The biological and psychological basis of learning and memory essay

Business

The means by which the brain performs are referred to as neuroprocesses, which are related to learning and memory.

The brain is the center of every function of the body that controls functional learning and memory and how the two are interdependent. Learning occurs when the memory is stimulated. The memory is activated once learning has taken place. With knowledge at the center of attention, it is imperative to stimulate the brain through lifelong learning to achieve longevity and quality of life. The brain is the center of every functioning part in a human body. Every process stems from the brain.

The central nervous system is an intricate menagerie of cells, neurons, cords, nerves, and many other parts that act as the computer center for our bodies. Neuroanatomy is the make-up of the central nervous system. The processes by which the brain acts or performs are neuroprocesses. Learning and memory are two similar neuroprocesses that cannot function without each other. The brain responds to experiences or memories from the past and learns how to function in similar situations in the future. When the brain receives changing information or variations from experiences learning occurs in the brain. Memory takes into consideration how the learned experiences are stored and reactivated (Pinel, 2009).

The act of learning occurs when two neurons communicate by sharing signals, receiving, and recalling information. Moreover, the processes responsible for learning are spread out over multiple areas of the brain and are classified into three different networks; recognition, strategic, and

affective. The recognition network receives sensory information from the environment and transforms it into knowledge.

It identifies and categorizes what is seen, heard, or read. The strategic network is recruited for planning and coordinating goal-oriented actions. Finally, “ the affective network is involved in emotional dimensions of learning such as interest, motivation, and stress” (Hinton & K.

M. -C, 2008, p. 90). Additionally, the cortex specifically the lateral prefrontal cortex, the temporal lobe, and the basal ganglia are main processing areas for learning. Neurons in the cortex and basal ganglia respond upon learning. To learn, memory storage areas in the brain must be tapped into to recall the information. The specific learning cells in the prefrontal cortex and basal ganglia exhibit signals relating to the outcome of human response and the behavioral cell’s signals shape learning.

According to a study at Harvard in (2009), our observations may represent a snapshot of the learning process-how single cells change their responses in real time as a result of information about what is the right action and what is the wrong one. The temporal lobe is mainly responsible for cognitive development or learning and memory. The brain has multiple portions that allow us to process memories, which include the hippocampus, amygdala, basal ganglia, cerebral cortex, parietal lobe, frontal lobe, temporal lobe, and supramarginal gyrus. Damage to any of these areas can cause short-term memory loss, amnesia, or permanent loss of memory.

Further, the hippocampus is associated with various functions of memory, which is responsible for creating mental maps, converting memories from short to long term, and encoding memories. Forming memories from experience without the hippocampus is possible, but damage to this area of the bran can inhibit the ability to form new memories to describe events. Located below the hippocampus is the amygdala. It responds strongly to emotional stimuli, especially fear. The neurons in the amygdala encode and enhance memories creating more consolidated, deep, and accurate recollections of events. This process of transferring information creates one long-term memory.

Moreover, the basal ganglia are associated with both learning and memory, which is are responsible for the unconscious memory processes. These include motor skills and implicit memory. The frontal lobes of the brain are responsible for working memory, which are vital in the coordination of information. The left and right hemispheres of the brain contain the cerebral cortex. Certain lobes in the cerebral cortex such as the temporal lobe are associated with autobiographical memory processes. The temporal lobe is also connected to recognition memory, or the ability to remember or identify someone or something. Damage to the temporal lobe can impair long-term memory.

The Parietal lobe is another portion responsible for verbal short term memory. Damage to this portion of the brain can cause specific short-term memory loss that affects speaking and recollection of reading skills. Learning to brush teeth, dress oneself, or button a shirt involves encoding, storing,

and retrieving events from the past. With repetition and practice people tend to become professionals at these skills and can remember them for the rest of their lives. Once a behavior or skill is learned the information is stored in the memory bank for either immediate or future retrieval.

The level of learning depends on how much information an individual can store and retrieve in his or her memory bank. Learning cannot occur without memory because the two depend on each other. Memory stores information learned and learning requires memory. Further, learning is a process in which knowledge is obtained about various things and memory is a phase of learning.

According to the University of Nebraska Medical Center, (2008) there are three stages of learning; acquiring, retaining, and remembering. Acquiring is perfecting something new such as a three-year-old learning how to tie his or her shoe. Second is retaining the information. This stage requires the child to store information in his or her memory bank so that he or she can later recall what was learned. Last is remembering. This stage requires retrieving information from the memory bank and in this case the three year old needs to recall how he or she learned how to tie his or her shoe.

Similarly, the case of the dog salivating, Ivan Pavlov “ began his self-inflicted studies of human verbal learning and memory” (Kimble, 1985, p. 84). Pavlov performed studies testing the intelligence levels of animals. One of his most prominent studies was teaching a dog to salivate at the sound of a bell and that teaching is referred to as classical conditioning. Pavlov conditioned the dog to perform an act every time it remembered or identified a specific

sound. The dog associated a sound with salivating. Also the concept of the salivating dog falls under the laws of learning and association. “ Among the laws of learning, the law of contiguity is one of the oldest and most fundamental” (Nodine, 1969, p.

351). It suggests that learning will take place regardless if reinforcement is provided as long as the conditioned stimulus and response takes place together. Once a stimulus is received whether visual or sensation of touch, the sensory for memory is activated.

For instance, if a child is walking the street and notices a man with spiked yellow hair, a visual stimulus is received by the brain activating the sensory for memory. The child notices the man a week later and mentions it to his or her mother. The ability to recall the information indicates that the child has subconsciously learned an image and stored it in his or her memory bank. Without the memory the child would not have been able to recall the information. Moreover, from a functional perspective the relationship between learning and memory has been described by Donald O. Hebb’s postulate for learning, which states “ when an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A’s efficiency, as one of the cells firing B, is increased (Pinel, 2009).

An example of a case study that helps one understand the learning-to-memory link is Skinner’s box. To illustrate, in this experiment conducted by B. F. Skinner a rat was placed in a box or cage that had a pedal on one wall that caused a mechanism to release a food pellet into the cage once

pressed. The rat was not shown the pedal in the box instead, it discovered the pedal itself while running around the cage and playing as rats do. The rat accidentally pressed the bar and a food pellet fell into the cage. The rat remembered that it could hit the pedal in the box whenever it wanted a food pellet.

This is an example of memorization as well as learning on the rat’s behalf. Next, in the case study of a child’s mind and its transformation one fins that the child play even in adulthood as also very necessary in recalling memory and continued learning proving that the two are connected. Additionally this study puts forward the view that adult play, as the memory of a more unencumbered past may be the radical subjectivity necessary for PM and individual transformation, and thus for more emancipated workplaces (Bokeno, 2009)—again demonstrating the relationship between learning and memory from a functional perspective. As the brain age it does not function as well as it did when it was ten years old. The brain also becomes more aware of things as it ages, and it is imperative to maintain that awareness. Learning is the key element to maintaining awareness because it keeps the brain inspired. Learning is a continual process that requires constant stimulation to preserve a balanced quality of life.

Moreover, lifelong learning is important to longevity and preservation of a balanced quality of life because it adds significance and self worth. When an individual is equipped with knowledge, skills, and wisdom, he or she tends to feel good emotionally, and when he or she feels good emotionally stress levels decreases. In addition to decreased stress levels and learning, there

are other major pathways that can assist an individual in making meaningful and quality of life enhancements according to Iwasaki, (2007) such as positive emotions, identities, and self esteem. Indeed, “ an individual with a high functional reserve may also have an increased capacity to keep learning and adapting despite age-related changes” (Fillit, Butler, & Connell, 2002, p.

82). Aging is not an indicator of decreasing abilities to learn and maintaining quality of life. Not only is learning important and contributes to longevity but also healthy emotional state is important as well.

In addition to lifelong learning, brain stimulation is also important to longevity and a good quality of life. Learning and stimulation are interdependent just as learning and memory are because during the learning process the brain is stimulated. Therefore, the two are as equally important to maintaining longevity. “ The aging brain remains capable of adapting to stimuli” (Fillit, 2002, p.

82) and one should continuously stimulate the brain by engaging in learning activities to keep the brain healthy as well as his or her emotional state. In short, the brain controls the functional aspects of learning and memory. Learning and memory are neuroplastic processes that cannot function alone because the two are interdependent. Memory stores information learned and learning requires memory to retrieve information. As the brain ages it is imperative to maintain stimulation through continuous learning.

Lifelong learning along with stimulation is required to longevity and quality of life.