

# Neurosciences and Education: An understanding of meaningful learning in Early Childhood Education

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Received: 03 Jun 2021;

Received in revised form: 19 Jun 2021;

Accepted: 02 Jul 2021;

Available online: 13 Jul 2021

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**Keywords**—Neuroscience. Pedagogy.  
Meaningful Learning. Education.

**Abstract**—This research is a dissertation carried out in the Master's Program in Science, Technology and Education of the Vale do Cricaré Faculty in São Mateus in Espírito Santo, which investigated, through a bibliographic review and interview (focus group), the that Neuroscience can bring to the teachers, uniting science and education, to achieve meaningful learning in Early Childhood Education. This work aimed to highlight neuroscience applied to learning and its contributions to the teacher's work to generate meaningful learning in Early Childhood Education, due to the knowledge of the functioning neurological of cognition that neuroscience brings to the professional. Neuroscience is increasingly emphasizing the importance of neurological knowledge in the fields of education. The justification for this dissertation lies in the search for a deeper understanding of the issues that address neuroscience as a basis to assist the teacher (pedagogue) in teaching meaningful learning, which begins in Early Childhood Education. This research focused on the problem: "How do Neurosciences contribute to the achievement of meaningful learning in early childhood education?", Seeking reflections on such questioning. Thus, the questions proposed in this instrument enabled a discussion about the study that had its main objective the contribution of Neuroscience to the achievement of meaningful learning in Early Childhood Education. After a focus group interview, it was possible to verify the interest and knowledge of teachers in the Early Childhood Education segment on Neurosciences and meaningful learning.

## I. INTRODUCTION

This paper aims to highlight neuroscience applied to learning and its importance in the contribution of the teacher's work to generate significant learning in early childhood education, due to knowledge of the neurological functioning of cognition that neuroscience brings to the professional.

The educational task is based on a set of concepts that generate reflection and pedagogical practice within its strands and dimensions. Theorists like Sigmund Freud, Jean Piaget, Lev Vygotsky, are considered precursors of educational psychology studies. This segment (Educational Psychology) has studies and researches that aim to

describe the psychological processes present in education. It's a branch of psychology which studies the teaching/learning process and has its direct relationship with cognitive and developmental psychology, an area of investigation that examines questions about memory, attention, perception, knowledge representation, reasoning, creativity and problem solving. Cognition can be defined as the ability to store, transform and apply knowledge, being a wide range of mental processes. Based on these scholars, current educational models and practices have been thought out and organized. Thus, a large part of what neuroscience brings from studies on the same issues with a scientific basis can be observed. However, it is worth emphasizing the importance of some of these models and

practices that emerged positively in the area of learning. One of them is the significant learning, highlighted and well explored by David Ausubel who proposes that the students' prior knowledge be valued, in order to build mental structures using, as a means, conceptual maps that allow discovering and rediscovering other knowledge, thus characterizing a pleasurable learning and effective, especially in Early Childhood Education. Meaningful learning takes into account all the knowledge already acquired by the child, which is the basis for new knowledge acquisitions.

Early Childhood Education is the child's first contact with the world, building their social knowledge. It is at this time that they begin to explore, experiment, discover and rediscover. In Early Childhood Education, children begin to practice their emotional, social, physical, cognitive abilities, capacities and potential. According to the Ministry of Education's Comprehensive Education Portal (MEC), these practices must be intentionally planned, systematized and evaluated in a political-pedagogical project that must be collectively and democratically elaborated with the participation of the school community and developed by teachers (pedagogues). Therefore, it is important for the professional to work with intention and knowledge for this child so that he can have more and improved learning conditions within his reach.

The contribution of neurosciences, in their line of research on cognition, works in education, unraveling memory processes, problem solving, learning, among other factors. Education and Neuroscience not only share investigative research on the learning process of human beings, they also explain the different levels of complexity in which this process takes place. Thus, educators need specific training that allows them to learn and understand these processes. As a problem for this research, it is reflected: How do Neurosciences contribute to the achievement of significant learning in early childhood education? Faced with the need to identify and provide meaningful learning for children, in increasingly heterogeneous classes, this work seeks, through a bibliographic review, to reflect on these contributions and, through an interview, to research the interest and knowledge of pedagogues regarding this contribution to continuing education, combining pedagogy and neuroscience. Adding scientificity to early childhood education without losing affectivity.

Therefore, Neuroscience through research and studies is increasingly highlighting the importance of neurological knowledge in the field of education. Neuroscience brings the biological explanation of the functioning of the nervous system, so that the education professional can

better understand the processes we go through to learn. This research aims to demonstrate how neuroscience can contribute to the good performance of the work of the teacher (pedagogue) in the classroom and thus be important allies to expand the possibilities of meaningful learning in the context of Early Childhood Education, since this is the basis of education. It is in the initial training (Child Education) of human beings that we build the basis of our knowledge and our life in society. There is a need to look at pedagogy as a science, aiming at meaningful learning for all early childhood education students. The justification for this dissertation lies in the search for deepening the issues that address neuroscience as a basis to assist the pedagogue in teaching meaningful learning, which begins with Early Childhood Education.

Each day, Neurosciences unveil more about the nervous system and collaborate with other fields. Example: Education - Neuroeducation, Psychology - Neuropsychology, Biology - Neurobiology, Chemistry - Neurochemistry - Medicine - Neurology, among others; showing and affirming the importance and functional complexity of knowledge of the nervous system. Specifically, the Central Nervous System, in brain functioning. And according to Relvas 2012, these advances in neuroscience studies have brought about a new vision in understanding the functioning of the brain, in cognition, in thinking, in emotion, in learning and in behavior.

The development of modern techniques, such as: electroencephalogram (EEG), spectral diffusion imaging, Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET), for the study of the nervous system, brain activity in humans, during the performance of cognitive tasks, it has allowed a more precise investigation of the neuronal circuits during their functioning, which generate human intellectual capacities, such as language, creativity, reasoning (Rocha & Rocha, 2000).

Relvas (2009, p. 16 and 17) emphasizes "how important it is to know the functioning of brain stimuli [...] the study of development and the milestones of brain maturation, learning difficulties and brain plasticity". Thus, he highlights in his studies neuroscience as one that can:

"[...] meet the needs of teachers, with a neurobiological and multidisciplinary approach, dealing with normal learning and its disorders. [...] Neuroscience has been reviewing, through Cognitive Neurobiology, Behavioral Neuropsychology, Neurophysiology and Neuroanatomy, how the human

effectively learns and teaches in the processes of vital contexts".  
(RELVAS, 2009, p 17)

According to Carbonell (2002), we aim at innovation, in a broad definition, being a set of interventions, decisions and processes that, with a certain degree of intentionality and systematization, deal with changing attitudes, cultures, ideas, content, models and practices pedagogical.

Pimenta (1996, p 42) emphasizes that education is lacking as an area of investigation of a science, saying that "the 'sciences of Education' lend to educational investigation an apparent statute of scientificity.". Thus, we observe that the appreciation of the need for continued and specific studies, as cognitive neuroscience brings, enable educators to better understand the aspects related to pedagogical practice, thus helping their work. Highlighting here in particular in the teaching-learning process of children in Early Childhood Education.

Libâneo (2001, p.6) defines pedagogy as "a field of knowledge about the educational issue in its entirety and historicity and, at the same time, a guiding guideline for educational action." The pedagogue monitors and assesses the learning process and the skills of each student. It can also work with people with physical or intellectual disabilities, helping their learning and inclusion in society. And to meet this demand, it is necessary to search for specific knowledge and understand why they do not learn in the same way.

According to Nóvoa, 1995, p. 26: "Teacher training is probably the most sensitive area of the changes taking place in the education sector: here not only professionals are trained; here a profession is produced".

And with the collaboration of neurosciences, education has a scientific basis for the understanding and development of more meaningful learning; once we look at how complex and broad the brain's functioning is.

According to Relvas (2012), the educator, in his planning, must establish teaching strategies, sensitizing himself with the students; bearing in mind that they are beings constituted by a brain biology in constant movement and transformation, having nervous connections that never stop. Encouraging learning is an action and reaction for everyone committed to education. Also according to Relvas, there is a need to know the tripod of systems for the construction of knowledge. The first aspect is the information system, the second is the understanding of biological systems and the third is related to everyday life, cybernetics. In light of this tripod, it is a fact that learning difficulties can be resolved or at least minimized if educators focus on the classroom as a neuroanatomist. Therefore,

Studies related to neurobiological processes on learning and cognitive development show that these should be exposed to teachers in training, aiming to promote an understanding of the impact on their work in the classroom and on the brain development of students, as well as clarification on the neurological dysfunctions that generate little acquisition and/or retention of new knowledge. (CRESPI, 2017)

Neuroscience studies have contributed to the work in the classroom, in the understanding of cognitive, motor, affective and social structures. Teachers must know this immense universe that is the brain so that they can better define and organize their learning concepts, identifying more or less permanent processes and modifications through the CNS, allowing the individual to better adapt to their environment in response to these internal and/or external requests of the organism. When a stimulus is already known, it triggers a memory. When the stimulus is new, it generates change. Thus, we are able to understand learning from the point of view of neuroscience (RELVAS, 2012, p.20).

In her book *Neuroscience in Pedagogical Practice*, Marta Relvas explains the challenge of the modern educator in his role in the classroom through the vision of learning in the current world, having the understanding from the point of view of neuroscience when she says:

"Information is developed by the cognitive, emotional, motor, affective and social brain. However, new trends that point to this century are the development of the creative brain, author, inventive, intuitive, ingenious, which experiences uncertainties, managing daily frustrations, without losing self-esteem. An autopoietic, self-regulating and reorganized, adaptable brain." (RELVAS, 2012, p. 21)

Marilza Delduque (2016) already bets us that it is proven how much a classroom is different when you have a teacher with a different look in front of that class. A teacher willing to seek to learn can generate daily stimuli in their students. The current teacher moves from the authoritarian position to the position of mediator, inseparable from his group. And quoted by Delduque (2016), Feuerstein, 1989, said: "For brain development to operate, simple exposure to sources of stimulus is not enough, the presence of a mediating agent is necessary".

Understanding that the learner can and must have the opportunity to modify their cognitive abilities and that, for such success, the mediator teacher needs to improve their

knowledge and dedicate themselves to knowing the acquisitions and phases of each apprentice is the initial part of the entire process. Together with this, we combine knowledge of the main theories of Jean Piaget, Lev Vygotsky, Henri Wallon, Froebel, Reven Feuerstein and Maria Montessori, to create a link with the authors of the Neuroscience of Learning.

Relvas (2016) explains that knowledge and application of neuropedagogy evolve through a neuroscientific view of the process of teaching and learning. Contributes to the identification of a biopsychological and behavioral analysis of the student through studies of anatomy and physiology of the CNS. It explains, models and describes the neuronal mechanisms that support the perceptive, cognitive, motor, affective and emotional acts of learning.

And this entire process takes place in the classroom.

With neuroscience studies in recent decades, it has been possible to understand that the current student is the “brain subject”. It is he who argues, questions and who has autonomy to learn; having the teacher the role of promoting challenges, reflective actions and allowing the dialogue between emotions and affections in an organic and mental body that is the medium of these reactions. For information to be transformed into learning, classes need to be involved in emotion, because when information has meaning in the student's life and the student uses the path of emotion, the information will never be forgotten. Thus reminding the teacher that there are several ways to teach, as there are many ways to learn. (RELVAS, 2016).

This reason is explained by Neuroscience as follows: the prefrontal cortex, responsible for inhibiting some behaviors, is not yet completely formed. Thus, students, especially children, have a reduced time of concentration in such an explanation (moment).

Leonor Bezerra Guerra, physician, specialist in Neuropsychology, coordinator of the NeuroEduca Project, at the Federal University of Minas Gerais (UFMG), in the area of disseminating knowledge in neuroscience to professionals in the field of education, he says: “The brain does not give up relevance – one of the teacher's challenges is to contextualize the information in the student's daily life and make it interesting”. The journal Neuroeducação interviewed this doctor who explained why a better understanding of how the brain works can help the educator (pedagogue) in their teaching process.

The interview began with the following question: “How can knowledge of the brain bases of learning be useful for the work of educators?” And Dr Leonor Guerra replied:

“The educator works with learning, a process that depends on brain

functioning. When the student learns, there is a remodeling of the nervous system (SN), especially the connections that occur in the brain. The SN is much more than just the brain [...] When the teacher understands the neurobiological principles of this remodeling, he can better understand the potential and some limitations of learning. For example, the fact that the student is looking at the teacher does not mean that he is paying attention. You may be thinking about totally different things, like a football championship, or noticing the teacher's own clothes, etc. Anyway, if he is not paying attention to what is said, none of the information will be processed. Now suppose he is paying attention. He understands for the moment what is being said. I emphasize attention because it is a primary function of learning – and we don't pay attention for a long time unless we are very interested. In addition, to continue remembering information after leaving the classroom, it must have some relevance to the student. In order for there to be any remodeling, he (the student) needs to keep thinking about the subject. Hence, the usefulness of resuming content in the classroom or through other activities. Each day, during the sleep period, the brain remodels the connections between neurons. When we keep thinking about a subject, that thought is reprocessed during sleep. And the neurons that come into activity by reprocessing this information produce proteins that will participate in the remodeling of the SN. So there is a biological time for learning to take place. The teacher needs to pass on the content, ask the student to check if he has really learned and give him time to actually grasp that information” (GUERRA, 2015).

Thus, we verified through the answer what we mentioned above: the student needs to be interested and motivated.



Use the student's emotion and previous knowledge so that their learning is meaningful.

When asked whether neuroscience should be part of the initial training of educators, Dr. Leonor Guerra said that less than 10% of the pedagogy courses verified in 2001 had some content related to biology and neurobiology. There were 60 courses and several have in their curricular matrix subjects that relate brain and learning, but the theme is still not frequent in the initial training of educators. Leonor believes that every pedagogy student would ideally have knowledge about the neurobiological foundations of learning and cognitive and behavioral psychology bases. Without forgetting that it changes and influences its relationship with the environment and that theories on child development are relevant and complementary to the subject.

And if we think of researchers and educators, let's remember that one is in the laboratory and the other in the classroom. According to Guerra (2015) training is needed for those who study neuroscience about school contexts. On the educator's side, it is necessary that we do not generalize neuroscience and that we must understand that it does not have an answer for everything. There is still a lot to be learned and researched about the brain. Neuroscience explains some aspects of the learning process, taking into account biological factors and behavioral psychology. With advances in neuroscience, the understanding of pedagogical strategies gained new perspectives. Guerra (2015) points out: "I believe that neuroscience has made good contributions to education,

The educator must keep in mind that pedagogical practices are not altered in the face of information from neurosciences aimed at learning. The practices will be the same; what will change will be the intention and planning as they will be thought. It is important to remember that the student must feel involved with actions and learning. Because learning is a desiring act and this only occurs if the student is interested, willing to learn. Therefore, the teacher must move towards arousing interest in the student, through the affective and emotional connections of the limbic system; releasing serotonin and dopamine (chemical messengers) related to satisfaction, pleasure and mood. Happy, involved and interested child learns more.

Studying neuropedagogy is rereading the main theories of learning, but it is also recognizing that it is a science that studies learning in the context of the chemical, cellular, anatomical, functional, pathological, behavioral process of the nervous system, thus demonstrating an integral view of the student. A neuroscience approach applied to learning comprises the understanding of the formation of intelligence, emotion and behavior in the school context,

within the biological, psychological, affective, emotional and social aspects. And this is to generate the possibility for the educator to enable a new skill in the subject, maximizing the potential of brain functioning.

#### **EARLY CHILDHOOD EDUCATION: THE IMPORTANCE OF TEACHERS IN CHILDREN'S LEARNING**

Early Childhood Education is the first stage of basic education. It is the child's first contact with the social environment. The purpose of Early Childhood Education is the integral development of children up to 5 years of age, with the purpose of developing their physical, psychological, intellectual and social aspects, complementing the action of the family and the community (MEC - LDB, art.29).

This comprehensive treatment of the various dimensions of child development requires the combination of education and care in child care. According to the MEC, these practices must be intentionally planned, systematized and evaluated in a political-pedagogical project that must be collectively elaborated and democratically with the participation of the school community and developed by qualified teachers. For Piaget (1969/1970), the main objective of education is to help the child to develop intellectually and morally.

Only in 1988 early childhood education began to be recognized, when for the first time it was placed as an integral part of the Constitution, then in nineteen, like Child and Adolescent Statute (ECA, Federal Law 8069/90), among the rights was the provision of care in day care centers and preschools for children from 0 to 6 years of age.

Barreto (2008, p.24) states that attention to Early Childhood Education in Brazil is a result of the last two decades of reflection, as from the LDB onwards, Child education it became the beginning of Basic Education, seeking to abolish the welfare view and with a view to training professionals working in this area.

In this magical and engaging world of Early Childhood Education, with games, experiences, music, dances, steps, rhythms and games, the brain triggers information for specific areas. If he learns through experience, changes occur in his structures (Marilza Delduque, 2016).

With regard to school responsibility, related to learning, we must give due importance to Early Childhood Education, where the child's first life experiences are carried out. Thus, the link between theories of knowledge, the main concepts, the student's relationship with the world and the role of the teacher and the school will influence the student's profile. This student will leave school for the world.

According to the development of education over the centuries, the importance that an educator has in their society is well known. This importance is not always understood, valued and transmitted to others, but which has always been a reason for reflection by those who knew the weight of a society with good education.

The pedagogue works to guarantee and improve the quality of education and has two main fields of action: administration and teaching (in person or at a distance). When their work is carried out in the school environment, from Kindergarten to Elementary School, the pedagogue needs not only planning, but to carry out their actions with intention and knowledge. Libâneo (2006) points out that: "All teaching work is pedagogical work, but not all pedagogical work is teaching work". The Legislation with its Guidelines for the Pedagogy course points to the possible construction of the professional identity of the pedagogue, a document based on the role of teaching according to the authors Libâneo, Franco, Pimenta (2007).

## II. METHODOLOGICAL COURSE

For this work there will be, in addition to the bibliographical research, an interview with a focus group, where teachers who contemplate the framework of early childhood education in a school in the capital Vitória, in the State of Espírito Santo. The research with the teachers will be through an interview, without identification, photos or videos.

10 teachers will be interviewed (pedagogues) who contemplate their work for more than 05 years in the mentioned institution, directly linked with the Early Childhood Education segment. These teachers are trained in pedagogy and have specialization related to the segment. The teachers selected to participate in the research remain in different classes; which covers every year within Kindergarten, being children aged 2, 3, 4, 5 and 6 years old. These teachers were selected according to the class they teach in that year of 2019 within the school so that all ages that go through Early Childhood Education were part of the research, as well as the time they teach in this company.

The survey took place in November 2019 in a focus group format, where each professional answered the questions having the opportunity to express their points of view, experiences, professional path, interests and other contributions they thought relevant to what was interviewed.

This was semi-structured, enabling open responses that came to be opportune during the focus group. Analyzing its advantages and disadvantages, this was the

methodology applied for this research. So we had the result about the knowledge and interests on the subject, making it possible to program materials for the continued study of these professionals.

## III. RESULTS AND DISCUSSIONS

According to the focus group held on November 22, 2019, on the topic of Neuroscience and Meaningful Learning, there was great interest and understanding of their importance for the daily work of pedagogues in the classroom. With the first questions it was already possible to see that the majority sought specializations and/or courses that could expand their field of knowledge and thus help their work in the classroom. The 10 participating pedagogues will be named here by letters (A, B, C, D, E, F, G, H, I, J).

Our first question asked about content, training or specialization, which they came to do focused on basic knowledge about learning in Early Childhood Education. If they had done, which one or which ones would they be.

In this question, we started with the speech of participant I, who said:

"Yea. Most of them were geared towards that. Training course in Clinical Psychopedagogy, totally focused on this subject... Psychology for Educators; Philosophy for children; Kindergarten Education Pedagogical Mediation... Most of the courses I took were focused on learning in Kindergarten..."

The participant said:

"Yes, in college I had courses that dealt with this subject: Educational Psychology, Philosophy of Education, Games and Play, among others."

Participants B, C, D, F, G and J reinforced participant H's comment, saying that in higher education, in the pedagogy course, the subject was addressed in subjects like those mentioned, but in a superficial way.

The participant had her speech reinforced by participant E, where she said:

"In training, it was superficial, but in the postgraduate course in Psychopedagogy that we did together (I and I), we had the course in Developmental Psychology, which

addressed the content a little more broadly”.

Teachers I, A and E, who took specialization courses, reported that they were already working in the area and felt the need for a greater understanding of this stage of development, as well as the interventions and learning processes to carry out a more assertive intervention in the classroom.

Our second question was: among your studies and specializations in the area of Pedagogy, did any of them address learning disorders? If yes, which/which ones? With this question, several complaints and comments about the formation of the pedagogue were exposed.

One of these complaints discusses the importance of this knowledge for observing, identifying and evaluating the student in Early Childhood Education. Learning disabilities are problems that affect the ability to receive, process, analyze or store information. These disorders can make it difficult for the child to acquire reading, writing, spelling, and mathematical problem solving skills.

Even Marta Relvas (2018) shows that neuroscientific studies focused on pedagogy collaborate to the recognition that everyone is capable of learning in the school process.

Relvas mentions in the article on his website that in this decade the main teaching in the field of neuroscience is that the brain has a capacity to undergo changes much greater than was previously thought. He even refers to the adult phase, also saying that “... Today it is clear that, even before, the adult brain, which was thought to be immutable, can be the seat of renewal, starting from some areas with the capacity to generate new cells. ”.

This brain plasticity has been generating great hopes and expectations in several areas of knowledge, especially thinking about mental health. Furthermore, according to Relvas (2018), it generates research possibilities for the use of stimulation and rehabilitation techniques that enhance existing skills for the development of certain functions.

In the third question I approached about seeking guidance/information to understand the different forms of learning as professionals in the field of Early Childhood Education. And on this issue, despite the majority being positive, there was debate about the importance of having this posture while pedagogues.

We can observe through the speech of each participant such importance that must be given to the subject. Participant A stated saying:

“As a Child Education professional, I started to seek guidance on different forms of learning, when I started

teaching. This diversity is very common in school environments and ends up being the biggest challenge in the teacher's career. Faced with this challenge, it is up to the teacher to know each student well in order to create and guide strategies that awaken in the child their maximum level of learning.”.

Participant F replied:

“Yes, through lectures, seminars and courses offered in the area”.

Participant D said:

“No. I try to dedicate myself to the learning method in which the institution I work believes in.”.

Afterwards, participant C collaborated by saying:

“In my college days I always tried to read and learn more about the ways of learning and everything that was covered, trying to clarify doubts with my advisors. It always comes to my mind how the learning processes are interconnected, how each person organizes, learns and internalizes the information of a given reality. Unfortunately, in these two years after graduating, I still couldn't go deeper into the different forms of learning, but it's something I leave as a "stand-by", as it is a future plan that I have not discarded and is part of my continuing education as a teacher. ”.

Participant B said:

“Yes, books and research on the importance of affectivity, music and play in learning.”.

The other participants just said yes, they seek guidance whenever possible.

And given what was said, we reaffirm that “(...) the pedagogue is every professional who deals with the formation of subjects, whether in educational institutions or elsewhere.” (LIBÂNEO, 2006, p.215).

Therefore, it is important that the educator understands that each subject is unique and that each one has its own identity, with its characteristics and knowledge.

The one who thinks like that will make the difference between the others. In addition to his own characteristics, as a pedagogical teacher, he has the pedagogical practice, where, along with theory, he will make the necessary intervention in the classroom so that there is true learning and understanding of the identity of his students and of them in the face of differences.

Participant I even mentioned several specializations among them one, even though it is not specific about neuroscience, she mentioned the approach and its relevance. She contributed by saying:

“I took a course with Argentinean Alicia Fernández on Clinical Psychopedagogy where I addressed neuroscience and learning disorders as a complement to the content. It was there that I heard a little more about neurosciences, but not in a specific way.”.

Participant A mentioned in this question saying that she likes to use social media, such as Instagram, to get more information about the content. And in the case of neuroscience, she follows the page @neurociencia\_e\_educação, where she said she finds most of what is published by the mediators of the page interesting.

Participant C said:

“I recently did a workshop on neuroscience and I was very interested. It was discussed how the brain processes the new things we learn and how learning becomes knowledge for life. As technology advances, it allows us to have contact (know it, how does it capture information? Why is that?) with our brain today, as 50 years ago we didn't have any of that. We can get an idea from the development of our ancestors, we were seeing physical change and the main development of our brain along this journey.”.

Grasses (2018) guides us saying that neuroscience together with Education promotes ways for the teacher to be a mediator capable of teaching with quality, using pedagogical resources that encourage the student to think about thinking. The author demystifies the relationship of more stimuli and more learning; explaining that it is not connected with the quantity, but with the qualities that these stimuli have. And it adds:

“That is why there is no “levelling” of learning, as we are different in biological, psychological, emotional, affective and social contexts. [...] If you are a teacher and educator, basic knowledge of Neuroscience is essential for your work, since your objective is to provide learning for your students and, preferably, in the most optimized way possible.”. (MARTA RELVAS – Article: Studies of Neuroscience applied to school learning).

Guerra (2015) emphasizes that neuroscience makes good contributions to education, providing a foundation for much of what is already being done in the field of pedagogy and also clarifying aspects of human behavior, reaffirming and suggesting strategies for more effective learning.

Finally, in the tenth question, I asked if they would like to be part of a continuing education course that addressed the contributions of neuroscience aimed at meaningful learning in Early Childhood Education.

Participant F said:

“I am interested in the subject and yes, it would be my pleasure to acquire more knowledge on the subject.” Participant C contributed by saying: “Yes, I was very fascinated with neuroscience, I'm reading it and trying to find out more about it.”.

França (2018) confirms the importance of giving continuing education to teachers, saying:

“The continuing education of teachers has been understood today as a permanent and constant process of improving the knowledge necessary for the activity of educators. It is carried out after initial training and aims to ensure an increasingly high quality education for students.”.

Participant E at the end collaborated and gave us a great reflection when she said:

“The teacher's great exercise is to carry out in practice what is brought about by theory. In the end, the biggest challenge for the teacher is to carry out significant learning in a class with students at different levels



of knowledge and as distinct as individuals.”.

All participants have this interest and believe it to be very valuable for complementing their work and a great help for their classroom planning.

#### IV. FINAL CONSIDERATIONS

With this work, we could see that Education and Neurosciences are distinct areas of knowledge, but they share the interest and search for understanding the learning process. While Neurosciences investigate the neurological structure and functioning that underlie several processes, including learning, Education, in turn, seeks to create conditions for individuals to develop their skills and competences within the school environment. Thus, the link between these areas has enabled investigation and dissemination through scientific research on learning.

Not long ago, this was only addressed in academia, leading educators to a series of reflections. Today, with neuroscience studies, it is possible to know more about brain functioning and thus its learning process, which helps educators and researchers to understand the structural properties of the Nervous System, the neural processes that serve as an intermediary for learning, and the stimuli that enable the cognitive development of students. The set of bibliographies analyzed in this work indicates that the approach of Neurosciences to educational practices in the school environment seems to present promising contributions to the learning processes, in particular the possibility of expanding meaningful learning.

According to what was aimed, I could in my specific goals verify the importance of neuroscience in the process for meaningful learning in early childhood education, bearing in mind that it is in early childhood that the greatest cognitive development and acquisition of knowledge occur. In the first 02 years of life, millions of synaptic connections strengthen learning and assemble the first concepts to be recorded in that individual. In the second specific objective, it was possible to describe about meaningful learning as well as early childhood education as a complement so that we could have a better understanding of the neuroeducational contributions in this segment with this focus.

In my third specific objective, I identified possible needs, interests and knowledge of pedagogues from a private school in the city of Vitória in relation to the contributions of neuroscience and meaningful learning in early childhood education through a focus group. In this research, it was also possible to perceive that the great

challenge of the pedagogue is to unite theory with practice. And so, according to the interview (focus group), a final product was imaginable with the objective of proposing a continuing education course for these teachers/pedagogues, in partnership with the school, so that they can expand the field of information and have access to the knowledge and contributions of Neurosciences applied to learning.

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