

## Neuroscience at the Service of Learning and Education

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### *Abstract:*

This article reflects on Neuroscience as an adjunct to Pedagogy, seeks to understand the development of the brain and its contributions to the teaching process, to contribute to the learning of new skills for the 21st century. In the meantime, the educator's understanding of the brain and its functioning is fundamental to its performance in the classroom. In a bibliographic, qualitative-descriptive research work, the objective here was to discuss the performance of the five brains, and within a socio-historical conception, based on the Vygotskian theory to debate neuroscience as a learning tool. The importance of educating the brain biology on the part of the educator to identify its plasticity and cognitive, affective, emotional, motor and anatomical dimensions is emphasized and using this understanding as a tool for his actions in the classroom, thus correlating neuroscience and school learning

**Keywords:** Neuroscience, Brain Plasticity and Learning

### **Introduction**

The importance of including neuroscience as a tool in the educational process of teaching and learning is due to the fact that it enables the understanding of the human brain and therefore the understanding of the student's action and behavior. Understanding that learning is the object of education and that currently there are many noises that affect and prevent it from occurring easily, neuroscience appears as a contributory factor for the acquisition of new skills and abilities for the exercise of education professionals in the classroom. Class.

According to Relvans (2009), knowing brain biology is important because it goes through the construction of education. Thus, it is necessary for the teacher to know the biology of the brain in its cognitive affective, emotional and motor dimensions, being able to consider neuroscience as a great ally of education.

To do so, you need to understand what neuroscience is and how it has contributed to teaching and learning.

As Neuroscience is a relatively new science that studies the central nervous system as well as its complexity, it can contribute to Pedagogy helping to understand the biology existing in the brain. With this understanding, teachers can understand that there is also an anatomy, and a physiology providing cerebral learning, to better understand the student in his singularities. Thus, in order to understand Neuroscience in its various functionalities, it is first necessary to understand the functional and pathological structures of human behavior with regard to memory, humor, attention to sleep, and general behavior.

In the studies and analysis on the origin of Neuroscience, two great scientists stand out in the 21st century, namely Hits and Fritz, who measure the importance of understanding this for the understanding of the individual's development process and, consequently, their learning .

### **1. The Brain and the Origins of Neuroscience**

It has long been known that the brain is an organ of the central nervous system that is very important for the functioning of the body. This organ constitutes the largest part of the brain, representing about 80% of the total mass of this structure. Its functions are related to intelligence, language, consciousness, memory, among others. In addition, it is able to process information from the senses together with other brain structures, initiate movements and influence emotional behavior. As for anatomy, the brain can be divided into two hemispheres: the left and the right, which are connected by the corpus callosum, a structure made up of myelinated fibers.

The left hemisphere controls the movements of the right side, and the right side controls the movements of the left side of the body. These hemispheres are divided into four brain lobes, which have specific functions. They are: frontal, temporal, parietal and occipital lobe. Each lobe is named according to the location in relation to the skull bones. In the brain, it is possible to observe two very distinct regions: a region known as gray matter and another known as white matter. The gray matter has neuron cell bodies and can be seen more externally. This portion is known as the cerebral cortex and receives impulses from various locations to be processed.

There are regions of the cortex specialized in interpreting sensations, sounds, smells, developing thoughts, keeping memories and controlling movements, for example.

In 1970, new technologies are developed that present us with an image thus providing more physiological and pathological information, never developed among them computed tomography and magnetic resonance. So it provided more physiological information. In 1990, Cardal established that each nerve cell is unique and distinct and individual and that these cells respond to stimuli thus forming synapses, regions of the cortex specialized in interpreting sensations, sounds, odors, developing thoughts, keeping memories and controlling movements, for example. (SOUSA, 2017).

More internally to the cortex is the white substance, which is more whitish in color than the cortex.

This last region is formed by bundles of myelinated axons and, therefore, it is whitish. Externally, it is possible to notice that the brain is full of grooves, which delimit gyri or cerebral circumvolutions. These grooves are formed by the folds that appear in the cortex, which increases faster than white matter. The protuberances formed in this way are called spins or circumvolutions. Grooves are important because they guarantee an increase in brain volume, and very deep grooves are called fissures. Among these fissures, we can mention the longitudinal, which guarantees the division of the brain into two hemispheres. (CARDAL, 1990 apud SOUSA 2017). We need to

understand the relationship of this brain to our daily lives. What is known is that all effective relationships and bonding relationships are linked to intermediary caring for the brain, which is related to the pleasures of our emotions, and our experiences of affective bonds.

This is how the evolution of man happens, leaving the reptilian brain and going to the neocortex earned intermediate brain, which is represented by a layer of thinking and reflective structure that we know as the upper brain. In this process of advancement, man builds himself in his knowledge, in this process we are faced with 21st century students, we are faced with a great challenge which is to understand them in the classroom and how to work with their reactions, because the student is a thinking subject who masters a language and who builds his thoughts and his actions, therefore, it is necessary for the teacher to understand how the human brain works because only then can he understand the strong and aggressive primitive reptilian brain that is in each one of us.

Without losing the understanding that this subject has the intermediate brain responsible for emotions, for the intellect, the teacher needs to understand, stimulate, so that he, the student, can develop knowledge.

Neuroscience makes this study possible, this walk through the structure of the brain, which is coated with an anatomical structure of two hemispheres, which is not so simple, the hemisphere has the function of communication, it is responsible for language analyzes, classifies, identifies, Already the hemisphere law is responsible for spatiality, temporality, but the two communicate with each other and this communication goes through five brains of which we humans are endowed, thus clarifying the multiple efficiencies and multiple intelligences in learning.

What are these five brains? The individual that is constituted of a unique and singular anatomical and physiological structure inside the cranial box, we have the social brain the cultural brain of society's relations but depending on the individual brain to carry out the actions, it is located in the prefrontal area put it requires attention and skills in positive attitudes, from personalities.

The third brain is represented by the movements of the body is located in the parietal area, and is the dexterity and refinement of the movements, by the readiness for the spoken by the reading and the writing.

The other important brain is the affective and emotional. It plays a fundamental role in our lives. It is in them that we establish our emotional bond. It represents our limbic system and is located in the hypothalamus, integrating with the cortex and in the frontal orbital area, in the singular cortex of the tonsils. cerebral. (SOUSA, 2017).

The frontal cortex has the function of stopping impulsive actions and the anterior cortex activates other actions to respond to conflicts. The role of the amygdala, on the other hand, is to produce responses to fear and negative responses. The fourth brain is a creative brain, a potential brain capable of using all its capacities from both the left and the right hemisphere to solve problems, expressing itself better to the desires and new discoveries.

It is noticed that when knowing the brain, the teacher will have a base that they can use to help their work in the classroom to understand each behavior, of the students. Hitzig & Fritsch (1870 apud RAMÓN Y CAJAL, 1902)) made a report that electrical stimulation in specific areas of the brain of the cerebral cortex caused movements. In that same century, two more scientists stood out, Broca and Wernick (1861), who confirmed the following, that language is organized in specific areas in the cerebral cortex. There were some presuppositions of Neuroscience.

According to (PATERNO & ZORZI apud SOUSA, 2017), the study of neuroscience considers the knowledge of brain functions as key pieces for stimulating healthy cognitive development. Knowing that the brain constantly reorganizes itself, in accordance with external stimuli, the challenge is to facilitate the absorption of the correct and positive stimulus. The authors claim that the first mechanisms for such absorption is memory.

For Kandel (2011) “we are products of our synapses”. It further states that we are who we are because of what we learn and what we remember. This author approaches that there is a dialogue with psychiatry and cerebral biology and therapeutics and affirms that, not everything that is explained by psychic conflicts or by altered neurotransmitters, therefore, all our brains are possible to change, to heal themselves. up and move.

It can be said that our brain and body are renewed through new learning. In this context all teachers need to understand the new trends in their pedagogical practices, put neuroscience brings a contribution showing us a broader look at the understanding, how the nervous system works, in this way neuroscience passes through the important interfaces for the teacher in classroom can understand how the brain's structural process is and how it works in the learning process.

The first scientific basis highlights what it is to learn and how the chemical bases are directly related, and the physical bases can understand the functioning of the neural function, therefore these chemical and physical structures will work exactly in a cellular structure.

They are: neurons and glial cells, which investigate how it will work to receive transmit and decode information. In this process, one can affirm the great contribution that neuroscience provides for a better understanding of the human nervous system.

According to Relvans (2011), it is necessary to study the groups of neurons that have a foundation within a circuit connection, highlighting that in any case, the brain is related to muscle functions and that there are nerve fibers that are inserted forming the neuromuscular system that

give us the condition of writing and speaking and reading. In this context, there is a greater understanding of how to understand the student's behavior in the classroom, of what can be detected in fears in school phobias, in depressions.

When you have this understanding, it becomes much clearer to understand the other. Another Neuroscience interface is to understand how thoughts and memories are processed, planning and motor skills and forms, which are conditioned in classrooms, and in schools in general.

## **2.1 Learning and memory**

At the beginning of the last century, Santiago Ramón y Cajal, (1902) already stated that almost all animals are able to modify their behavior with results of experience. [...] the authors argue that the most plausible explanation is that learning and memory are expressed as changes in the synaptic connections between neurons. According to Luria (1903-1978 apud Sousa, 2017), the brain is a biological system that is in constant interaction with the environment, that is, higher mental functions are developed during the evolution of the species, social history, and the development of each individual.

It can be said that we have the concept of brain plasticity here. Understanding that the human brain is restructured, and can be revitalized (neuroplasticity), there are other possibilities to work the teaching and learning process, since the brain is dynamic, has the ability to change in response to the challenges of society Modern. this view allows changes in educators' actions, understanding that nothing is decisive, and better and better results can be obtained from new pedagogical practices.

In Vygotsky's theory (2000), the relationship between development and learning are important points, in which he values pedagogical action and intervention, in addition to considering that it is learning that promotes development. For him, learning is a necessary and fundamental aspect for the establishment of superior psychological functions. The individual develops, in part, thanks to the maturation of the individual organism, but it is the learning that provokes the internalization of the psychic function. Thus, neuroscience helps to understand why the child does not learn it implies analyzing how the reverse process occurs, that is, how he learns. Achieving success in the learning process is linked to the integration of the object and material to be learned in an activity that makes sense to the child and involves objects that he can perceive.

Educators need to internalize the importance of the child being attracted by the way it is being taught to have the pleasure of learning so that the subjects are assimilated. It is necessary to avoid repetitive methodologies and invest in participatory, engaging, stimulating classes that promote concentration and attention.

Stimulating the learning of formal and scientific knowledge parallel to what happens in the child's brain, in addition to the relationship between assimilation of information will provide the internal development of a scientific concept in the child's consciousness. According to Vygotsky (2000), a concept is more than the sum of certain associative links formed by memory; it is more than a simple mental habit: it is rather a complex and genuine act of thought that cannot be taught only by permanent repetition. In fact, it can only be accomplished when the child's own mental development has reached the necessary level. The expansion of concepts presupposes the development of many intellectual functions: deliberate attention, logical memory, abstraction, the ability to compare and differentiate, among others.

These complex psychological processes cannot be mastered through initial learning alone. Practical experience shows that it is impossible to teach

concepts directly.

### **Final Considerations**

In this context we understand the contributions of neuroscience to education, the discourse as: knowledge, memory, sleep, humor of forgetting the attention of fear of affectivity, the senses and language are physiologically structured, by our brain, from child to adult boys or girls.

All of this becomes an interesting and fundamental subsidy for understanding the pedagogical actions to understand the importance of neurons, including mirror neurons, which enable the human species to recognize itself as an individual, and learn to communicate and understand intellectual learning, and to know that brain plasticity is an ally of education because the brain continues to develop, to change and adapt to adulthood to senile adulthood. By understanding these brain actions it does not, change our view of learning and teaching. Neuroscience enables us to reflect that the backward and the limited do not exist, but we have several possibilities to learn, so there are several ways to teach.

As much as we better understand how the brain works, the better we can teach them. In the process of understanding how the brain learns neuroscience, it shows us a new concept of the student in the classroom. Seeking to understand the cerebral subject, and within its plurality as the human brain learns and keeps knowledge. Who is this cerebral subject he thinks dialogues, uses languages as a main tool in the learning process.

The teacher can use exactly this process to understand the history of this student and treat him as a unique subject in his singularity of the classroom within a collective where he will be included as a participant in diversity.

What can be said is that the construction of each brain is unique, but these brains undergo changes in the measurement of the learning process, thus becoming an important main author for this new learning of the 21st century, so it is extremely important to understand how far they are. the dimensions of this cerebral and reflective subject are stimulated as educating, and having recognized his potential, in his limits of affection capacities and in his limitations in his potentialities.

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