



The Learning and Development Process in the Light of Cultural-Historical Psychology: Contributions to Teacher Education

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Abstract

This study aims to analyze the theories that permeate the Pedagogical Project of the Course of Licentiate degree in Biological Sciences of a public university in Ceará, with emphasis on Historical-Cultural Psychology. The investigation is qualitative, and the method used was documental research. For data collection, PPC was used, which was analyzed using the Content Analysis technique. The results obtained show that the PCC is intertwined by a diversity of theories of learning and development, which generates a multiplicity of methodologies and evaluative practices. Considering that the PPC is a document that should contribute to raising the quality of the course, as well as to the training of future teachers, the need for critical theories such as Historical-Cultural Psychology is highlighted, to support the teaching practices of teacher educators, teachers of the Licentiate degree, in particular, of the Biological Sciences course.

Keywords: Theories of Learning and Development. Historical-Cultural Psychology. Teacher Trainers. Science. Biology.

O Processo de Aprendizagem e Desenvolvimento à Luz da Psicologia Histórico-Cultural: contribuições à formação docente

Resumo

Este estudo objetiva analisar as teorias que perpassam o Projeto Pedagógico do Curso - PPC de Licenciatura em Ciências Biológicas de uma universidade pública do Ceará, com ênfase na Psicologia Histórico-Cultural. A investigação é de natureza qualitativa, e teve como método a pesquisa documental. Para a coleta de dados, utilizou-se PPC, que foi analisado por meio da técnica de Análise de Conteúdo. Os resultados obtidos mostram que o PCC é entrelaçado por uma diversidade de teorias da aprendizagem e do desenvolvimento, o que gera uma multiplicidade de metodologias e de práticas avaliativas. Tendo em vista que o PPC é um documento que deve contribuir com a elevação da qualidade do curso, assim como com a formação dos futuros professores,



ressalta-se a necessidade de teorias críticas como a Psicologia Histórico-Cultural, para fundamentar as práticas docentes dos formadores de professores nos cursos de licenciatura, em particular, nas Ciências Biológicas.

Palavras-chave: Teorias da Aprendizagem e do Desenvolvimento. Psicologia Histórico-Cultural. Formadores de Professores. Ciências. Biologia.

1 Introduction

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Teacher education is a praxis that needs to be oriented as to its philosophical, epistemological and methodological foundations, constituting an important challenge for undergraduate courses, which, in their Pedagogical Course Projects - PPC, should make such foundations explicit, considering that this complex is essential to the process of humanization and transformation of society, in the sense of contributing to emancipatory processes, especially regarding the overcoming of the current model of sociability orchestrated by the capital.

To this end, it is necessary to seriously consider one of the essential processes of formation: learning. In the last decades, there has been investment in several teaching strategies, in methodologies that enhance learning, etc., but we need to ask: such propositions are anchored in which perspectives and theories of learning and development? Since it is quite questionable to deal with teaching proposals without clarity on how their foundations conceive learning and how they articulate with it. It is fundamental that the teaching methodologies/proposals are guided by learning and development theories that are aligned with the social role that is intended for education in the emancipatory perspective of social transformation.

It is known the diversity of learning and development theories that, historically, have been produced and supported educational proposals, and that, like other theories in the social field, reflect determinations of the contexts in which have been developed, whether economic, cultural, political, etc., among them: Behaviorism; Transmission/Traditionalist Learning Theory; Discovery Learning Theory; Meaningful Learning Theory; Cognitive Development Theory Piaget's Theory of Development





Affective of Wallon; Humanistic Theory of Rogers and Kelly; and, Vygotsky's Cultural-Historical Psychology. However, the choice for one or another, when it comes to teacher education, brings important developments on how the students will learn the contents and how, in the future, they will conduct the teaching processes in their work contexts. Among the theories listed, we understand Vygotsky's Cultural-Historical Psychology as the one that is most aligned with the main purpose of Education, namely: human emancipation.

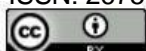
In this sense, and having these questions as motivation, this study aimed to analyze the theories of learning and development that permeate the PPC of the Degree in Biological Sciences of a public university in Ceará, with emphasis on the Cultural-Historical Psychology, having in mind the theoretical-methodological unity, as well as an integral human formation.

Methodologically, we inform that this study is an investigation of qualitative nature, having as method the documental research. As a data collection technique, we used the Documentary Analysis of the PPC, more precisely of its volumes 1 and 2, which deal respectively with the general perspectives of the course and the menus of each course subject.

The study is anchored in the authors of these theories and in others that help us understand them from the point of view of their limits and advances in relation to learning and development of individuals. It briefly approaches the foundations of the theories of learning and development and the formation of teachers; the theories of learning that permeate the Pedagogical Project of the graduation in Biological Sciences and, before the final considerations, the contributions of cultural-historical psychology to the formation of teachers of Sciences and Biology.

2 The Foundations of Learning and Development Theories and Teacher Education

Before entering the analysis, properly, and explaining the contributions of Cultural-Historical Psychology to teacher education, in this topic we briefly introduce the foundations of some learning and developmental theories, namely: Behaviorism;



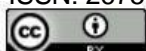


Transmission/Traditionalist Learning Theory; Discovery Learning Theory; Meaningful Learning Theory; Piaget's Theory of Cognitive Development; Wallon's Theory of Affective Development; Rogers and Kelly's Humanistic Theory; and Vygotsky's Cultural-Historical Theory. This will be resumed in the topic Contributions of Cultural-Historical Psychology to the education of teachers of Science and Biology.

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O **Behaviorism** is an empiricist behaviorist approach, i.e., it considers experimentation as the basis for knowledge, and knowledge is the way of ordering experiences. Bringing it into the educational context, in order to carry out a behavioral analysis it is necessary to consider that both the teaching elements and the responses that students emit can be analyzed based on behavior, although in the teaching system there are behavioral patterns that can be changed through training according to established goals. Importantly, the goals set are categories of behavior or skills, and the skills are the responses emitted (MIZUKAMI, 1986).

The first step towards the study of behavior was taken by Ivan Pavlov (1849-1936), who worked with the conditioned reflex, this being one of the first objective and scientific approaches to the study of learning. Pavlov's work provided the basis for the studies of John Watson (1878-1958), considered the founder of Behaviorism. Watson studied behavior based on the principles of stimuli and responses applied to a given organism, which are linked to Pavlov's conditioning (OSTERMANN; CAVALCANTI, 2011). According to Watson's studies, learning is the result of the connection between stimulus and response, in which this connection is built based on Pavlov's classical conditioning. Watson focused on the study of observable behavior, leaving aside the mental processes, the thoughts and feelings of each being, because although he did not deny the existence of these mental processes, for him it was unproductive to research in this medium. He also defended the influence of the environment on the individual's development, and, for him, all behavior was a consequence of the environment's





influences, believing that every being is born devoid of a biological heritage, being considered a tabula rasa (JUNGES, 2017).

For Mizukami (1986), the behaviorists did not care much about the cognitive processes that take place in the mind of an individual during the learning process, because their focus was on the control of observable behavior. For them education is linked to the cultural transmission of knowledge and ethical behaviors, social practices, and skills that are considered basic for manipulating the environment.

Linked to the behaviorist or behavioral perspectives of learning is the **Transmission or Traditionalist Learning**, which advocates a transmission teaching, in which has as the center of the process the teacher's oratory expositions that are seen as stimuli for the students (VASCONCELOS; PRAIA; ALMEIDA, 2003). A transmission-based learning is centered on the teacher's content, in which these contents must be memorized by the student without any claim (POZO; CRESPO, 2009).

The contents addressed in a transmission teaching is purely disciplinary, thus causing a 'learning' of purely scientific concepts that will be memorized and soon forgotten (POZO; CRESPO, 2009). With this, it can be seen that meaningful learning does not occur, in which the student can actually learn subjects that will serve them in their daily lives. The same way the activities are memoristic and not linked to the student's daily life, prevailing a selective and not formative assessment. In this logic, the teacher assumes the role of maximum authority, being the one who knows and should not be questioned. He is seen as the provider of information that is transmitted to the students in the most faithful and content-based way possible. The student, in turn, assumes a passive posture, being treated as a receiver of knowledge that must be reproduced as an original copy (VASCONCELOS; PRAIA; ALMEIDA, 2003).

In opposition to the behaviorist pedagogical model, the **Discovery Learning Theory**, proposed by Bruner, in order to break with the predominant transmissive



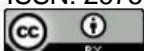


pedagogy, defending an active learning, through exploration and discovery (VASCONCELOS; PRAIA; ALMEIDA, 2003). According to Ostermann and Cavalcante (2011, p. 32), "[...] The discovery method consists of teaching content perceived by the learner in terms of problems, relationships and gaps that he must fill in, so that learning is considered meaningful and relevant [...]".

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In this perspective, the best way for a student to learn science, for example, is to do that science himself, because with this he will have the opportunity to discover and re-signify knowledge, based on the methodology of scientific research. "In other words, the best way to learn something is to discover it or create it by yourself, rather than someone else being the intermediary between you and the knowledge" (POZO; CRESPO, 2009, p. 252). This statement by Pozo and Crespo (2009) leads us to a reflection on the teaching profession, as it signals the emptying of the teacher's work. In this sense, Facci (2004) clarifies that the teaching professional has long been undervalued and treated, often mistakenly, developing a role that is not his, as for example, that of father and mother, having, still, his identity in crisis, due to the social level that the profession occupies in society, that is, always undervalued and seen as something not so fundamental to the process of teaching and learning, as assumed by the Discovery Teaching. For these and other reasons, the teachers' identity needs to be recovered, so that the work of teachers is valued and respected.

Also according to Pozo and Crespo (2009), the discoveries made by students provide them access to scientific knowledge, thus making them subjects similar to scientists. In counterpoint to the ideas of these authors, it is important to say that the role of science teaching in the life of a student and of any individual is not to make him/her imitate scientists, but to form a critical and autonomous subject, in which, based on his/her studies, he/she can understand how science was built, its history, its importance for society, among other factors (KRASILCHIK, 1992). As for the role of the teacher, he





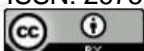
should direct the research so that the student can research and make his own discoveries.

As for **Meaningful Learning Theory** created by Ausubel and collaborators (1978) gives memorization a distinct place in the learning process, when compared to the Discovery Learning Theory. It is based on constructivism, because it considers knowledge as something that is being built in the cognitive structure of the learner, from the interactions between subject and social environment. Thus, learning is a personal process that is influenced both by social factors and by the way the classes are conducted (VALADARES, 2011). In this sense, the cognitive structure is strengthened through teaching factors, such as, for example, a sequential content exposure. However, it is worth noting that if the content learned is not anchored to existing knowledge in the student's mind, there will not be a Meaningful Learning, but a mechanical learning (SILVA; SCHIRLO, 2014).

As for this mechanical learning, it consists when a "[...] new information is learned without interaction with existing information in the subject's cognitive structure. The information is stored literally and arbitrarily, contributing little or nothing to the elaboration and differentiation of what he knows" (GUIMARÃES, 2009, p. 199).

During a Significant Learning process, knowledge must be obtained, in which it must unite with a subsuncer concept, according to Ausubel, thus giving rise to cognitive bridges. Thus, the relationship between the acquired and already existing information is not just any relationship, but a process of assimilation in which the subsupplier concept must be modified, i.e., gain meaning (GUIMARÃES, 2009).

In the Meaningful Learning process, the organization of the contents occurs in a hierarchical manner, i.e., it starts from the more general contents to the more specific ones. Teaching activities must have a relationship between what the student already





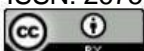
knows and what he or she will learn, and prior organizers of information are extremely important.

Still on the subject of constructivism, there is **Piaget's Theory of Cognitive Development**. For Ostermann and Cavalcanti (2011, p. 32), Piaget's Theory "is not exactly a learning theory, but a theory of mental development. He distinguishes four general periods of cognitive development: sensorimotor, pre-operational, operational-concrete, and operational-formal".

Regarding the stages of intellectual development, it is important to remember that in each stage the individual builds cognitive structures according to the needs and situations experienced, in which these structures are being interconnected by the different stages. Piaget also considered important concepts regarding the development of knowledge, such as: assimilation, accommodation and adaptation. Assimilation is understood when the child, for example, comes across something new and extracts information from it that will be stored in his mind. Accommodation occurs from assimilation, that is, when assimilating information there must be modifications in the child's mental structure. That is why assimilation and accommodation are only effective if both happen. Adaptation is a state of balance between assimilation and accommodation (SANTOS; OLIVEIRA; MALUSÁ, 2017).

Another of Piaget's contributions to education concerns the reversible teaching process. For Piaget, teaching involves the provocation of imbalances that should not be irreversible, but reversible to the point that the subject returns to a state of equilibrium. It is in these imbalances that the student shows his abilities and develops new competencies, and all this should happen through the teacher, who helps his student in the search for a new equilibrium. Thus, the reversible teaching and learning process should be alternated by balances and imbalances, thus happening, assimilation and accommodation of information (OSTERMANN; CAVALCANTI, 2011).

Another theory widely considered in the field of Education is **Wallon's Theory of Affective Development**. Wallon (1879-1962), was fundamental to education and to the understanding of how the human being develops and what are the ideal conditions for





this development. He studied human functioning, taking into consideration the affective, cognitive, and motor aspects, which influence and are essential throughout an individual's life.

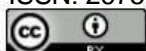
Although Wallon's Theory of Affective Development was not able to explain all the transformations that human beings experience, it was very effective because it provided a complex view of the development of an individual from birth to old age. In fact, Wallon was one of the only scholars who focused on studies of the human being in old age, since he considered that the subject never stops developing (PETRONI; ANDRADA; SOUZA, 2017).

In Wallon's theory, the main axes of the development process are affectivity and integration. Integration between the organism and the environment and affective, motor and cognitive integration. Considering the integration between the organism and the environment, Wallon emphasized that this relationship is essential, since sociocultural factors are fundamental in the development of the human being. As for the affective, motor and cognitive integration, Wallon called them functional sets, also including the person as the fourth set (MAHONEY; ALMEIDA, 2005).

In the field of Humanistic Theories, we find **Humanistic Theory of Rogers**. According to Mizukami (1986, p. 37-38), humanistic theories focus on the subject, with emphasis on "[...] interpersonal relationships and the growth that results from them, centered on the development of the individual's personality, on his processes of construction and personal organization of reality [...]".

Rogers did not aim to understand the behavior, the cognitive development of an individual, but rather, the personal growth of the student, because he considers him as a person who must realize himself through teaching, aiming at a learning that encompasses affective, cognitive and psychomotor factors. For him, students need to be understood much more than evaluated, judged and taught (OSTERMANN; CAVALCANTI, 2011).

Mizukami (1986, p. 41) points out that "for Rogers reality is a subjective phenomenon, for the human being reconstructs the outside world within himself, starting





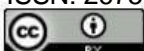
from his perception, receiving the stimuli, the experiences, attributing meaning to them [...]", being "the personal and subjective experience [...] the foundation on which knowledge is built, in the course of the human being's becoming" (MIZUKAMI, 1986, p.43).

As for Kelly's Humanistic Theory, it takes into account the Psychology of Personal Constructs, i.e., the constructs that are ideas built by the self, imply in the teaching and learning process, since they allow the reconstruction of the internal paradigms of the individual, learning occurs to the extent that the personal constructs are rethought according to the formal constructs. In this context, the teacher becomes a professional mediator of the process, and should facilitate and direct the formation of new constructs, always respecting the limits of the student (SILVA, 2017).

Finally, the **Vygotsky's Cultural-Historical Theory** which brings great contributions to education. Vygotsky's (1866-1934) objective was directed to the development of consciousness, that is, of the human psychism. His thesis is that this is socially and historically constructed. Among his studies, an important concept is that of the Zone of Immediate Development. "It is a stage of the learning process in which the student can do by himself or with the collaboration of more advanced colleagues what he used to do with the help of the teacher, that is, he does not need the teacher's mediation" (VIGOTSKI, 2009, p.10).

For Vygotsky, learning occurs from the interactions between the subject and the Culture, in which the individual cannot be seen as a blank slate, because their interactions with the socio-cultural environment should be considered, because from these one can build deeper and more elaborate knowledge (SILVA, 2017). In this learning process, Ostermann and Cavalcanti (2011) report that the teacher is a mediator and a key player in the teaching process, because the success of student learning depends largely on the quality of the instruments used by the teacher.

In Vygotsky's theory, learning is treated as something continuous that is built little by little and through mediations. The social relationship that the subject experiences, whether at home or at school, contributes to the fact that the subject can perceive the





socio-cultural diversity, and also helps in the intellectual development. That is why it is important a cooperative relationship between school and family environment, so that the student can understand that both spaces are conducive to learning, because even before the subject goes to school he already knows a lot, he learns even along the way, but the school offers other knowledge that can be assimilated by the learner (COELHO; PISONI, 2012).

Envisaging the potential of cultural-historical psychology for teacher education, this theory will be resumed in the topic Contributions of cultural-historical psychology for the education of science and biology teachers.

3 The Theories of Learning that Permeate the Pedagogical Project of the Undergraduate Degree in Biological Sciences

The analyzed PPC is the result of the joint work of the entire collegiate of the Biological Sciences course in question, and other courses of the institution, which together, try to find solutions to the constant challenges that are posed to professionals in education. In this sense, the PPC of this course is a document that, at each end of the course validation, must be submitted to a new evaluation. At the time of the research, the PPC was in force until the end of 2019 (PPC, 2013).

The PPC, as a collective and integrating document, when elaborated, executed and evaluated, requires on the part of this collective a climate of cooperation and dialogue, since it is a work that involves many voices. The legitimacy of a PPC is directly related to the degree and type of participation of those involved in the process. To elaborate the PPC of a Training Course means to go in search of facing the challenge of emancipatory innovation, for much more difficult than elaborating it, is to execute it in an emancipatory, political, and democratic way.

Considering the constant scientific and technological changes that society faces, the PPC states that training institutions must always be attentive in relation to their educational projects, so that they can keep up to date, and thus contribute to the





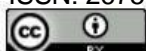
formation of critical and active subjects. Thus, schools and universities play a key role in this training, since the formative principles of these institutions cover social, political, cognitive, psychological aspects, among others (PPC, 2013).

Legally, the PPC was, at the time of the research, supported by Resolution No. 01/2002 of the National Council of Education / Full Council, which established the National Curriculum Guidelines for the Training of Teachers of Basic Education, in Higher Education, in Licenciatura Courses, in the Opinions No. 9/2001 and 27/2001, also of this Council, which provide the general principles that guide the organization of the projects of Licenciatura Courses, giving quality to the curriculum and the formative process of these professionals.

Considering the structure of vol. I of the PPC of the Degree in Biological Sciences course, it was organized in the following sections: general information regarding the PPC and the institution; justification for the elaboration of the PPC; characterization of the course; information about the graduate, taking into account the guiding principles, function and professional profile, skills and competencies, fields of action; structure of the course, listing the objectives of the course, structure and curricular organization; Tutoring Projects and Initiation to Teaching; evaluation plan; Extension Projects; staff; physical structure and equipment.

Regarding the guiding principles of the graduate training listed in the PPC, these are close to the Discovery Learning Theory; Vygotsky's Cultural-Historical Psychology, by listing that the training space should integrate theory and professional practice, develop interdisciplinary actions, whose activities are methodologically guided by the problematization of reality and address the teaching content according to the didactics that best support its development (PPC, 2013).

According to the ideas of problematization and contextualization of reality as a didactic strategy, Ricardo (2003, p. 6), based on the ideas of Paulo Freire, points out that in this way "it enables dialogue, not only with the reality of the subject, but also between teacher and student, which fundamentally characterizes Freire's proposal [...]". It further clarifies the relevance, "[...] of meaningful knowledge that has its origin in the daily life of





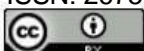
the subject in his or her awareness of the reality pronounced and that the knowledge apprehended possess the dimension of universality [...]" (RICARDO, 2003, p. 8).

The PPC states that at the level of training, the graduate student should receive knowledge that will enable him/her to have a teaching practice in Basic Education that goes beyond the exclusive use of explanatory models, and should explore the capacity for reflection, analysis, and intervention in the concrete reality, based on social problems (PPC, 2013). Here, one can notice a criticism directed at traditional methods, thus, going against the Transmission Learning Theory/traditionalism. Libâneo (1992, p. 4) points out that "the traditional liberal pedagogy is alive and active in our schools [...]", however, despite this deep rootedness of Traditional Pedagogy, it can be innovated in face of other teaching and learning methods as long as students appropriate the socially and historically produced knowledge in a dynamic way mediated by the teaching practice.

In order to enrich the learning process in institutions and bring new approaches to integrate the teaching-learning field, the PPC proposes that "[...] the process of teacher education will be oriented towards developing the spirit of inquiry, the capacity for reasoning, and the autonomy of thought [...]" (PPC, 2013, p. 22).

In view of this, the Discovery Learning Theory and Meaningful Learning Theory are implicit, since these theories propose the use of investigation, since they can contribute to the development of cognitive, affective and motor skills of the subjects involved, going these ideas to meet the theories of Piaget, Wallon, Rogers. Once the affective, cognitive, and motor development of a subject is achieved, this achievement contributes to the improvement of each student's reasoning capacity and autonomy of thought.

Teacher training, according to the PPC, should move towards a democratic, autonomous, and reflective teaching practice, leaving aside policies authoritarian, which massify teaching and do not promote student learning. According to this premise, all learning theories dealt with in this research are implicit, except for the Transmission Theory of Learning/Traditionalist, because it aims at the teacher as the center of the teaching-learning process, holder of the knowledge, etc., contradicting what the other





theories presented here; and, Behaviorism, since the teacher for the behaviorists is seen as an engineer of behavior, which aims to maximize the knowledge of students.

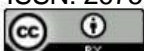
Gadotti (2003, p. 3) states that being a teacher nowadays requires "[...] living intensely one's time with conscience and sensibility. One cannot imagine a future [...] without educators. Educators, in an emancipating vision [...] form people [...]".

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In summary, the PPC (2013, p. 25) points out that the purpose of the formation in the Degree in Biological Sciences "[...] is expressed by the "professional knowledge of teacher" whose essence is formed by the set of theoretical knowledge and experiences that should not be confused with the superposition of disciplines mediated by concepts and techniques [...]". Still for the PPC (2013, p. 25), "[...] by a know-how about a concrete situation, made possible through the structuring cores of the curriculum, properly articulated, in which knowledge is built in a problematizing way, through individual and group work [...]".

Contributing to the achievement of this purpose, all learning theories exposed in this research, except for the Transmission/ Traditionalist Learning Theory and Behaviorism, can help in the fulfillment of the role of the Degree in Biological Sciences, since they enable an education based on aspects of problem solving linked to the student's social reality, cognitive, affective, motor, didactic and pedagogical aspects, etc. Thus, as a means to materialize an integrating and dynamic formation, the PPC establishes that the formative curriculum should be dynamic enough to allow the expansion of knowledge and experiences linked to professional practice. To this end, it becomes necessary "[...] to mobilize other knowledge from different experiences in different curricular times and spaces, in order to reflect, solve or predict new pedagogical situations" (PPC, 2013, p. 26).

Thus, it is manifested above the Meaningful Learning Theory because it emphasizes the use of existing knowledge that each learner carries with him, in that these can be mobilized for the construction of other knowledge, which can be more meaningful. Gadotti (2003) calls attention to the fact that the student must (re)construct





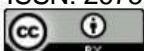
their knowledge from experiences that are meaningful to them, so one learns what makes sense to them.

Regarding the professional function of the undergraduate, the PPC lists several functions, but the main ones indicate that the teachers who graduate from the Biological Sciences course need to have skills, abilities and attitudes that contribute to the formation of the citizen, following ethical and political principles, in order to achieve the best learning strategies. Among the various functions assigned to the teacher, all the learning theories mentioned in this research are implicit, except for the Transmission/Traditionalist Learning Theory and Behaviorism.

In this sense, the teaching profession is not a simple task to be put into practice, because it goes far beyond the exposition of contents. Every teaching activity to be performed should be mediated by reflection to consider what the intention of this activity is, and thus seek ways to accomplish the pedagogical work so that teachers and students can relate and together build a learning that transforms ideas, life and social reality (MENDES; BACCON, 2015).

Anchored in these placements, the Degree in Biological Sciences course, according to the PPC, presents several objectives, going through some of them the focus on using scientific research methods and the solution of real problems from the teaching pedagogical practice, as explained below: "Solve real problems of pedagogical practice, observing the learning stages of students, as well as their sociocultural characteristics, through a reflexive-investigative posture" (PPC, 2013, p. 37 and 38).

In the scope of the specific objectives addressed in the PPC, all the learning theories are implicitly manifested, since they contemplate a training based on didactic, pedagogical, cognitive, humanistic, socio-cultural aspects, among others. The learning situations proposed by the course objectives are in line with the theories studied in this research, such as the exploration of problems, investigative and research activities, debates, content mastery, etc. This is extremely important, since it can be seen that the Biological Sciences course proposes a teaching training that is not restricted to a single





teaching-learning, but a teaching that is involved by many theories of teaching and learning.

Mizukami (1986) proposes that teacher training courses should enable, in their teaching-learning proposals, conflicting situations between didactic approaches, because each learning theory is not something readily finished and entirely correct and effective, but rather, several theories together can promote a more emancipating and transformative work. These courses should also provide teachers with an analysis of their own teaching work, so that they can be aware of their actions and, whenever feasible, reflect on them.

In relation to the didactic activities that will be developed in each course subject, these are at the teachers' discretion, however, the PPC suggests some activities: development of scientific research, thematic projects, case studies, production of texts and didactic and pedagogical material, seminars, workshops, lectures, among others.

The activities suggested by the PPC are implicitly close to the Discovery Learning Theory, by proposing research activities on materials that help students' study, investigative projects on certain themes, etc. The ideas of Piaget, Wallon, Rogers and Kelly, Vygotsky and Paulo Freire are also implicit, since there are activities that require a critical and more active attitude from the subjects; and, Learning by Transmission/ Traditionalism and Behaviorism, since seminars and lectures, depending on how they are carried out, present traces of these theories.

Regarding the field of activities, the PPC (2013, p. 44) deals with extracurricular activities and monitoring programs and initiation to teaching, such as the Institutional Program of Scholarships for Initiation to Teaching (PIBID), in which these "comprise studies and activities of diverse nature that are not part of the academic offer of the Course [...]. These activities aim to complement the professional training of the Biologist for the exercise of responsible citizenship [...]"

As far as volume II of the PPC of the Degree in Biological Sciences is concerned, it is made up of the course schedule, with, first, the mandatory courses and, later, the optional courses. At The structure of the program of courses presents: name, code,





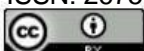
credits, hours/classes, subject pre-requisites, menu, objectives, syllabus, teaching methodology, forms of assessment and references.

For data collection in this research, all the curricula of the courses were analyzed in order to verify which learning theories are present in them, specifically in their methodologies and evaluations. It is important to point out that the explanation of the learning theories found in each syllabus, in the methodologies and evaluations sections, will be made in a general way, due to the limited number of pages of this writing.

In general, the courses pointed out the use of the following as methodological and didactic resources expositive-dialogued class, directed study, seminar, discussion group, debate, panels, theoretical and practical workshops, slides, transparencies, paintbrush, whiteboard, CD-ROM, overhead projector and videotapes, practical class in laboratory or field, group work, lectures, films, use of exhibitions, individual and collective reading of texts and/or articles, summary, field research, morphological/anatomical description, dynamics, project elaboration, field class, case study, problematization.

Regarding the forms of evaluation used, the following can be highlighted: continuous diagnosis, evaluation by means of lab/field/internship class reports, seminar, team work, objective and subjective tests, directed study and fixation activities, procedural evaluation through activities developed by the students in class, attendance, punctuality, interest and participation in class by the students, fulfillment of scheduled and group work, individual evaluation, evaluation by means of projects, oral and/or written expression, production of didactic material, progressive evaluation, student's interpersonal relationship.

After the analysis of the menus and the mapping of the methodologies and forms of evaluation, the presence of all learning theories is verified in Volumes I and II of the PPC. This fact shows how diversified the teaching-learning process can be in the Degree in Biological Sciences course, thus corroborating, with the ideas of Mizukami (1986), who emphasizes the importance of working together among the different teaching-learning approaches.





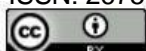
Furthermore, it is important to stress that both in the analysis of vol. I and vol. II of the PPC, in general, the theories are manifested in the document in an implicit way. Regarding vol. II, that is, the document of the course syllabus, what is stated in each one is part of what can be called content, but the way it will reach the students depends on the pedagogical practice of each teacher, that is, on the objective and subjective conditions that permeate the teaching work. Moreover, sometimes, the writing on paper may point to a particular theory, but in practice it may be directed and contemplate the foundations of another. Hence, the care in dealing with these theories should not be annulled and extinguished from the educational environment, but discussed and analyzed so that they can compose the scenarios that best match the emancipatory perspectives of work and teacher training.

4 Contributions of Cultural-Historical Psychology for the Training of Science and Biology Teachers

The Historical-Cultural Psychology, tributary of Vygotsky, Leontiev and Luria, is aligned to the dialectical historical materialism. It starts from the understanding that "humanity is not "born" in people from themselves, but results from the objectified humanity made available to their appropriations" (MARTINS, 2013, p. 131), and turns "to the analysis of the objective conditions that, in a class society, reserve unequal conditions of humanization for different individuals" (MARTINS, 2013, p. 132). Based on this understanding and not by chance:

Vygotsky (1996) dedicated himself to the study of the relations between teaching and development, pointing out the order of conditionability of the first over the second. He evidenced that it is teaching that promotes development, differently from what was postulated by the naturalizing and ahistoric conceptions conveyed by traditional psychology. For the author, only the contradictions installed between the legacy of nature and the one provided by culture promote the rise of "simple", elementary mental structures into "complex", superior structures. (MARTINS, 2013, p. 135-136).

Santos and Aquino (2014, p. 136), point out that according to Vygotsky, "the contents available for appropriation contain qualitatively different aspects, so that which



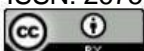


The authors also emphasize that Vygotsky points out that "for it to promote development, it must affect the psychic structures, transforming them". Thus, according to these authors, the psychic phenomena cannot be considered and studied as mere objects, but as changing processes, in which mediation plays an important role, because it is the fundamental link between the social-cultural environment and the individual. It is worth pointing out that if this mediating action towards the student is performed by a teacher, friend, relative, etc., it is said to be a pedagogical mediation. If it is done through signs, the most important sign being language, mediation is semiotic, since it deals with the study of signs (COSTA, 2006). Bernardes (2010 apud SANTOS; COSTA, 2014, p. 79) states that:

The signs and instruments, as a construction historically developed by man, aim to mediate the process of appropriation of reality, and in parallel, to create conditions for the transformation of nature. The signs act in the transformation of internal activity and the instruments in the activity external to man.

Thus, "semiotic mediation makes understandable the origin and social nature of psychic life, the productive character of human life and the social process of knowledge and consciousness (SANTOS; COSTA, 2014, p. 81). This understanding is fundamental to the understanding of the social role of education, teacher training and teaching in the process of humanization of individuals, which includes the teaching of science and biology in school and the training of teachers in this area, processes that presuppose an effective learning through the appropriation of school content, i.e., the knowledge produced and systematized by humanity and capable of intervening in reality.

The training of Science and Biology teachers cannot do without the foundations of Cultural-Historical Psychology, under penalty of considering learning alien to social aspects and the objective and subjective production of life. Such production concerns how men relate to each other and to the natural environment, in the construction of the human world, in view of the ineliminable dependency relation that we have with nature. Cultural-Historical Psychology, by committing itself to the unveiling of these relations, presents itself as an essential reference to a emancipatory formation, in the direction of





overcoming class society, which generates alienation and limits the full development of human potentialities.

In this way, Silva and Souza (2022, p. 2), list that, "facing the current dilemmas and problems that influence the teacher education, it is necessary to think about the profession, knowing that several elements impact the teacher education, especially in a context full of contradictions, as it is in Brazil". Therefore, it is necessary that all those who are part of this formative process are "[...] inserted in the fight for better working conditions, learning for all students, living conditions with dignity and justice for all [...]" (SOUZA; ANSELMO, 2021, p. 11).

5 Final considerations

The study in question allowed to raise reflections about the need for teaching practices in teacher education to consider the learning and development theories that subsidize the undergraduate curriculum, in the direction of social transformation and human emancipation. The importance of teacher educators recognizing the philosophical and epistemological foundations that support their methodological proposals is reaffirmed. The clarity about the fundamentals of their actions in the process of conducting teaching, having in view the learning, will enable a more intentional and effective teaching practice, especially when it comes to the training of teachers, who will also conduct teaching processes in Basic Education.

In this sense, the defense of Cultural-Historical Psychology as a foundation that needs to be present in teacher training, is due to its foundations in Dialectical Historical Materialism and the cultural-historical conception of man, society and educational nature that guides the relationship between both through human vital activity, that is, through work, as Martins (2013) states, although the importance and contributions of other theories that are also focused on learning is acknowledged.

In relation to the PPC, in the specific case of the course in question, Cultural-Historical Psychology was explicitly identified in the Psychology disciplines, which raised





the question of whether this theory would be restricted to the disciplines mentioned or if they shape the training of future teachers of Science and Biology, in a broad and articulated way. A question that will certainly raise new studies and will require greater depth in relation to the Theory of Cultural-Historical Psychology.

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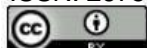
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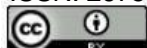
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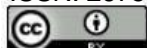
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