the main reasons of a deficient teacher. (Jensen, 2006, p.52)

Pressure was used as a weapon to regularize human beings behaviors' for quite long time. The mostly used pressure types by the teachers are detainment at the class, giving low grades or exclusion the students from some prerogatives. Many students do not care these kinds of pressures since these pressures are considered insignificant. Briefly, the pressure has not considerable sanction on changing behaviors. (Jensen,2006, p 52-53).

As a teacher I have witnessed students reacting defensively in the classroom. Test anxiety is a classic example. It is often marked by a physical reflex response: upset stomach, perspiration, dizziness.

Erlauer (2003) explains the teacher behaviors that effect student stress as:

Table 1: Teacher behaviors that effect student stress

| **The behaviors decrease student stress** | **The behaviors increase student stress** |
|---|---|
| Making clear class rules and determine the situations if made an exception to a rule | Punishing the students according to his/her mood |
| Informing the students sensitively. E.g. behaving to them regarding the individual features and their classes | Considering the students as charged. To bore the students for the sake of success |
| Talking to student respectively, calling them with their names, approaching everyone sensible | Calling students as if s/he were their boss |
| Taking assessment, such as rubric, into consideration at evaluation. Expressing what is expected from the students is their learning. | Making quizzes to students at the subjects they haven't studied |
| Smiling, amusing education, expressing humor senses | Never smiling. Always shouting at students at every mistake |

Chronic stress lowers the ability of the students to determine what is important and what is not. (Gazzania, 1988) Jacobs and Nadel (1985) note that stress effects thinking abilities and memory, too. Short term memory and long term memory functions are limited under stress. It also causes the students become diathesis. A research showed that the student's immune system is limited during the exam term and consequently their resistance to produce antibody slows down. (Jermotte and Magloire, 1985, quoted by Jensen, 2006, p. 53).

A stressful physical environment is nearly related to student achievement. Crowdedness, poor student relations and even lighting may be a problem. Generally a stressful student breathes hardly. This situation damages short and long term learning. Eyes become more careful to the stimulus. That causes inefficient reading since the eyes are hooked on a point. (Jensen, 2006, p. 54)

*2.3. Music and Brain:* Research has shown that music causes the brain to release endorphins, the body's own pain reliever. When there is no pain and endorphins are released, the body experiences a pleasurable feeling (Sprenger, 2002, p.100). At the very least music can enhance the learning environment by calming our nervous systems; but recent studies are suggesting that music can also improve memory, cognition, concentration and creativity (Jensen, 2000a, p.69).

Justine Sergent, who is from Montreal neurology Institute, signs that listening to music actuates the two hemisphere of the brain. When one listens to music, learns how to play an instrument or setting a poem to music, the left hemisphere is activated. How does music contribute to enrich the brain? It is a good tool to stimulate the brain, to transport the words and trigger activation. Stimulation means increase or the decrease of the neurotransmitters which are related to attention. For example the melody of the Rocky may be a good sample to refreshing music. It undoubtedly affects the students' attention and learning. According to the research that is published at the Magazine Principle done on $8^{th}$ and $9^{th}$ class students, listening to background music increased the students' reading performances. (quoted by Jensen, 2006, p37)

Jensen (2000a, s.248) says the learning benefits attributed to music are;

- Relaxation and stress reduction (stress inhibits learning)
- The fostering of creativity through brain-wave activation
- The stimulation of imagination and thinking
- The stimulation of motor skills, speaking, and vocabulary
- A reduction in discipline problems
- The focusing and alignment of group energy
- Vehicle for conscious and subconscious information transmission.

*2.4. Food, water and brain:* Actually you are whom you eat. Whatever you eat is converted to energy and neural waves by the brain. According to Restak, brain's working functions are more related to what we eat at breakfast. Many students and teachers do not have nutritious breakfasts and do not drink enough water for brain functions during the daytime. At schools, facilities' must be provided for the teachers and students to drink enough water. (Sylwester, 2000, Quoted by, Duman, 2007, p.147-148)

Do the healthful foods which are especially beneficial for brain exist? Yes, there are many beneficial foods for the brain but children do not like lots of them. Green leaved vegetables, salmon, nut, walnut, lean meat and fresh fruit are beneficial for the brain. (Connors 1989) Calpain clears synapses and contributes to solution of proteins. (Howard, 1994). That causes an effective neural transferring and contributes to learning. The sources of Calpain are milk and milk products such as yoghourt, and also spinach, kale and etc. Many children eat only to get full and have no information about foods or importance of aliment. This is an important point because the neurons myelination goes on till the age of 25 and the brain goes on developing till that age. (quoted by, Jensen, 2006, p.26)

Water is the second favorites thing for the brain. According to the previous beliefs human beings need to drink eight glasses of water daily which is absolutely correct. Not all of that water amount is spent for the body but some of it is spent for the brain. The brain consumes much water compared to other organs in the body. It means that thirst effects the brain directly. The one of the causes of the students who lays on the desks is thirst. (Erlauer, 2003, p.43)

Since the brain is consisted of much water compared to the other organs in the body, thirst effects the brain too rapidly. That causes the decrease of attention apathy. Children need water much more. Cola, fruit juice, coffee and tea make the body need excretion more rapidly therefore they are not able to deal with our water need. Both teachers and students should be encouraged to drink water. The families who know the importance of water should provide their children drink water instead of tea, cola or the acidic drinks. (Jensen, 2006, p. 26)

*2.5. Moving and Brain:* What is the role of movement in learning? Why should students get up and move around? One reason that many students think that school is boring is the amount of seat work that middle school, secondary school, and college teachers –and staff developers- demand. Although people can learn while sitting in chairs for an extended time may be misguided. The human body, for the last 400.000 years, has primarily been walking, sleeping, leaning, running, doing, or squatting. It has not been sitting in chairs, which are a relatively new invention in human history, only used for the last 500 generations. The typical students who sits much of the day runs the following risk: poor breathing strained spinal column and lower back nerves, poor eyesight, and overall body fatigue. We expend much energy just to maintain a posture, even a bad one. (Jensen, 2000b, p.34-35).

Sitting in any chair for more than a short (10 minute) interval is likely to have negative effects on your physical self, hence your mental self, and at a minimum, reduce your awareness of physical and emotional sensations (Carnz, 1988; quoted by, Jensen, 2000b, p.35).

Be purposeful about integrating movement activities into everyday learning. Provide much more than mere hands-on activities. Facilitate daily stretching exercises, walk and talks, dancing, role playing, seat-changing, quick energizers, and movement games (Jensen, 2000a, p.167).

*2.6. Sleep and brain:* Deficient sleep has negative effects on learning. Sleeping is the time for the transferring the information from short term memory to the long term memory. (Lock and Prigge, 2002) one of the factors that effect learning is sleeping. Brain needs physiologically relaxation to perform its best. The learnt information is digested and arranged during sleeping. Searcher Bob Stickgold claims that the sleeping duration effects the previous day's learning. During sleeping, much unnecessary information, memoirs are deleted and neuron net gains efficiency due to sleeping. That process provides us much more efficient brain functions. (quoted by Eyuboglu, 2004). Sleep deprivation can cause significant problems. The ability to learn and remember can be hampered. Accidents are more likely to happen. A lack of sleep can contribute to depression, and some sleep-starved children exhibit characteristics of ADD (attention deficit disorder) or hyperactivity. (Sprenger, 2002, p. 110).

Molecular biologist Dale Boger shows that the hormone which is secreted at adolescent causes the teenagers go to bed latish and not to be able to wake up at 8.00 o'clock. Erman says that "high school students are devoid of uninterrupted sleeping thus it is very difficult to perform their cerebration. At the studies it is found that the adolescents who wake up later the ones who does early are more successful. (Quoted by, Jensen,2006 p.24). carskadon and Carey (1991) suggest that classes should start later comparing to the ones at primary and secondary schools. For primary schools it is appropriate to start the classes at 7.30 am but it is 9.30 for the secondary schools and high schools. The application of late start of the classes at Texas Corpus city has provided decrease at the discipline problems, more awake students and effective learning. In order to make our students learn the subjects better and process efficient learning, we should provide them enough and healthy sleeping. (quted by, Jensen, 2006, p.25).

## 3. Conclusion and Suggestions

It should be comprehended well that learning is too complex to be explained by using biological terminologies, full of mysteries and difficult to be understood completely. Explicating learning in detail, we should deal with not only its one point but also its psychological, sociological, philosophical and even historical basis. (Gulpınar 2005, quoted by Keles and Cepni 2006). The studies done on brain enables us to notice the things we have never thought on and consolidating of our previous learning. Therefore the brain structures should be taken into consideration in order to get benefit of the factors which effect learning process. Thus we can achieve learning at the top level.

Dr. Marian C.Diamond, who is one of the most significant experts on neuro suggests for a healthy brain and learning at his book "successful aging of the healthy brain" that (quoted by, Özden, 2003, p.50-51);:

- Oxygen is the basic commodity of the brain. We should do exercises to deliver more oxygen to the brain.
- The water rate of the brain is higher than any organs in the body. Thus, our brain is the one ehich mostly effected by thirst. We should avoid staying thirsty.
- Aliment is very important for our brain as it is also for the other organs. Soybeans, egg white, peanut and liver are source of acetylcholine which is neurotransmitter that enables the connection between our nerve cells. White meat, potato, carrot and trout are also source of vitamin $B_6$ which produces neurotransmitter.
- Antioxidants are important for brain maintenance and aliment. The foods that includes vitamin C and E, especially strawberry and blackberry are good for the brain.
- Calcium is very crucial for increase of nerve cells and their condition.
- The abundance of the oxygen rate at the blood increases learning performance. Therefore we should often do sportive activities.

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