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EDUCATION AND NEUROSCIENCE: CONTRIBUTIONS IN THE EDUCATION OF TEACHERS OF BASIC EDUCATION

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ABSTRACT

It proposes to reflect on studies related to education and neuroscience in primary education to understand cognitive and learning processes, contributing to teacher training. The objective is to identify the elements of neuroscience and their contributions in teacher training, broadening the understanding of the teaching and learning process. He used methodologically the research of bibliographical nature from authors and theorists who discuss on neuroscience and education. As a result, there are few studies related to education and neuroscience in public schools, but their contributions in the pedagogical teaching process is the differential axis for understanding cognitive aspects, language, thinking and intelligence.

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INTRODUCTION

Faced with today's technological changes, education has become a fundamental tool to understand society in constant change and in permanent construction. In this bias, Pedagogy presents itself as the science that seeks to analyze and interpret social phenomena related to the educational scope and to understand the cognitive process, language, thinking and intelligence about the pedagogical aspects of school. However, other areas of knowledge have aided education in trying to understand some issues. In this sense, one area of science that has advanced a lot in understanding these aspects is neuroscience. That is, it presents itself as an important permanent training mechanism of teachers who work in Basic Education contributing to the teaching and learning process. In view of these questions, the following problematic is presented: What are the contributions in neuroscience for the training of Basic Education teachers in the public school? Therefore, it is important to emphasize that the answers still represent a challenge through the curricular areas that the scientific studies of neuroscience cover. It was sought to weave some reflections from the education and neuroscience making an intersection with the formation of teachers of Basic Education. Therefore, the purpose of this article is to make an introduction to neuroscience studies and to identify the

contributions of their studies in teacher training. That is, it shows that the educational foundation is found in the Basic Education, because it is necessary to conduct the research teacher's view on the child from 0 to 8 years old, not only in nurseries and preschools, that grows in importance as the training of these subjects can contemplate the essential foundations of human development, and most of all in the process of Elementary Education. Education and neuroscience is a field of interdisciplinarity that encompasses sociological, anthropological, philosophical, biological, neurological and psychological aspects of the human species. Adapting this reflection to the focus of this article, it can be said that the brain plays the central role in the formation of the human intellect, either through neural connections that are the polarization of the opposites in search of ways to learn, or through sociocultural experiences which influences human formation. In this sense, the importance of studies about the brain in the learning process is highlighted, in which the contributions of neuroscience and Education are pointed out for the formation of teachers seeking the deepening of the best results in the process of teaching and learning in Basic Education. In order to weave the analyzes the reading on the thematic axis was based on theorists and authors, in which the methodology used is characterized as an exploratory approach of the theme based on the bibliographical research in pertinent

authors, among which were highlighted Damásio (2000), Chomsky (2005), Izquierdo (2004), Grossi (2012) and Vygotsky (1991). The reflections contributed to understand the epistemological foundations of neuroscience and its contributions in the educational field. Thus, to understand the central aspects of the article, we chose to point out two important points: the function and purpose of Neuroscience in teacher training and the relationship between the brain and learning.

METHODOLOGICAL PROCEDURES

We sought to use in this work the methodological basis based on a bibliographical research based on theorists who discuss education and neuroscience, mainly questions related to the teaching and learning process, such as: intelligence, language, memory, cognition, thought and knowledge. In order to weave the analyzes the reading on the thematic axis was based on theorists and authors, in which the methodology used is characterized as an exploratory approach of the theme based on the bibliographical research in pertinent authors, among which were highlighted Damásio (2000), Chomsky (2005), Izquierdo (2004), Grossi (2012), and Vygotsky (1991) who contributed to the analyzes and reports on the functioning of the human brain and the learning process.

Function and Purposes of Neuroscience: Starts the discussions about neuroscience, considering it as a powerful tool in understanding the brain, behavior, language, intelligence and other aspects. The studies can present important results on human learning and its relationship with educational practice. An important issue is the neuroscience and education approach, as it presents as a differential axis for the formation of Basic Education teachers contributing to evidence learning problems in school. The knowledge of neuroscience offers more questions than answers, but studies already present significant contributions in the cognitive processes, as the author points out:

Neuroscience is understood by 6 approaches: 1-Molecular neuroscience: investigates the chemistry and physics involved in neural function. It studies the several molecules of functional importance in the NS. 2 - cellular neuroscience: considers the distinctions between the types of cells in the SN and how each works respectively. 3 - Systemic neuroscience: studies the regions of the NS, processes such as perception, discernment, attention and thought. 4 - Behavioral Neuroscience: studies the interaction between systems that influence behavior, explains the mental capacities that produce behavior such as sleep, emotions, visual sensations, among others. 5 - Cognitive Neuroscience: studies the most complex mental abilities such as learning, language, memory, planning. 6 - Clinical neuroscience: studies the pathologies of NS. (GROSSI; LOPES; COUTO, 2012, p.29).

The authors' statements reveal the complexity of the epistemological studies of neuroscience and the breadth of the interdisciplinary field, however, it observes that the educational scope is related to behavioral studies, mental abilities, learning, memory and intelligence, in which all these aspects are related neuroscience and education, essential elements for understanding the development and learning of the child. The researches point out that researchers reinforce the thesis that it is in childhood the fundamental moment in the

constitution of the brain, being the period of development fundamental to potentiate its cognitive capacity. Therefore, the future of neuroscience is to constitute elements that can understand the development of the human brain, the functioning of the neural network and its relation as the central nervous system. The above discussions lead to a discussion in the biological area, which distances itself from our focus in question. Thus, he chose to expose as a basis the authors the function and purpose of neuroscience as a teacher training tool in what concerns the aspects of human learning exposing central issues such as the significant importance that neuroscience has to understand cognition and the teaching process and learning in schools and also reveal that neuroscientific studies are still few discussed in the curricula of education in Brazil regarding the training of Basic Education teachers. In this regard, it should be noted that:

The learning process of the brain is in cellular neuroscience, highlighting in this process the importance of neurons, whose basic function is to receive, process and send information. The transmission of information from one neuron to another or from neuron to non-neural cell occurs through specialized structures called synapses, which can both induce and inhibit post-synaptic cell depolarization. Each neuron can have 1,000 to 10,000 physical and chemical synapses (MACHADO, 2002, p. 134).

The evidence put forward by the author reveals the relationship between the teaching and learning process with neuroscience, thus confirming its intrinsic relationship with education. In this sense, it is not fitting here to make a value judgment about neuroscience, but to realize the importance of its elements for the formation of teachers who work in Basic Education and are directly in contact with children who have different learning difficulties presenting a list of purposes for educational scope. To expose some elements of the purpose of neuroscience for the pedagogical field, one of them is to identify the predominant natural languages in the minds of individuals and to stimulate brain regions with interventional pedagogical actions. Thus, three important languages stand out in this process: visual language, auditory language and synaesthetic language. To corroborate the author's statements and points out that:

Pedagogical practices may be guided by multiplicity in learning, in which information is exposed in different ways, using multiple methods. For example, studies have shown that fun can contribute to learning because in these situations the body releases the dopamine neurotransmitter, which is responsible for feelings of well-being and pleasure and functions related to cognition, motivation, reward, attention, mood and learning (GROSSI; LOPES; COUTO, 2014, p. 19).

The statements reveal that ensuring a good learning for the student does not depend only on the teacher, it is fundamental a neural study that identifies the crucial issues of the learning process and cognition difficulties. In this context, knowing the individual thinking of each student, understanding the student's personal characteristics and valuing cultural knowledge are some starting points to stimulate different languages. Based on this assumption, it is argued that the teacher has a minimum knowledge of neuroscience and its field of action so that the teacher can offer, through his practice, an environment that

respects individual differences allowing learners to be stimulated from the intellectual and emotional point of view. For this, it is essential that they know the significant studies of neuroscience, since this scientific knowledge influences the understanding of teaching and learning processes. Undoubtedly, the human brain is enormously complex in understanding its networking, but studies have found that the neurons that are the units that process information in the brain are in constant connection, and it is exactly these connections that form neural networks or synapses. Thus, if learning is achieved through synapses, pedagogical intervention plays a crucial role in this process and can be strengthened through knowledge of neuroscience. Finally, the classroom for education and neuroscience is essential, knowledge of the brain and pedagogical knowledge form a unit of study, becoming a great ally to identify not only learning problems in school, but also to ensure a teacher education that can understand each human being in their development process.

The relationship between the brain and learning: Another fundamental point that we chose to discuss here concerns the relationship between the human brain and school learning, considering that these two aspects are related to neuroscience and education studies. In the foreground we know the complexity of the brain and its functioning, so neuroscience seeks this relationship as a way of identifying students' learning difficulties and relating it to brain functioning. The authors state that the brain is a system that can work alone and can work seamlessly across all systems working at the same time. If the brain is responsible for all the development of human capabilities, then it is his studies that can contribute to better understand the network of functioning synapses because:

The nervous system is the first system to appear between the third and fourth week of formation after fertilization. The maturation of the neuron promotes the formation of synapses. The newborn's brain is poor in synapses, but the infant brain has an exaggerated amount of synapses that continues to grow until early adolescence. During this period, regressive processes begin to reorganize the brain structure. The ability to learn is related to the amount of synapses. It is the phenomenon of synaptogenesis and synaptic pruning comes from research with monkeys, suggesting its great importance in the first three years of life. (COSENZA; GUERRA, 2011, p.16).

Thus, it highlights the importance of knowing the functioning of the human brain and its relationship with the social environment, because it is through it that the human being develops and learns. It is known that learning is not absorption of contents and concepts, but is the internalization and appropriation of culture and, this requires a complex network of neural operations through the functioning of the brain. There is no doubt that learning requires the contribution of the environment, but it is also proven that the culture produced, the symbolic aspects and the interaction with another subject are crucial in the learning process. What is found in the studies is that the complexity of learning requires brain and mental functions that interact in a dynamic process. In this regard:

Learning and memory are basic properties of the nervous system, there is no nervous activity that does not include or is not affected in any way by learning and memory. We learn to walk, think, love, imagine, create, do simple and

complex motive or ideational acts, etc.; and his followers called learning and memory superior nervous activity (IZQUIERDO, 2004, p. 90).

Studies show that learning occurs when two or more systems function interrelated through the development of school pedagogical activities that stimulate the brain airways. A good example is the musical activities in school as a pedagogical and didactic resource that simultaneously enhances the nervous, auditory, visual and motor systems. It is noteworthy that this type or form of learning is not exclusively what enhances the systems responsible for learning, pedagogical actions such as role plays, sports, fine arts, dances and others are also tools that contribute to the development of learning and stimulation of certain areas of the human brain. Studies show that such pedagogical activities contribute to the interconnectedness of the brain and learning. Therefore, thinking of a proposal for training for teachers of Basic Education that meets the pedagogical actions providing different school activities needs to be built into the teacher education curricula. The proposal is to provide a pedagogical support for classes that facilitates the functioning of the interconnection between the brain and learning. That is, schools need to build a planning with these aspects for the development of a school curriculum based on neuroscientific studies to provide the teacher to ensure student learning. Therefore, the teacher is the subject of reality transformation, being able to promote change in school and in the classroom. In this bias, neuroscience is presented as a fundamental tool to guarantee the necessary transformations for the learning and cognitive process.

Final Considerations

The study showed that there is a very close relationship between neuroscience and education, although neuroscience studies are still very early. However, in the school space it is increasingly evident the need to identify the learning problems of students in the initial years of Basic Education, in which the pedagogical training of education courses does not guarantee a training that meets the new demands. In this sense, thinking about teacher training based on neuroscience studies are essential to identify the different learning problems in the school. With regard to brain comprehension, it has been shown that certain areas are more responsible than others, showing that any brain dysfunction changes learning and may limit the ability to conceptualize, interpret and learn. Therefore, the brain-related study encompasses all facets of learning that are related to the act of learning, affectivity, cognition, and consciousness. That is, the training of teachers on the perspective of neuroscience can present greater interest and better performance in pedagogical activities and content related to students' reality. Undoubtedly, neuroscience studies expand teacher knowledge by considering the cognitive and pedagogical aspects. As a result, there are few studies related to neuroscience and education, but the contributions in the teaching pedagogical process is a differential axis for the processes to understand cognitive processes, language, thinking and intelligence. After all, science explains a lot about childhood, adulthood, and old age, but it does not yet have effective explanations of the best way to teach how to best help as an apprentice and build knowledge autonomously, because it is in the relationship between lived experiences and scientific knowledge that the human being seeks the understanding of life.

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