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AN OMNILATERAL EDUCATION OF MARX BASED ON DAVYDOV'S FORMATIVE DIDACTIC EXPERIMENT METHOD

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ABSTRACT

The article presents an analysis between the categories of Marx's Dialectical Historical Materialism, and Davydov's Formative Didactic Experiment method, in an understanding of the importance of experimental methodologies in teaching-learning activities in basic education. And it is established as an objective, to understand the relations about *"omnilateral"* education, in Marx, with the Davedovian Formative Didactic Experiment method, and this as an experimental methodology of teaching-learning. Valuing the collective appropriation of scientific concepts and their sociocultural applicability. This process is based on the Theory of Study Activity in Davydov, a discussion is established about *Marx's omnilateral* education, productive work and alienation. In the experimental processes in scientific research on the development of psychology in Vygotsky as psychic transformation, Leontiev in the influence of human activity to understand the evolution of consciousness. In Elkonin in the theoretical research on periodization in the teaching-learning process and Davydov in the theoretical construction of the Study Activity. It is concluded that the teacher, by developing experimental methodologies, enables the understanding of how the processes of mediations, of dialectics, influence the transformations of the students' higher mental functions.

Keywords: *Omnilateral*. Formative Didactic Experiment. Davydov. Culture.

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INTRODUCTION

This article presents the logical-historical development of the Activity Theory, basing it on Marx, through Vygotsky, Leontiev, Elkonin to Davydov, who elaborates the teaching-learning proposal called Developmental Teaching, synthesized in the Didactic-Formative Experiment.

In this sense, the application of this method in teaching-learning activities is related as a method that establishes a close relationship with Karl Marx's Historical-Dialectical Materialism. Apart from the development of pedagogical practices anchored in the philosophical conception in Marx and according to Freitas (2009) this method enables the understanding of critical analyses, of the material, social and cultural conditions of the students.

The Historical-Cultural Materialism theory in Vygotsky, which is supported and grounded in the philosophical conception described in Marx, enabling the understanding of the economic and social phenomena in which students are inserted to develop pedagogical actions. Historical-Cultural Materialism is understood as a theoretical conception that explains how the psychic development of students takes place, based on the teaching-learning phenomenon, which is articulated with scientific knowledge, applications in social contexts in an understanding of the collective relations between teaching-learning and psychic development (Freitas, 2016).

It is estimated that, to plan the actions that enable the transformation of cognitive operations that is found in Davydov's theory of Developmental Teaching, all theoretical structures that are based on the Historical-Cultural Materialism theory can contribute significantly to the formation and appropriation of concepts. To this end, Davydov describes six actions that make up the Study Activity of the Didactic-Formative Experiment (Freitas, 2016).

Freitas (2016) explains that each action must be planned and organized by the teacher, the first being described as: "Transformation of the task data and identification of the relationship of the object studied", the second "Modelling of the universal relationship", the third "Transformation of the model to study its properties purely", the fourth "Construction of the system of particular tasks that can be solved by a general procedure", the fifth "Control of the performance of previous actions" and the last "Evaluation of learning" (Freitas, 2016).

Thus, the objective is to understand the relations on *"omnilateral"* education, in Marx, with the Davydovian Didactic-Formative Experiment method, and this as an experimental teaching-learning methodology, valuing the collective appropriation of scientific concepts

and their sociocultural applicability. The method of the Didactic-Formative Experiment is related to the philosophical, *"omnilateral" conception,* being an education that enables the development of all sides, that is, all human dimensions based on Marx's theory of Historical-Dialectical Materialism, and with the Logical-Historical Movement, in an understanding for human development (Libâneo, 2022).

By developing research to understand the relationship between the method of Davydov's Formative Didactic Experiment and the method of Karl Marx's Historical-Dialectical Materialism, it is perceived that both value the Logical-Historical Movement of knowledge, thus explaining its transforming function in the human psyche, enabling the development of man's social consciousness.

Historical-Dialectical Materialism sustains and determines that changes in society occur from the awareness of social contradictions and collaborative action among people. For Libâneo, (2016), The method of Formative Didactic Experience seeks, in a planned and gradual way, to promote to students an understanding of the world with a humanized perspective, valuing collective learning.

By identifying the contradictions present in education, based on the neoliberal public policies made available in public schools, exempting the main entities in this process, families, the educational system, and transferring responsibilities to schools, teachers and students for the low performance in external evaluations.

The imperative need for a collectivity among the subjects involved in the participation of educational tasks is perceived, such as problem solving, shared readings, socialization of knowledge and social life. Such attitudes are essential to achieve cognitive transformation and collective reality. It is, therefore, essential to think and act in education with approaches of methods that enable students to appropriate scientific knowledge with significant application.

Thus, the development of conscious actions that stimulate reflections can minimize the influences of a neoliberal education system, because in this model, education is shaped by political and economic interests, which limits spaces for reflection and aims at ideological coercion. Thus, Freitas and Libâneo, (2022) highlight that the development of Davydov's Formative Didactic Experiment can collaborate significantly in the construction of critical and scientific thinking and the formation of concepts, enabling reflections and creating spaces for the subject's psychic development.

WORK AND EDUCATION IN MARX

According to Marx, work is the element that mediates the relationships of individuals with nature. Rego (1995) corroborates this view by stating that, to understand mediation, it is necessary to observe the interaction of human beings with the world and with themselves. Thus, for mediation to occur, it is essential that, in the interaction, there is a conscious and directed work, considering the individual's relationships with the world.

Historical-Dialectical Materialism is a philosophical conception that starts from the understanding that matter is an essential part in the formation of the human being. Marx and Engels (1982) emphasize that this relationship occurs with natural, social, and historical phenomena and that it presupposes that matter is what determines man's thought. Historical-Dialectical Materialism in Marx states that matter is concrete reality, it is an abstraction of reality, it is the closest form to modified reality transformed by man's social, cultural and scientific relations with material and immaterial means.

In this perspective, the social subject is dependent on his material condition. This record presents the philosophical and social understanding that was developed by Marx in the relationship between labor and material production as dialectical processes existing in the contradictions of human development and its survival. And at this moment, work is identified in Marx as a human and dialectical activity presented in the following contradictions.

> The national economy conceals the estrangement in the essence of labor because it does not concur the immediate relationship between the worker (labor) and production. Undoubtedly. Work works wonders for the rich, but it produces deprivation for the worker. It produces palaces, but caves for the worker. It produces beauty, but deformation for the worker. It replaces labour by machines, but throws one part of the labourers back into barbarous work and makes the other part machines. It produces spirit, but it produces imbecility, cretinism for the worker. (MARX, 2004, p. 82).

For Marx (2004), the main activity developed by man is work and, based on it, man establishes himself as a social and cultural being, explaining the logic of the instruments developed by man throughout his history (Bernardes, 2010, p. 301). In this process, man builds dwellings and produces material goods, through the creative and productive activity that characterizes work as the fundamental human activity for his survival. And this construction is intrinsically related to the history of man, evidencing the importance of work as a means of subsistence, of overcoming its natural, material and psychological conditions. (Bernardes 2010, p. 301)

> To this end, the possibility of overcoming the idealist and naturalist conceptions by the dialectical historical materialist method in the study of the human psyche is given by the conception that the nature that influences exclusively man are the historical

> conditions and that man acts on nature and transforms it, thus creating new conditions of existence. According to Marx and Engles (2009:24), "we can distinguish men from other animals by consciousness, by religion – by everything we want. But they begin to distinguish themselves from animals as soon as they begin to produce their means and subsistence (Lebensmittel), a step which is required by their corporeal organization. By producing their means of subsistence, men indirectly produce their own material life." In the movement of production of the means of subsistence, work and communication are considered the essential elements in the process of constitution and transformation of the nature of man.

Marx (1866) presents, indirectly, expressive contributions in the field of education, which make it possible to understand the education offered by public schools to young people from the working classes today. An education for the world of work to meet the capitalist market, marked by social inequalities. Marx knew, first of all, that children and young workers had to be saved from the crushing effects of the political-economic system of his time, and it extends to the present day. In which, to this day, the most needy are seen as incapable and unprepared to occupy the best positions, while the wealthiest guarantee the best opportunities in the labor market.

It is possible to establish in Marx some strategies and pedagogical models that allow us to understand the development of man through *onmilateral education.* Omnilateral is understood as a category in Marx that establishes a relationship between productive man and educational processes, which enable the student to prepare the physical body, scientific, cultural and technological knowledge, thus becoming a category of *omnilateral formation.*

According to his analysis of capitalist society, Marx (2004, p.69) points out the need for the formation of the working class that combines productive work, intellectual formation, bodily exercises and polytechnic education, constituting an integral formation, which, according to him, will raise the working class above the levels of the bourgeoisie and aristocracy. For Marx and Engels (2004), the formation of the new man must necessarily overcome the opposition between intellectual and technical formation, for this, it becomes indispensable to combine instruction with productive work.

Marx and Engels' (2011) proposal for education is that it should combine intellectual, artistic, technological, physical education, as it was given in gymnastics schools and military exercise, showing the importance of preparing man to perform productive work. Marx (2011, p. 677):

> By education we mean three things: First: Intellectual instruction. Second: Physical education, as it is imparted in gymnastics schools and by military exercise. Third: Polytechnic instruction, which transmits the general principles of all the processes of production and, simultaneously, initiates the child and the young person in the practical use and handling of the elementary instruments of all trades. A gradual and progressive programme of intellectual, physical and polytechnic instruction must

> correspond to the classification of workers between 9 and 17 years of age in the three age groups indicated. Except the first grade, the costs of polytechnic schools should be partly paid for by the sale of their products. The combination of paid productive work, intellectual training, physical exercise, and polytechnic instruction will raise the working class well above the level of the upper and middle classes. The employment of all persons from 9 to 17 years of age (inclusive) in night work and all trades harmful to health must be strictly prohibited by law.

It is an education that must provide man with his integral development and all his potentialities. Marx (2011. p. 677), he describes,

> [...] primary education as a mandatory condition for work. Its success demonstrated, first of all, the feasibility of combining teaching and gymnastics (and military exercises for men) with manual labor, and therefore also manual labor with teaching and gymnastics. [...] in Robert Owen's work, the germ of the education of the future sprouts, which will combine, for all children from a certain age, productive work with teaching and gymnastics, [...] but as the only method for the production of human beings developed in their multiple dimensions.

Marx (2011) defends an education based on polytechnic and agronomic schools, vocational schools, to better prepare children and young people for manufacturing activities. The preparation should contribute to them becoming knowledgeable about professional tasks, receiving instructions on technology, practical handling technique of industrial instruments and, thus, performing the work productively and understanding the importance of learning.

From the conceptions of activity, work and education contained in Marx, Vygotsky bases his research project, which presents as a result the foundations of man's psychic development. This idea is core in the historical-cultural theory and permeates the theorists who were responsible for its development, with Leontiev, Elkonin and Davydov as the main researchers.

VYGOTSKY'S EXPERIMENTAL PSYCHOLOGY

Vygotsky (2010) develops a theory related to Experimental Psychology to understand the multiple human dimensions. For Vygotsky (2010), man is the result of his historical, social and cultural development in which he is inserted.

Cultural processes are dialectical and perfected throughout history, such as household utensils and tools used in agricultural production, instruments such as calculators and calculation algorithms, are examples of cultural instruments that have been historically developed and modified through social life. These instruments are used in mediation processes and as a consequence in the development of higher mental processes and human intellect, Vygotsky (2010).

Social and cultural aspects are closely related to human cognitive development. V ygotsky (2001 p.72-73) states:

> [...] The main (extraordinarily simple) idea is that during the process of their historical development, what changes is not so much the functions, as we have previously considered (this was our mistake), nor their structure, nor their line of development, but what changes and modifies themselves are precisely the relations, that is, the connection of the functions with each other. so that new groupings unknown to the previous level emerge.

Thus, for Vygotsky (2010), the socio-historical dimension of man makes it possible to understand that the human psyche is inherited in culturally organized processes, and historically developed and shown that human culture is produced and determinant in the higher psychic transformations, without which man does not exist Vygotsky (2001).

He values the scientific experiment as a way of collecting data and how to unveil the processes covered by the idealistic psychology of his time, stating that to understand any phenomenon in the world it is necessary to go to it, emphasizing the importance of extracting the core, the essence of this phenomenon in research. Vygotsky (2001) uses the scientific experimental method in his research, contrasting research that proposed development associated with genetic, natural and stimulus-response processes.

Rego (1995, p.39-40) clarifies that *Vygotsky and his collaborators sought to prove these ideas through experiments with children, investigating how mental processes were organized in individuals from different cultures.* Aligning himself with the historical methods proposed by the social sciences, Vygotsky explained the progress of consciousness and the development of the intellect in the human being, incorporating in this process the history, culture and society in which this man is inserted. This approach was presented as an alternative in the field of social research, according to Rego (1995, p.40-41).

> His research program reflected the attempt to seek an alternative approach, which would overcome the antagonistic tendencies present in the psychology of his time. Based on the principles of dialectical materialism, he sought to build a "new psychology", to integrate, "in the same perspective, man as body and mind, as a biological and social being, as a member of the human species and a participant in a historical process"

The basis of the investigation of human development is the search for the improvement of thought in a Historical-Cultural context, therefore, the method developed by Vygotsky received several denominations, (Bernardes 2010), such as Genetic-Experimental, Instrumental Method, Historical-Genetic Method, Double Stimulation Method, so he definitively adopted the Historical-Dialectical Materialism Method.

According to Freitas and Libâneo (2022), for Vygotsky, the experimental research method is characterized by emphasizing the data collection processes, appropriating the sociocultural characteristics of the individual. Therefore, during the participation of the research subject, consciously and critically, it is possible to understand the psychic processes in transformation. The individual in the process of experimentation feels himself to be a collaborative, participative, dynamic, dialectical subject in an understanding of the concrete activities engendered in the psychic functions that emerge.

In this context, this experimental and investigative method in research on psychological development can be appropriated as a teaching-learning method, in an application of mediating intervention of signs and instruments as a unit. Because when they are developed by the teachers, the sociocultural context of the subjects, the cultural history of the scientific object, the teaching-learning process addressed, and the collective involvement of the students with the socialization of knowledge are considered. Vygotsky (2022, p.190, 191) points out that:

> The role of the auxiliary means, with which the child is enriched in the process of development, also leads to a second fundamental postulate that characterizes the processes of compensation: the postulate about the collective as a factor in the development of the child's higher psychological functions, [...], as a superior form of attachment with language. As is well known, language initially develops as a means of communication, of reciprocal understanding, as a social function of communication. [...] The path of the transformation of language as a means of communication, as a function of social, collective conduct, the path taken by language until it becomes a means of thought, into an individual psychological function, gives an idea of the law that governs the development of higher psychological functions. [...] Any higher psychological function in the process of child development manifests itself twice, that is, first as a function of collective conduct, as an organization of the child's collaboration with the people around him, and then as an individual function of conduct, as an inner capacity for the activity of the psychological process in the strict and exact sense of the word. [...]. As one of the researchers expresses, not only children, but also we, adults, trust the word, that is, we demand few demonstrations. In the child, the need for logical reflection on the statement depends on the development of collective functions, such as the function of discussion.

Instruments are material objects and signs are psychological tools on how to handle instruments, both are basic elements of mediation, which allow man to act and react on the world consciously. And so, a dialogical relationship is established in the exchange of knowledge in the use of language in a collective way for the appropriation of the object under study. For Sartini, Longarezi and Oliveira, (2024, p.8),

> [...] Theoretical or conceptual research based on the historical-dialectical materialist method, expressed in the historical-cultural theory as a method of genetic investigation, must, through the method of investigation and exposition, reach the theoretical connections necessary for an analysis of the totality of that phenomenon

Vygostky's great interest was to present in his research how the development of the students' psyche took place, after promoting pedagogical interventions that allowed the appropriation of the contents presented to them, valuing bibliographic research, field research and records of critical observations.

Vygotsky's (2010) proposal reflected the need to develop a theory that would show the development of knowledge in human beings, based on concrete Marxist philosophy. Rego 1995, (p. 60 - 62)

> We can conclude that, for Vygotsky, the development of the human subject occurs from the constant interactions with the social environment in which he lives, since the most sophisticated psychological forms emerge from social life. Thus, the development of the human psyche is always mediated by the other (other people in the cultural group), who indicates, delimits and assigns meanings to reality. [...] In summary, in the Vygotskian perspective, the development of specifically human intellectual functions is socially mediated by signs and by the other. By internalizing the experiences provided by culture, the child individually reconstructs the modes of action carried out externally and learns to organize his mental processes. The individual therefore ceases to rely on external signs and begins to rely on internal resources (images, mental representations, concepts, etc.)

The methodological process must consider both psychic development and the influences of external activities on internal actions. In this sense, Longarezi and Puentes (2013) warn that the development of the Didactic-Formative Experiment must take into account aspects related to consciousness, behavior, personality and perception, which influence throughout its teaching-learning process. The Formative Didactic Experiment has a branch in the Genetic-Causal process, being a very recurrent methodology in Vygotsky's research, and appears linked to research in experimental psychology. His central concern was investigative theoretical research.

According to Freitas (2009), Vygotsky developed a psychology based on Historical-Dialectical Materialism, with a Marxist basis, to investigate and understand the constitution of human psychological phenomena in their complexity, considering their historical context, the social relations involved and the "processes of mediations".

Vygotsky did not conclude his research on the type of activity favorable to promote a deep psychic development. It was up to Leontiev in his research to approach it scientifically, so Leontiev (1972) took on the challenge of developing an Activity Theory.

Alexei Nikolaevich Leontiev was born on February 18, 1904, and died January 21, 1979 in Moscow. He describes the *importance of understanding the transformations of higher psychic functions, as specifically human functions*.

Given these circumstances, Leontiev developed in his research a theory that can provide the understanding and understanding of how an intentional human activity

promotes deep psychic development. By developing the theory of activity for this purpose, being observed and applied in real and adverse situations, he identified the favorable ways to instigate the participation and involvement of students in the operations described in the classroom tasks.

For Leontiev, the Experimental Method establishes a close communion with the Activity to be developed, it is a relationship between the subject and the world, it is the process mediated by activities in dynamic movement. Leontiev (1972) states that there is an interactive relationship between man-activity-world, mediated by the mental reflex, by the social relation, by the collective, by the scientific content and by images and signs that guide it in a concrete way, such as the development of higher mental functions.

For him, the actions to be developed must be collective, valuing the operations, in the importance of the other social being, in a process of exchange of experience and accumulated knowledge.

For Leontiev (1983), Historical-Dialectical Materialism represented a new method of research based on the process of experimental investigation, which provides an understanding of the development of human consciousness, based on Vygotsky's experimental proposal (Leontiev; Luria; Vygotsky, 1991). It is a process that aims to understand man as a being in his totality, a man who builds his history consciously and collectively. Which understands the importance of the mediating process established by the cultural and social environment in the transformation of man, (Vygotsky, 1991), Leontiev, (1983), in a process of developmental education (Davidov, 1988).

And to enable the understanding of how this transformation occurs, Leontiev, (1989), states that from the structure that is *determined by: need, object, objective, motives, actions, subject, operations, conditions, means and product*.

Thus, they encompass an investigative process, which aims to study the degree of understanding of the object, the essence, the nucleus, its main part. These experimental processes are developed and appropriated through diagnostic activities, thus promoting actions and operations that determine the formation of concepts and, also, observing the transformations in the cognitive and psychological development of the student, according to Leontiev (1998).

In this methodological proposal, the studies of scientific concepts are presented as a logical-historical path of the content and its social application, as it is developed as an experimental methodological process, and this process can mitigate or even overcome the ordinary and lightened processes of traditional pedagogy.

With the application of this process, it is expected to minimize the effects of individual and repetitive activities, as they do not supply scientific understanding or the perception of social demand. The importance of identifying social and collective needs emerges, awakening the reasons for the appropriation of knowledge in study activities.

THE STUDY ACTIVITY IN DAVYDOV

Later, Davydov advanced in research, he presented investigations on the formation and appropriation of scientific concepts. He developed the Didactic-Formative Experiment that is understood as a teaching-learning method of personal transformations by consciousness and collective by the social. According to Longarezi and Puentes (2013), Davydov developed the formation of concepts in a scientific approach, articulated with the social and cultural contexts of the students, supported by the theory of Developmental Teaching.

Researchers Elkonin and Davydov studied the teaching-learning process through experiments in pedagogical activities, this process of experimental research made it possible to understand the psychic transformations that produce significant learning in planned situations.

Based on this teaching-learning process, the Didactic-Formative Experience used in the investigation of school learning seeks to "explore the relationship between teaching and the development of students' mental activity" (Freitas, 2010, p. 6). This experiment consists of developing activities and tasks through planned actions in school activities that allow monitoring changes in their mental development.

We highlight the works of D. B. Elkonin and V. V. Davydov, for their depth in the concepts of Vygotsky's experimental psychology, thus making the Didactic-Formative Experience a methodological tool of teaching-learning in a process of dialectically objectifying-subjectivizing scientific concepts in Study Activity. For Davidov (1988), this process allows the correction of the experiment routes in the search for learning strategies that make use of experimental investigation, and can repeat this movement until the understanding of the contents under study is developed.

This teaching-learning system necessarily provides for the act of planning, problematizing, executing, redoing, analyzing, correcting and evaluating the activity, in a collective construction of knowledge (Davidov, 1988). By developing study activities in this perspective, students can understand the history of the content, the historical context of the scientist, the core property of the scientific concept, the genesis of the content under study

and verify possible applications in real, concrete and collective situations of the students. (DAVYDOV, 1988, p. 52,).

> The realization of the formative experiment presupposes the planning and modeling of the content of new psychic formations that are being formed, as well as the psychological and pedagogical paths and the means to form those new formations. In the investigation of the ways to realize this plan (model) in the process of cognitive learning work with children, it is possible to study, simultaneously, the conditions and the laws of the origin or genesis of the corresponding new psychic formations.

This methodology of Experimental Activity, according to Davidov (1988), enables the subject to objectify and subjectivize the objects of knowledge from the experiments, in a collective way, and enables the enjoyment of the pleasure of understanding the content and discovering the path that were used by the scientists in the elaboration of the scientific concept under study. This process is based on the Marxist dialectic, observing the contradictions that permeate the doing and the redoing, the theory and practice, the discovery, in the promotion of the development of the student's psyche (Davydov, 1988).

This process is used to understand the development of higher mental functions through experiments carried out with the object. In this perspective, it is understood that for the acquisition and formation of scientific knowledge, as it instigates and involves the subject in the process of discovery and construction of knowledge. (Libâneo; Freitas, 2007) highlight that the teacher, when planning teaching-learning activities developing research on the principles of scientific concepts intentionally, intervenes in the learning process, allowing the knowledge appropriated by the students to collaborate in their integral development.

The teacher, by directing the research problem with pedagogical activities to the experimental doing, allows the development of the student from the Study Activity, collectively, understanding the importance of the object of study in their personal formation and social relations (Davidov, 1988).

To better develop the organization of teaching, Davidov (1988) formulated a general structure that transforms the teaching-learning conditions into Study Activities to be understood by students, and this structure is composed of the following six actions:

> Transformation of the conditions of the study task to observe the universal relationship of the object of study; Modeling of this universal relationship in objectified, graphic form or using letters; Transformation of the model of the universal relation to study its properties in 'pure form'; Solution of a system of particular tasks that can be solved by the general method; Analysis of the performance of previous actions; Evaluation of the level of assimilation of the general method that results from the solution of the given study task (DAVYDOV, 1988, p. 29-30).

Thus, according to Freitas (2016**),** the first action of the study activity, based on Vygotsky's historical-cultural theory, called "Transformation of the task data and identification of the relationship of the object studied", starts from a problematic. During the development of this stage, students are encouraged to seek resources for the resolution, prior knowledge.

The next action called "Modelling the universal relation", involves the construction of a representative model, in this stage students are guided to build a universal general relation, using their previous analyses as a basis, in a process that combines creation and reproduction (Freitas, 2016).

The third action that the author calls "transformation of the model to study its properties purely" facilitates the study of the object, its properties and its general and universal relationship, making concepts more tangible and less abstract (Freitas, 2016).

Freitas (2016) explains that in the fourth action, "transformation of the task data and identification of the relationship of the object studied", the student solves tasks, originating in a universal general relationship and its connection with particular representative relations.

The fifth action establishes the "Control of the performance of previous actions", aims to monitor the actions for the full development of the activities before this one, observing the student's progress, with reflection and self-evaluation of them (Freitas, 2016).

The last action may reveal success or the need to build new actions, to provide learning opportunities. Freitas (2016) explains that this action called "learning assessment" is conducted by the teacher to assess whether the student has been able to assimilate the general, specific and concrete relationships of the object, expanding their psychic capacities.

These actions allow students to understand the universal relationship of the concept studied. Davydov (1988) advises establishing the social relevance of the content, contextualizing it with other sciences, so that the student realizes the importance of studying other scientific models, identifying problem situations in which the conceptual core can be applied. Davydov (1988) identifies the relationship of these scientific concepts with social situations and thus verifies the existence of scientific definitions that can solve real and social problems, allowing the evaluation of the level of participation, commitment, and assimilation of the appropriate concepts by the students.

According to Davydov (1988), experimental activities accompanied by the actions described above allow the understanding of the real, with depth of the scientific essence, of

the conceptual core in abstraction and application in the concrete, achieving the understanding of the object investigated.

The theory of Developmental Teaching in Davydov helps and supports the planning and development of actions aimed at the appropriation of scientific knowledge. According to Freitas and Libâneo (2022), this epistemology, with profuse literature, enables the construction of teaching activities for the formation of mental actions, based on Marxist theories, which enable a formative teaching-learning process and aimed at a humanizing education.

CULTURAL ASPECTS

The characteristics linked to technological, social, historical and economic aspects, which are pertinent in the analysis of the relationships between the theories presented.

a) Critical understanding:

In Historical-Dialectical Materialism, he emphasizes the importance of Marx's (2013) analysis, a critique of social, political and economic reality; in the Formative Didactic Experiment, Davydov (1988) brings a critical understanding of social phenomena and problems that can be solved collectively among students.

b) Relationship between man and object:

In Historical-Dialectical Materialism, dialectical interaction between the subject and the social environment (Marx, 2013), with the concrete and abstract material object.; in the Formative Didactic Experiment it is expanded by encouraging the interactive participation of students in the construction of knowledge, involving them as productive subjects (Davydov, 1988).

c) Emphasis on theory and practice as praxis:

In Historical-Dialectical Materialism, transformative action on reality (Marx, 2013), as an essential element in the understanding of the world and its transformation; in the Formative Didactic Experiment, to promote learning (Davydov, 1988) in a participatory way, relating theory and practice, in the development of knowledge that allows them to be related to real, social problems.

d) Reality in the historical context:

In Historical-Dialectical Materialism, Marx (2013) emphasizes the importance of understanding the history and development of societies in their course and analyzing their current conditions; in the Formative Didactic Experiment, contents contextualized historically, providing the understanding of how past events can influence the understanding of the present (Davydov, 1988).

e) Contradictions and social change:

In Historical-Dialectical Materialism, Marx (2013) recognizes the contradictions inherent to societies and the importance of these contradictions in social changes; in the Formative Didactic Experiment there is a reflection on the existence of economic contradictions in the social context and presents concerns about how they can be overcome or resolved (Davydov, 1988).

f) Holistic vision, a broad vision:

In Historical-Dialectical Materialism, expand the understanding of social phenomena in their concrete totality (Marx, 2013), considering the multiple interactions and connections with the social and the historical; in the Formative Didactic Experience, a multidisciplinary approach, connecting the different areas of knowledge that provides a scientific and integrated view on the social (Davydov, 1988).

DIDACTIC ASPECTS

Some characteristics linked to the aspects of cognitive development pertinent from the methodological point of view for a teacher, in the application of a Formative Didactic Experiment.

a) Critical Understanding

Historical-Dialectical Materialism emphasizes the importance of analyzing the concrete to be understood, critically relating it to social, political, and economic reality (Marx, 2013); in the Formative Didactic Experiment, there is a critical understanding of social phenomena and problems that can be solved collectively among students (Davydov, 1988).

b) Relationship between man and object

In Historical-Dialectical Materialism there must be a dialectical iteration between the subject and the social environment (Marx, 2013), with the concrete and abstract material object; in the Formative Didactic Experiment, it is expanded by encouraging the interactive participation of students in the construction of knowledge, involving them as productive subjects (Davydov, 1988).

c) Emphasis on theory and practice as praxis

In Historical-Dialectical Materialism there is a transformative action on reality, as an essential element in the understanding of the world and its transformation (Marx, 2013); in the Formative Didactic Experiment, there is a promotion of learning in a participatory way, relating theory and practice, in the development of knowledge that allows them to be related to real, social problems (Davydov, 1988).

d) Reality in the historical context

In Historical-Dialectical Materialism, Marx (2013) emphasizes the importance of understanding the history and development of societies in their course and analyzing their current conditions; in the Formative Didactic Experiment, according to Davydov (1988), the contents are contextualized historically, providing an understanding of how past events can influence the understanding of the present.

e) Contradictions and social change

In Historical-Dialectical Materialism, Marx (2013) recognizes the contradictions inherent to societies and the importance of these contradictions in social changes; in the Formative Didactic Experiment there is a reflection on the existence of contradictions in the social context and presents concerns about how they can be resolved (Davydov, 1988).

f) Holistic vision, a broad vision

In Historical-Dialectical Materialism, there is a need to expand the understanding of social phenomena in their concrete totality, considering the multiple interactions and connections with the social and the historical (Marx, 2013); in the Formative Didactic Experiment, there is a multidisciplinary approach connecting the different areas of knowledge that provides a scientific and integrated view on the social (Davydov, 1988).

Such characteristics are in disagreement with idealism and sustain the construction of the authors' theoretical thinking that supports the conceptions and practices of teaching, and allows us to reflect on the relationships that influence the formation of the individual.

By developing teaching-learning practices supported by this theory, for Freitas, Libâneo, (2022), they enable critical teaching, the conscious formation of the individual and a humanizing education, as it analyzes social relations, considers scientific, psychological, historical and social phenomena that interfere in cultural and cognitive development and the entire historical dimension of the individual.

CONCLUSION

The application of the Formative Didactic Experiment as a teaching-learning process presupposes planning, including the application of a diagnostic test as a way of valuing the student's previous knowledge, which is an important starting point. It includes the understanding of the historical, social and cultural process of the student through interviews, questionnaires, analysis of the conceptual knowledge acquired by the student, investigation of the logical-historical movement of the conceptual core of the Activity to be proposed, it seeks to instigate the students in the understanding of their needs and motives, through the perception of the importance of the continuity of studies.

The Didactic-Formative Experiment contributes to the awakening of the student in the possibility of pedagogical practice, as a challenge to understand science, in a perception of the desire for appropriation of the concepts under study, these are mediated by the experimental process, by abstract and/or concrete tools, by the teacher in the dialogued interference in the conduct of tasks, in collective socialization and construction of the object under study.

This teaching-learning process allows the student to be humanized by developing higher psychological processes in a conscious, cultural, collective and cognitive way, allowing its transformation through the teaching-learning process into a humanistic education.

Thus, the relevance of the Didactic-Formative Experiment is understood, supported by the Marxist theory of Historical-Dialectical Materialism, which aims to promote interactions, resignifying the teaching-learning process, making the subject active and enabling the formation of mental actions, through a teaching posture that goes beyond the survey of a diagnosis or mechanized activities. In this way, the application of a Didactic=Formative Experiment enables the construction of anti-authoritarian activities, with actions aimed at learning, promoting a humanizing teaching organization, allowing a conscious education that goes beyond a classificatory teaching system. And this process is in line with Marx's proposal of *omnilateral education* , an education for the transformation of the subject.

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