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# Learning and Printing the Brain

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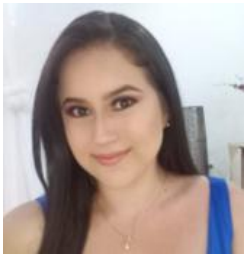

***Keywords***

*brain plasticity;*
*cognition;*
*knowledge;*
*learning;*
*printing;*

**Abstract**

The work of reflection about learning and the important role that the brain plays, establishes a referential analysis, with the purpose of investigating and knowing everything related to the knowledge of the human being and the activities that he performs during the process of acquiring knowledge, thus emphasizing how vital it is to know this organ and how the content can be transformed, in addition, emphasis is placed on brain plasticity, which constitutes the adaptation of the changes or modifications that take place throughout the learning process. Meaningful learning is acquired through good educational practices and the application of active methodologies, where an appropriate environment is established, in which motivation plays an important role and strategies are in accordance with the content to be treated, which is not possible without the brain involved. Through analytical research and the use of the inductive method, the work is synthesized by analyzing the problem from the general to the particular, the elements that intervene in the learning and the imprint of the brain are defined, the relationship with society in the cognition of contents and skills necessary for the development in different areas of knowledge, in addition to using bibliographic resources, to relate to the topic to be treated. The objective of the work is to analyze the brain function associated with the teaching-learning process.



**Contents**



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## 1 Introduction

Learning is part of everyday life and is responsible for the acquisition of knowledge that is used in the course of life and that allows developing as human beings; It develops from birth, since learning to crawl, take things, walk and talk as one of the most basic functions of learning, which are useful for the development, communication, skills development, growth and personal training. Much of the learning that is acquired during growth is the result of the practice and experimentation of situations that allow understanding and learning the development of countless activities, such as reading and writing; skills that are acquired and correlated with phonological representations (Ríos & Cardona, 2016).

The brain is one of the most important organs of the human being, responsible for thinking, learning, skills, and abilities; allows to analyze the events that are lived in everyday life; Despite being a rough organ, it is divided into two parts, one known as the right hemisphere and the other as the left hemisphere, they have nerve fibers that allow information to be exchanged from one lobe to another. It is connected to the body through nerve endings, which transmit impulses depending on their location and function, allow you to experience pain, heat, cold, sound, touch and vision (Muñoz *et al.*, 2012; Chávez *et al.*, 2019).

The process of synapse or interneuron communication and the way in which the cells form impulse transmitting networks that stimulate the brain and promote its actions as a central processor are of relevance for the achievement of learning; Neural plasticity can be observed, which is the ability of the nervous system to promote neuronal contacts and synaptic efficiency, in response to the internal and external stimuli received by the brain (Velásquez *et al.*, 2009; Vasquez *et al.*, 2019; Tuarez *et al.*, 2019). It was husbands Caine & Caine (1997), who in their book "Making Connections: Teaching and the Human Brain", clearly expressed the need for an updated knowledge of what happens during learning in the brain, which, at After all, it is the organ that, through neuronal connectivity, makes learning possible; what constituted the beginnings of the relations of learning and neuroscience.

In the content of the work, emotions are described as responsible for increasing learning in human beings, especially in students who face complex situations, which hinder optimal academic performance; Emphasis is placed on the use of technologies that in recent years have presented an important breakthrough thanks to globalization and that have become the greatest source of information available today. It is worth mentioning that all the advances that have been made with the technologies have been thanks to the fact that the brain understands and develops the equipment, which are samples of experiences and knowledge as a result of correct and adequate teaching for these purposes.

## 2 Materials and Methods

The methodology applied corresponds to the type of analytical research, which establishes an analysis to obtain an accurate knowledge of the subject of study. The method used is the inductive method that allowed us to analyze the problem from the general to the particular, defining the relationships that exist between brain function and the educational teaching process. The gnoseological phrase that makes it possible to make references of texts from previous and current years on topics that are related to research is put into practice; In addition, the bibliographic references that support it (Hérnandez *et al.*, 2010).

## 3 Results and Discussions

*The human brain*

The brain (Velásquez *et al.,* 2016) is a biological and social organ that is responsible for all functions and processes related to thinking, intuition, imagination, playfulness, action, the writing, the emotion, the conscience and infinity of processes that thanks to the plasticity understood as the ability that the brain possesses to change responding to the modifications of the environment, the connections between neurons, the network of capillaries that provide them with oxygen are modified and nutrients and produce new neurons, all this, during the life of the person and not only in adolescence or the first years of adulthood as previously believed; It is the brain's ability to create or search for new alternatives or communication routes between specific and associated process control centers, depending on age (plasticity is greater in children than in adults), the magnitude and severity of the lesion (if there is), previous injuries (neuron injuries), emotional effects (emotional characteristics of the information). Thus, the human brain responds with its plasticity in relation to other people and assimilates what it is exposed to; for this reason, it modifies its organization and functioning in order to capture the abundance of stimuli imposed by today's world. Currently, the study of the brain is a complex issue to analyze, where each of its parts is studied and the functions it performs, becoming one of the most important and indispensable organs of the body, it is necessary to study and investigate everything related to the same.

It could be said that the result of research that produced the first direct impact on education was, more than 20 years ago, when some functions of the left and right cerebral hemispheres were described, as a result of neuropsychological evaluations carried out in commissurotomized patients– intractable epileptic patients with divided brain (Zaidel & Sperry, 1974). These results led to the characterization of a globalist or holistic and intuitive right hemisphere and an analytical, sequential and detailed left hemisphere. In Education, it affected the form of what was called "learning styles", a term with which the educational field is fully familiar. Possibly these findings from the hemispheric lateralization studies were overvalued because it should not be forgotten that the description of the functioning of each hemisphere was being made from the observations made in chronic patients with divided brains. Normal is a brain function with an intact corpus callosum that allows access to virtually simultaneous information to both hemispheres. The left hemisphere (on the right) takes care of verbal comprehension and communication, sequential analysis and planning; the right hemisphere of the recognition and expression of emotions, the recognition of musical patterns, has the recognition of nonverbal language, self-awareness and learning ability. With the current emphasis on the importance that emotions acquire in learning (Goleman, 1996), another element is added that helps to understand the greater ease of acquiring facts "significant" in the teaching-learning process, which leads to a greater understanding of them.

According to Jensen (2008), the human brain can adapt to any situation, think, create and analyze different aspects of life, the organ weighs approximately 1,300 to 1,400 gr., Is made up of 78% water, 10% fat and 8% protein; it has wrinkles or folds as part of the cerebral cortex, which is a rough and thin layer, responsible for muscle function, reason and language; It is precisely this cortex that allows you to study yourself, scientists divide the brain into areas called lobes, which perform specific functions, detailed in figure 1.

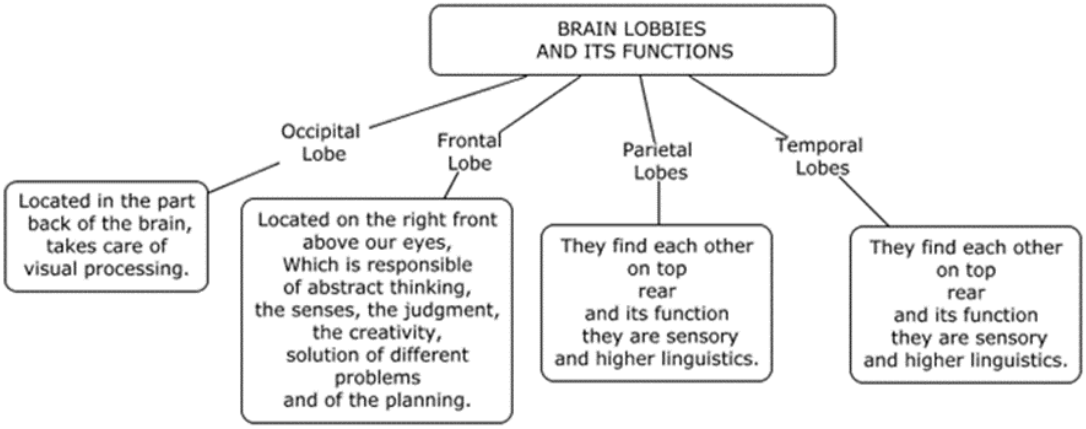


Figure 1. Brain lobes Brain lobes and their functions
Source: (Jensen, 2003)

The occipital lobe is located in the back of the brain, is responsible for visual processing; then the frontal lobe is located on the forehead just above our eyes, which is responsible for abstract thinking, senses, judgment, creativity, solution of different problems and planning; the parietal lobe is in the upper back and its function is superior sensory and linguistic; Finally, the left and right temporal lobes are located above and around the ears, responsible for hearing, memory, meaning and language.

*Brain and learning*

The brain is the most complex organ, where the human being performs a group of functions, such as the ability to perceive emotions, beliefs, desires, and intentions, this ability is acquired through neuronal connectivity and thus, conceives the learning. According to Manes & Niro (2014), it is who directs us to mental activity from unconscious processes to philosophically elaborated thoughts. It is remarkable the advances that contribute in the acquisition of knowledge and help to the solution of problems, it reaches its maturity between the second and third decade of life, it is being built as human beings acquire knowledge and respond to stimuli from the external environment, In addition, the neurosciences have made contributions regarding the intentions of the different components of empathy, language area, emotional mechanisms and neural circuits, in order to interpret and analyze the environment.

The brain through the functions it performs can analyze all situations and acquire knowledge to use it when necessary, that is, it uses memory significantly to perform some activities. One of the main contributions of neurobiology (Alava & Martinez, 2019), is the contribution of evidence on the effect of the learning experience. Research on the brain confirms that multiple and complex previous experiences are essential for learning and teaching to be meaningful. Every complex event leaf information in the brain that establishes connections of what is being learned with the rest of the learner's experiences, his past knowledge and his future behavior.

Brain development and learning turn out to be like two sides of the same coin. The vital experiences of a person literally lead him to make new connections between neurons and to the secretion of chemical agents that transmit the signals (Punset, 2009). New experiences and new ideas are interpreted based on what has been previously experienced or understood. It should be noted that the human brain plays an important role, during the acquisition of content and in the role of research, where the human being has the ability to investigate and nourish relevant information useful and beneficial to himself, thus, he chooses to develop competent skills, for the development in different areas of learning, being a processor that can go through many events at the same time and in parallel.

The brain is a relational data processor, selected, encoded and mixed with other data, and create effective and timely information about a problem to investigate (López, 2000). It not only controls the internal systems of the body but also the sensory organs towards the outside world, which collect information from the environment and go directly to the brain, thus, study any research topic and obtain the relevant results. Brain-

based learning, through experiences relevant to reality, ensures that students process this information, so that it increases the possibility of obtaining meaning and interpreting them, and leads to meaningful learning based on scientific knowledge in the educational field, through practice, which directs the understanding of knowledge and not memorization, therefore, superficial and significant knowledge is emphasized.

The human being must be aware that the best thing he can do is encourage his learning and inquire about the functioning of himself, and how different learning styles occur. According to Jensen (2008), each new stimulation, behavior or experience the brain is modified, scientists deduce some ideas of how this happens. One of them takes place in memory, through stimuli that reach the brain, are processed and sent to different directions, which is easily activated and when necessary.

Learning takes many forms, which are easily observable and in other cases are subtle. Ormrod *et al.* (2005), state that some people learn to get external rewards such as good grades, recognition or money; but on the other hand, there are people for obvious and internal reasons, such as obtaining feelings of triumph or simply to make life easy. Thus, understand that learning is not only based on quantitative data but qualitative, that prepares society for life.

When information is acquired, the environment that surrounds us must be taken into account and the resources it offers us must be relevant. The brain structures are the same, but each brain is unique, it is organized and learned differently, even if they have been twins, from leaving the mother's womb, they develop in different dimensions (Tokuhama-Espinoza, 2013). In addition, learning occurs according to the skills and intelligence that students have, in the performance of each curricular or extracurricular activity. The importance of adopting skills from childhood is essential for human beings, so you can think and analyze clearly what is related to your environment, make the best decisions in your life and develop in different educational spaces. An adequate environment enriches the acquisition of knowledge, when it occurs at early ages of life, giving effect to facilitate better brain functioning for future ages

*Brain plasticity and learning*

At present, awareness is made of the permuted differences that arise, and therefore each human being learns in a particular way, although the structure of the brain is generally described, it has a great functioning and learning ability, that skills are acquired and trained as you learn. Aguilar (2003), mentions that cerebral plasticity is the ability to adapt to the nervous system, which minimizes the effects of different changes or injuries, in order to modify its own organization or functions. Brain development is a continuous process for which neuronal plasticity is important. Various are the compounds that modulate the process and that exert great influence on the central nervous system (CNS), highlighting among them: neurotransmitters, opioids, drugs and especially hormones (Vigil *et al.*, 2016).

It is convenient to study in detail the brain, the functions it performs and the different situations that occur during learning and adaptations to changes, which is determined as brain plasticity, where information is acquired and restructured. Making a comparison between the brain and a machine could be of contribution up to a certain limit, being a machine a physical object that obeys the human being, instead the brain is an organ capable of converting, ordering and transforming information (Saavedra MD, 2001). It refers to a machine that is irreplaceable and adapts to any environment by restructuring content. The plasticity of the brain allows individual experiences to build new circuits and increase the effectiveness of existing connections, resulting in more specific learning, linked to the experiences of an individual, immersed in their culture. Known as experience-dependent plasticity, it occurs throughout life and allows the human being to develop in an extraordinary way, and adapt to new personal, social and cultural contexts (Jiménez *et al.*, 2019).

Following the same idea (Belin & Grosbras, 2010), he clarifies, "in the first years of life the human brain is very susceptible to environmental experiences and also needs them to start functioning properly" (p. 29). The period, in which the brain goes through moments where experiences and the environment exert a lot of influence on certain neural structures and circuits, is known as sensitive periods, where the neural circuits are more flexible, more plastic and more receptive to environmental stimulation. Brain complexity grows and evolves continuously, where each person knows himself and does not focus on educational curricular designs; learning cannot be radiographed by an applied test but depends on synaptic communication, and the respective development of structures, so that the evolution of the human brain requires acceptance (Soul,

Brain architecture as responsible for the learning process, 2013). Neuroscientific research suggests fostering and developing human abilities, which are related to where the brain develops and the stimuli it receives.

*Research on learning*

When talking about learning, the research carried out, the processes, models, and importance that are generated when acquiring new knowledge are taken into account, depends on the type and difficulty of training, which generate multiple emotions that trigger countless possibilities in terms of decision making, text comprehension and knowledge development; The analysis is carried out on already published research of importance for the performance as teachers. Within the field of emotions, according to Elizondo *et al.* (2018), there are negative and positive states in learning, making it known that emotions allow us to obtain knowledge through stimuli related to the conditioning that the individual can acquire. A response is generated in the collection of information, through self-regulation and motivation that causes a beneficial reaction to the increase in learning, the academic performance that benefits the student and educator is obtained.

On the other hand, the idea of the Caine is that the more connections between neurons the brain has to learn, what is achieved with a rich experience, there will be a better understanding of the new material to be learned, because the new information can be related (the traditional concept of "association") with the already known and make connections with existing content. As a consequence, the educator teaches his subject by relating it to what the child brings to the learning situation. The idea has been put into practice in educational reform; and looked at from the neurobiological perspective it indicates that the child does not arrive at the situation with a brain similar to a "tabula rasa", but instead brings a series of experiences from his family situation and his particular socialization, which have already allowed the establishment of numerous neural connections in the brain, due to the learning already carried out. By taking this into account the educator, it will greatly facilitate student learning (Saavedra MD, 2001).

The application of emotional states on learning is not always going to be useful, because it is based on a conditioning that does not apply when the student encounters health problems, a wall that destroys an easy and practical solution is displayed, which favors the increase in student performance, to counteract this problem, the student's progress and teaching strategies that the teacher transmits during pedagogical hours are taken into account. Teachers choose to learn teaching methods, in response to the lack of interest in the study by students, for this, we have the proposal of (Arellano *et al.,* 2017), on cognitive learning styles, the Kolb and Herrmann model to improve training. Since the 50s different concepts have been developed on the mentioned styles, which have revolutionized the chair in educational centers have been beneficial for society, they also generate some uncertainty when choosing a model, which is related in a psychological perspective.

Cognitive learning styles together with the Kolb and Herrmann model have a certain relationship with emotions, there is no total dependence and they are applied without complication. In turn, they allow developing the increase in training rates, however, it is considered that the academic performance required does not depend on the student, but that other factors, such as family relationships, difficulties in reaching an institution and status are involved in economic.

The development and application of learning skills in education are related to methodologies. According to Sobrado *et al.* (2002), they mention that when managing and processing information, connections between the information to be learned and previous knowledge are established, however, the scope of understanding and learning should not be disgusted at the time of that difficulties arise when perceiving new information. Traditionally the teacher was in charge of how to learn and what is taught, it is taken into account that not only the student learns what has been explained, thanks to new approaches that education has had, it is said that the teacher is concerned with the pedagogical progress of the student, where they acquire significant knowledge.

Example on which Cortés-Cortés (2019), states that physical education teachers know from their daily training that the practice of physical exercise allows adolescents to develop skills such as leadership, teamwork, logical reasoning ability, anxiety control, and personal self-care. They are important daily and have a positive impact on the learning process and the integral development of students. In general, physical exercise triggers pleasurable and motivational effects, which can encourage you to continue exercising. These effects are attributed to the secretion during the exercise of endogenous endocannabinoids and opioids (encephalin, endorphins and dynorphins), which have various functions in the CNS.

A recent study in Nature Communications (Haaker*et al.*, 2017), shows that in humans, opioids regulate the learning of social threats. It supports the fact that exercise would not only generate benefits in physical health but also in mental health. The implementation of methodologies for children in initial education is established through pedagogical resources. According to Esteves *et al.* (2018), the didactic material serves as a support for the transmission of knowledge, which generates an impact in early childhood, where children are susceptible to stimulating environments that favor affinity with new knowledge.

In recent years, a technological advance has been developed, which allows teachers to obtain ease of access to texts, allow them to understand the psychology of the student and update specialized knowledge. With the application of technologies, tasks are sent digitally and facilitate student access to information available on the network; it is suggested that they enter pages where practices are carried out on specific topics to avoid academic failures.

The advance of globalization on ICT, is essential for the training of students and teachers, allows to find information on any subject; There is a controversy about the use of technologies because of the impact generated by its management within the institution, it is necessary for teaching about the rules that must be followed for the preparation and delivery of tasks by mail. According to Sandoval (2018), it says that there is a great diversity in terms of the characteristics, applications, and functions that allow being an object of multidimensional study, to show if they are useful for the teaching and learning of students, everything will depend on the good use of the technologies

The brain is an organ of importance for functioning, is responsible for learning and knowledge development, based on practice and experience, rests through sleep where learning processes are regulated, consolidate content, acquire new skills and improve the adaptability to new situations, allowing an optimal concentration to develop specific tasks performed day by day. In addition, it allows motivation to develop academic activities. Brain functions are involved when learning new knowledge. Wuth (2009), mentions that to obtain true learning it is necessary to process information to transform it into knowledge. The prefrontal lobes of the cerebral cortex and the limbic system carry out neuronal processes as a biological substrate for language development, problem-solving, planning and execution of tasks, this process is known as executive functions, which are necessary for the Neuronal and metacognitive performance of the human being when performing neutral functions. To conclude, it is emphasized that in the previous paragraphs it was mentioned how the different forms of teaching are fundamental for academic performance and the influence of behavior and interaction with the environment, it has been shown that the development of learning is due to the importance it exerts the brain over the other organs and the activities that allow us to perform, the emotions derived from the executive functions that are performed in the frontal lobes generate that the student has a better concentration and performance in their daily activities.

## 4 Conclusion

The brain is an organ where you can store, change, transform and modify information, it has a number of functions and thanks to research about it is known in depth how it is composed and the activities it controls. Learning has taken place in society, but it would not be possible without the functioning of the brain, it is mentioned that, if skills and contents necessary for our life are acquired, solutions will be given to different situations that arise in our environment. It is concluded that brain research and learning, allows to have a better idea about the functions of the vital organ, with emphasis on its role in the collection of knowledge, from experiences, activities and a whole series of factors that determine the level of learning of an individual, highlighting that they are inextricably linked and not acting independently.

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