THE CONTRIBUTION OF DEVELOPMENTAL PSYCHOLOGY IN THE TEACHING AND LEARNING PROCESS

ORIGINAL ARTICLE

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ABSTRACT

Pedagogical action is essential in the search for theoretical foundations and practical knowledge of knowledge and needs to be a permanent accomplishment in the work of the educator, so that he can resize his performance in an attempt to improve the teaching-learning process, contributing to the development of the human being. From this perspective, this article was based on the guiding question: what theoretical assumptions about Developmental Psychology applied to the teaching and learning process are in force in the literature? With this, the objective was to present an introductory and synthetic approach of the current theoretical assumptions in Development Psychology regarding the teaching and learning process. Therefore, this article used bibliographic research as a methodology, through which it was observed that, in view of the support that has been given to the systemic vision, enriched by dialectics, there is currently the opportunity to seek for a unifying structure of theoretical perspectives fragmented since the origins of Developmental Psychology, in order to contribute to society, building present, spiritual and ethical citizens.

Keywords: Developmental Psychology, Teaching-Learning, Individual Development, Modern Systems of Psychology, Humanism.

1. INTRODUCTION

Although several studies in Brazil persist in discussing the various problems of school learning, the solutions are still small. Factors such as: lack of training of educators; difficulties in the administrative, pedagogical and structural management of schools; and economic, social, educational and cultural issues of families among others, have served as an agenda for debates inside and outside schools, universities and congresses, blaming these factors as the cause of school learning problems.

According to Vygotsky (1995), there is a relationship of dependence between human development and learning carried out in a given social group. Development and learning are linked from birth. It comes from birth, from genetics. In the author's understanding, the child with learning difficulties needs to be understood in a qualitative probability and not as a quantitative variation of the child without disabilities (VYGOTSKY, 1999).

Intellectual performance is never independent of affective development. Affectivity and the development process are directly associated, just as intelligence and learning are not an autonomous function. The potential that each child brings is only consolidated under certain conditions, which are strongly linked to the quality of exchanges with others. Aristotle already said that the human being is a social entity that, as such, needs to interrelate and, from this contact, manage and produce psychobio affective material for the environment (VYGOTSKY, 1995).

Based on this context, this article was based on the guiding question: what theoretical assumptions about Developmental Psychology applied to the teaching and learning process are in force in the literature? Therefore, the objective is to present an introductory and synthetic approach to the current theoretical assumptions in Developmental Psychology regarding the teaching and learning process. In this context, bibliographic research was used as a methodology.

2. INDIVIDUAL DEVELOPMENT

The individual's development and growth procedure is not established autonomously, randomly or determined only by internal factors. The entire development process has the particularity of being global, integrated and interdependent. Young children, in their first months of life, when they are still poorly characterized in the various areas of their development, have organic and psychosomatic manifestations in the face of problems faced in their relationships, especially with the mother and depending on their living conditions. Therefore, at this stage of life, socialization is important. Many Brazilian children spend more time in day care centers or schools than at home, and these institutions may be responsible for occasional problems in the child's development. According to Erikson (1987), when he learns new skills and acts in the world around him, the child has a feeling of mastery, however, for this to happen, he must be animated, otherwise he will feel inferior.

The individual, upon entering the school, will readily have experiences based on various situations and will react to this new environment according to previous conditioning. For this reason, it is common to find children who cannot adapt, without having a satisfactory performance in their studies because they are affected by anxieties and psychic tensions (NOVAES, 1986).

The learning problem is estimated as a symptom that expresses something and has a message. In this way, not learning has a function as integrative as learning. Learning Disorder is a common term that characterizes a heterogeneous group of disorders, manifested by difficulties in the acquisition and use of hearing, speech, writing and mathematical reasoning (TULESKI and EIDT, 2007).

According to Yaegashi (1998), at the end of the 19th century, there was a more systematic and scientific search for the origins of individuals' difficulties in learning school contents. At first, the natural difficulties of brain injury and endogenous or

exogenous mental retardation were investigated, and then problems associated with reading. In this context, the expression “learning difficulties” only appeared in the 1960s, demarcating problems in language and/or speech, reading, writing, mathematics, among other school areas - differentiating it from the problems generated by mental retardation. Thus, individuals who did not have neurological deficits and who had expressive aversions in the midst of their learning potential and school production were included in this profile (YAEGASHI, 1998).

The 1980s were marked by the creation of instruments to assess learning difficulties and the shift from a neurological to a functional approach due to the need to carry out a different diagnosis for this type of difficulty. After that, about school failure, Patto (1999, p.122) highlights that:

> Em 1981, a literatura sobre o fracasso escolar continuava a registrar a mesma afirmação que encontramos em meados da década de setenta: o professor idealiza, mas não encontra nas salas de aula da periferia um aluno “sadio, bem alimentado, com uma família organizada e atenta aos seus problemas pessoais e com prontidão para aprender”, o que equivale a dizer que o aluno com que o professor se defronta, nestas escolas, é doente, mal alimentado, com uma família desorganizada e desatenta aos seus problemas pessoais e sem prontidão para aprender.

In the 1990s, the definition of the concept of learning difficulties became even more precise and began to encompass disorders manifested in delays or difficulties in writing, reading, speaking and calculation, in individuals with normal or higher intelligence, not generated by deficits (visual , auditory, motor or cultural), but related to difficulties in generalization, attention, information retention, interpretation, coordination, reasoning, spatial organization, social adequacy or emotional problems (RELVAS, 2007).

The science of Pedagogy offers several theoretical systems that not only elucidate the teaching and learning process, but also indicate ways of acting that are consistent with these assumptions. Because of this, pedagogical theories contain

both stable and variant elements. As elements that vary, school knowledge, teaching methods, forms of evaluation, school organization, among other aspects, stand out. As constant elements of each theoretical line, the concepts of teaching, learning, knowledge, science, man, school and society can be mentioned (NUTTI, 2002).

The pedagogical work carried out with students with learning difficulties is based on behaviorist conceptions, which are inclined towards skills training, and on constructivist conceptions, which imply the development of the subject. Given this, it is worth highlighting what Moscovici (1981, p. 194) says:

> [...] quando você classifica alguém como neurótico, judeu ou pobre, não está meramente afirmando um fato, está também fazendo um julgamento e está estigmatizando tal pessoa. E também revelando sua teoria sobre a sociedade e natureza humana.

Progressive science starts from the idea that man is a being of a social nature and that everything human in him derives from his life in society, within the culture created by humanity. In this aspect, Leontiev (2004, p. 284) states that:

> Se as crianças se desenvolverem desde a mais tenra idade, fora da sociedade e dos fenômenos por ela criados, o seu nível é o dos animais. Conhecem-se pelo contrário, casos inversos em que as crianças, oriundas de povos que se encontram num nível de desenvolvimento econômico cultural muito baixo, são colocadas muito cedo em condições culturais elevadas; formam-se então nelas todas as aptidões necessárias para sua plena integração nesta cultura.

Learning difficulties are based on aspects of a psycho pedagogical, sociocultural or/and emotional-family nature that the student goes through. Therefore, they are not linked to biological systems and do not encompass an organic compromise, even though they intervene in the student's probabilities of learning, regardless of their satisfactory neurological conditions (FONSECA, 1995).

The use of cultural mediators makes it possible for all people, with or without learning difficulties, to develop internal psychological processes and the ability to functionally organize their own behavior. This theory authorizes verifying the value of pedagogical action, mediation, the role of the teacher and the organization of teaching. Therefore, in Facci's view (2004, p. 210):

> O professor, neste aspecto, constitui-se como mediador entre os conhecimentos científicos e os alunos, fazendo movimentar as funções psicológicas superiores destes, levando-os a fazer correlações com os conhecimentos já adquiridos e também promovendo a necessidade de apropriação permanente de conhecimentos cada vez mais desenvolvidos e ricos.

The assistance that students with learning difficulties need to receive part of the intention that, respectively with the difficulty, there are still compensatory probabilities to overcome the limitations, and it is exactly these possibilities that must be understood in the process as its guiding force. According to Vygotsky (1997, p. 47):

> Construir todo o processo educativo seguindo tendências naturais de super compensação, significa não atenuar as dificuldades que derivam do defeito, senão estabelecer somente tais tarefas e fazê-lo em tal ordem, que correspondam a graduação do processo de formação de toda a personalidade sob um novo ângulo.

Rubinstein (2001) clarifies that: “when a student has learning difficulties, he does not always have a mental disability or some kind of similar disorder”. In fact, there are essential factors that need to be worked on to achieve the best performance at all levels of learning. In this way, it is emphasized that when we talk about learning, we are not only based on the acquisition of disciplinary knowledge, but also of others that are of fundamental importance for the human being.

Learning is not just about learning to read and write. However, many students cannot read and write at the age/grade in which this learning should take place. For this reason, complaints about most students having problems related to

graphics and reading and not being able to assimilate the programmed content are common among teachers. In this context, it is known that some learning problems may be the result of the child's mutual influence with his environment. The competence of concentration, work and reflection are distorted depending on the emotional state and when there is an appropriate control of the level of anxiety, creative aptitude, thinking, understanding and learning start to have meanings and, from then on, it is possible to overcome the difficulties. In this sense, it is emphasized that the student's family environment, if it is affable, provides better conditions to deal with aggressive and emotional impulses at that moment (SISTO, 2001).

That said, it is noted that psychopedagogy collaborates with the work of minimizing some learning problems, both for students who have Learning Disabilities (LD) and for students who, in the school's view, are evaluated as "normal" to learn, who manage to master reading, writing and mathematical situations. Thus, when pedagogical actions are not organized, they result in disagreement and can cause problems in the student that will require referrals for private intervention with professionals in the area (ZIPPIN, 2008).

The ability to accept frustrations is one of the most important factors to be taken into account by teachers in the classroom, because the school environment itself, when it is not able to overcome challenges, can drive the occurrence of failures in the development of learning and lead to to lag, disagreement, affective/emotional problems and low school performance. And this causes a high level of tension and frustration and, therefore, increases disinterest, which may eventually lead the student to develop a general aversion to studies, due to the low affective factor caused by the school and also by the family. The student needs to have a controlled emotional structure to be able to tolerate the demands imposed by the school, because, on many occasions, he is forced to carry out activities that come from an unquestionable school curriculum, which does not have much to do with his moment, their aspirations and prospects. These are activities that do not

consider the needs that life requires of the student with regard to a prosperous future (TOPCZEWSKI, 2006).

The student's failure can lead to failure and, therefore, to school dropout. The manifestation of low performance and/or learning difficulties can be momentary or lasting, however, both situations need to be a reason for apprehension and alert, both for the school and for the parents. When the influences of affective bonds, positive and negative, of the subject with objects and situations are taken into account, the school encompasses the students' learning process and displays different amplitudes and posture to guide personality and disciplinary behavior, with less or greater degree of stability. In this context, psycho pedagogical intervention is important, as it focuses on the subject in his/her relationship with learning (RUBINSTEIN, 2001).

That said, it is known that learning difficulties are not the result of a biological aspect of the individual. In this regard, Oliveira (2007) states that some children may have other difficulties that indirectly intervene in memory, both auditory and visual, without having an organic cause; Martinelli (2007), in turn, highlights that one can find subjects with a high intelligence coefficient and natural from a favorable economic class presenting some type of learning difficulty; and Proença (2002) says that, although doctors have searched for the origins of learning difficulties in anatomopathological examinations of the brains of patients, no brain injury has yet been identified, such as those found in cases of dyslexia.

Tacca (2007) points out that, in an attempt to modernize the most common concept of learning difficulties, there has been talk about the personal differences of students with special educational needs, as well as the variety in the learning process. Thus, according to Tacca (2007), there is a tendency to extract evidence that occurs with the student, in order to identify their role in the relationship with the school system, with the curriculum and with people in the school space.

Therefore, in the expectation of looking at other aspects that are imbued in the learning process, a reflection on social and pedagogical factors is inserted and the understanding that the biological body, in order to function and change, needs social mediation (PATTO , 1993).

To cover learning difficulties, it is essential to know the forms and mechanisms of the subject's development and the compensation processes that it constitutes, not forgetting that the differences understood are associated with the mediation of the social context. Given these considerations, the question raised by Tacca (2008, p. 9) stands out:

> Se uma criança que tem um defeito orgânico sério, uma deficiência mental, por exemplo, deve ser educada tendo em vista a superação do defeito, considerando os caminhos isotrópicos do desenvolvimento, o que se deve então propor a uma criança que apenas se manifesta de outra forma em relação a uma proposta de aprendizagem que lhe foi apresentada?

The answer to this question comes from Vygotsky (1995, p. 151) when he warns that the design of the school does not focus on adapting to the defect but on overcoming it. At this point, the expectation of thinking about the probabilities of learning and not the difficulties that arise.

It is worth remembering that learning difficulties are not synonymous with mental disabilities. The confusion of the concept of mental deficiency had consequences to elucidate the attendance to this situation in common and special schools. Therefore, it is common for many teachers, when dealing with students with more marked learning difficulties, to confuse these manifestations with mental deficiency. However, this confusion, on many occasions, is used by the teacher to explain their own difficulties and inabilities in attending to the expressive differences among the students. Despite this, it is important to stress that mental disabilities and learning difficulties are distinct and require appropriate assessments that provide targeted educational interventions (CORREIA, 2004).

Along these lines, Barros (1988) corroborates that learning difficulties can be evaluated as something that absorbs a variety of educational problems. Thus, this term is commonly misinterpreted, in part due to the different definitions that have been attributed to it. However, it is worth noting that the study in question represents a very broad and complex field, which involves socio-cultural, economic, pedagogical, psychological and family factors.

For Brandão and Vieira (1992), the term learning and its consequences (difficulties and disturbances) result from a gap between the true and observed performance of a child and what is expected of them compared to the average of children in the same age group, both in the cognitive aspect and in a psychometric view.

In this regard, the need arises to understand this difficulty as a failure in the learning process that led to academic failure. Thus, not only thinking in terms of failures in the acquisition of knowledge (learning), but also in the act of teaching, this problem is not only translated as a problem specific to the learner in the sense of competences and potentialities, but in a larger constellation of factors and their interrelation, which directly or indirectly involve this complicated web (JARDIM, 2001).

Difficulty learning difficulties have exclusively cognitive origins, to blame the student himself for his failure, considering that he has some impairment in his psychomotor, cognitive, linguistic or emotional development (he talks a lot, he is slow, he does not do his homework, he has no assimilation , among others), family breakdown, without evaluating the learning conditions that the school offers to this student and the other intra-school factors that favor non-learning. Learning difficulties at school can be analyzed as one of the causes that can lead the student to school failure (FERNANDEZ, 1990).

Strick and Smith (2001) point out that, for many years, students were penalized and held responsible for their failures, where they suffered punishment and

criticism, however, with the advancement of science, we cannot limit ourselves to believing that the learning difficulty whether it is a matter of the will of the student or the teacher. This is a much more complex issue, where several factors can intervene in school life, such as teacher-student relationship problems, teaching methodology issues and school contents.

Teacher-student affinity can make the student capable or incapable, so that if the teacher treats him as incapable, he will not be successful and will not admit his learning and development. And, of course, if the teacher is unable to manage the situation presented in the classroom, he will be more likely to shift his difficulties to the student. Therefore, the empathy between the teacher and the student will turn into antipathy and an animosity may occur between them (GAMA, 2020).

In this aspect, it is understood that a professional specialized in pedagogy is essential to guide the student, the family and the teacher himself in the search for overcoming the difficulties that arise, transforming obstacles into stimuli for the educational process (JOSÉ and COELHO, 2002).

2.1 TEACHING LEARNING PROCESS

In Brito's (2006) conception, teacher education should be based on the perception of a professional who constantly rethinks his teaching practice, establishing an active process that can break with the theory-practice dichotomy, thus articulating the educational process with the social fact.

If an overview of the teaching of Brazilian schools in recent years were carried out, it would certainly be seen that the way of teaching was based on the transmission of content, that is, on banking education, as Paulo Freire called it. The School was not innovative and inflexible and the teacher was responsible for transmitting information about the student being in need of any and all previous knowledge and experiences, not really caring about the student's learning. For a long time, the

School launched this teaching by depositing incipient knowledge and mechanically on the student, without taking into account the cognitive aspects of this individual. Particularly, in relation to the teaching of Portuguese, it can be understood that the situation was not very different. The apprehension with aspects related to the acquisition and production of reading and writing, according to the cultured norm, took place along the lines of traditionalism. First, the most important aspects assessed were speaking and writing well. Thus, the student would need to master grammatical rules to succeed not only in the school environment, but to be someone in life, to know how to read and write impeccably. Even today, it can be understood that the teaching of the Portuguese language still retains some traces of the traditional paradigm; in some schools, it also continues to be focused on the teaching of grammar, completely disconnected from reflections, decontextualized and distant from the true needs of the students (PERRENOUD, 2002).

In this context, Luckesi (1994, p. 155), when debating the importance of teaching processes in everyday school life, asks that:

> Será que nós professores, ao estabelecermos nosso plano de ensino, ou quando vamos decidir o que fazer na aula, nos perguntamos se as técnicas de ensino que utilizaremos têm articulação coerente com nossa proposta pedagógica? Ou será que escolhemos os procedimentos de ensino por sua modernidade, ou por sua facilidade, ou pelo fato de dar menor quantidade de trabalho ao professor? Ou, pior ainda, será que escolhemos os procedimentos de ensino sem nenhum critério específico?

The use of the term teaching strategies corresponds to the means used by teachers in the articulation of the teaching process, according to each activity and the entrusted effects. In this regard, Anastasiou and Alves (2004, p. 71) recall that:

> As estratégias visam à consecução de objetivos, portanto, há que ter clareza sobre aonde se pretende chegar naquele momento com o processo de ensinagem. Por isso, os objetivos que norteiam devem estar claros para os sujeitos envolvidos – professores e alunos – e estar presentes no

> contrato didático, registrado no Programa de Aprendizagem correspondente ao módulo, fase, curso, etc.

In the teaching-learning procedure, several factors intervene in the expected results, namely: the structural conditions of the educational institution, the working conditions of the teachers, the social conditions of the students and the available resources. However, in addition to these factors, the teaching tactics used by teachers stand out, as they need to be able to sensitize (motivate) and submerge students in the craft of learning, making clear their role (PIMENTA and ANASTASIOU, 2002).

In the assessment of Luckesi (1994), teaching procedures reflect teaching practice. Therefore, in order to establish teaching procedures with some precision, it is necessary: to have a clear pedagogical proposal; understand that the teaching procedures selected or constructed are mediations of the pedagogical and methodological proposal, and must be closely articulated; select or build processes that are results-oriented, even if partial; make use of available scientific knowledge; and being permanently alert to what is being done, evaluating the activity and making new and immediate decisions.

The teacher's resourcefulness in identifying these differences and indicating the teaching processes that best fit the peculiarities of the students they work with can make them more successful in their teaching profession. The use of teaching forms and procedures needs to consider that the way in which the student learns is not an isolated act, chosen at random, without analyzing the contents worked and without considering the indispensable skills for the execution of the objectives to be obtained (ANASTASIOU and ALVES, 2004).

The meaning of the use of a certain teaching-learning strategy analyzes the objectives that the teacher constitutes and the skills to be developed in each series of contents. In the view of Pimenta and Anastasiou (2002, p. 195), “concerning the

method of teaching and making people learn, it can be said that it depends, initially, on the teacher's view of science, knowledge and school knowledge".

In view of this, Duarte (2001) emphasizes that it is in the pedagogical action that the challenges of the teaching and learning process appear, where students who do not obtain good grades proceed every day, adding to the rates of students evaluated with learning problems.

According to Sisto (2001), in society, the school is the space that, due to its nobility, performs the function of transmitting/socializing this cultural legacy. In the school space, the subjects of this process interact, the teacher and the students, and both have an active role: the first is systematizing, organizing and mediating, he is the one who directs the activities to be developed; while the second is responsible for the appropriation of knowledge, questioning, evaluating and preparing concepts that are instruments for understanding and appreciating reality (SISTO, 2001).

Thus, the appropriation of knowledge by the subject as an instrument for the conception of existing social relations requires simultaneous movements: the transmission and appropriation of knowledge. In order to implement the teaching process, the teacher needs to have a deep knowledge of what he wants to teach. In this sense, he needs to be at the same time a student, an assiduous reader and a researcher. In addition, it needs to plan pedagogical interventions appropriate to the content and context and organize its action in order to articulate the knowledge accumulated by the students with the new concepts, so that they can overcome the daily concepts, building a framework of systematized knowledge (VYGOTSKY, 2001).

Learning comes through the mediation between the student (subject) and knowledge (object). This mediation, in turn, is performed by the teacher, who masters the scientific content to be transmitted, using social instruments and

language. The simple relationship between the subject and the object does not guarantee learning. This process needs the teacher's interference, that is, it is not presented easily, but is the effect of the subject's mutual influence with other subjects. In this context, this is how the student dispenses with the social meaning of objects, a meaning established with elements collectively and socially constructed by individuals (VYGOTSKY, 2000).

For Rappaport (1984), in the educational process, teaching and learning are important factors for teachers and students to create essential links for learning. This process must be established in a socio-interactionist way, since teaching and learning encompasses the teacher, the student and the environment where learning is offered.

It is noted that the teacher, as an intermediary in the teaching-learning process, needs to be an interventionist in solving problems and develop a conscious work that generates learning. In this way, the school is one of the most privileged places to alleviate learning problems. It needs to offer favorable, satisfactory conditions, and an appropriate environment so that the student can feel well accommodated. It should promote periods of psycho-pedagogical action reflection and prioritize the role of rebuilding the figure of the student and the teacher, where the teacher promotes learning and the student is the creator of his personal, educational and social/cultural process. When the school teaches expressive learning, knowledge is learned and apprehended and becomes meaningful for the student's life (SCOZ, 1994).

In the opinion of Simão (2004), dialogue presents itself, in the teacher-student relationship, as a valuable instrument for investigating the teaching-learning process. It allows recognizing the student's thinking process and the manifestation of their meaning processes, which will allow the teacher to make a decision as to how to organize their pedagogical practice and, in this way, favor the student's learning and development.

According to Nelson (2002), in learning, motivation raises the learner's state of arousal, improving productivity, concentration, alertness and information capture. While motivation can develop in the student, a good look at learning and the entire school environment, punishment or lack of motivation can cause learners to dislike studies and this will make it impossible for them to evolve. Still, Netto (2002 *apud* BARROS, 2014, p. 18) confirms that “the child who is rewarded for school work acquires a taste for learning, while the child who is punished learns to dislike education”.

Paying attention, understanding, accepting, capturing, transferring and acting are the fundamental components of learning, as highlighted by Netto (1987). And, in the understanding of Bock, Furtado and Teixeira (2002, p.138), students are always willing to learn things that are useful and have meaning for their lives, which is where the value of motivation lies. The motives for learning need to be salient and expressive, both for those who teach and for those who learn.

One of the aspects that decides the professional success of the teacher and, consequently, of the teaching-learning process is the ability to relate, communicate and motivate the student in a constant and competent way. In addition, another important factor is intellectual competence, bringing theory to practice and the experience of theoretical reflection (NETTO, 1987).

Communication techniques, when used by the educator, following the idea of Moran *et al*. (2000), are important for the success of this process. A teacher who speaks well, who tells attractive stories, who feels the mood of the class, who adjusts to occasions, who knows how to play with metaphors, humor, who uses technologies properly, is sure to achieve good results with students. Students like a teacher who surprises them, who has news, who changes their techniques and methods of organizing the teaching-learning process, thus making them motivated. And as the Behaviorist approach indicates, even when repetition is essential for

learning, it can be creative and differentiated so that the student can better assimilate (BOCK, FURTADO and TEIXEIRA, 2002).

The friendliness of the teacher is essential in the relationship with their students. By showing himself to be human and understanding, he can attract students and direct their attention to the awaited learning. Moran (2000, p. 80) emphasizes that "the good educator is an optimist, without being naive. He manages to awaken, stimulate, encourage the best qualities of each person."

The teacher's way of being in front of students is a significant motivational factor in school learning. The enthusiastic, friendly teacher who likes the students and trusts them commonly achieves better results than the hypercritical, irritable teacher who disdains the ability of the apprentices (NETTO, 1987).

The subject of motivation linked to learning is always highlighted in school environments, leading teachers to overcome themselves or making them retreat, reaching the point of giving up in the most difficult cases. However, it plays an extremely important role in the results that teachers and students want (TAPIA, 1999).

According to Burochovitch and Bzuneck (2001), students do not always understand the value of schoolwork, because, on many occasions, they cannot understand the relationship between learning and a claim to value for their lives, what causes them not to engage in work.

The aforementioned authors go on to claim that:

> [...] a motivação tornou-se um problema de ponta em educação, pela simples constatação de que, em paridade de outras condições, sua ausência representa queda de investimento pessoal de qualidade nas tarefas de aprendizagem.
>
> [...] à medida que as crianças sobem de série, cai o interesse e facilmente se instalam dúvidas quanto à capacidade de

> aprender certas matérias" (BORUCHOVITCH e BZUNECK, 2001, p. 13).

The more advanced the grades are, the problems tend to be more complicated and intense because they are rooted in those that were generated in the early grades and because they are influenced by the new requirements of different types of disciplines, combined with the evolving characteristics of the student. From a humanistic point of view, motivating students is about encouraging their inner resources, their sense of competence, self-esteem, autonomy and self-fulfillment (BALANCHO and COELHO, 1996).

The motivational secret of school learning is to be able to harmonize the development of the child's intrinsic motivation (by the self-perception of the progress obtained and the necessary process). In the view of Burochovitch and Bzuneck (2001), "intrinsic motivation refers to choosing and carrying out a certain activity for its own sake, because it is interesting, attractive or, in some way, generating satisfaction", with the support of the extrinsic or external motivation (adult assessment, information about it, genuine praise, etc.).

Extrinsic motivation is one that works in response to something external to the task or activity, to obtain material or social rewards, recognition, to respond to the commands or pressures of other people or to demonstrate skills or abilities. In this way, several authors evaluate the learning experiences provided by the school as being extrinsically motivated, leading some students who drop out or complete their courses to feel relieved to be free from the manipulation of teachers and books (BORUCHOVITCH and BZUNECK, 2001).

Assessment is an indispensable and permanent didactic task of teaching work, which needs to accompany the teaching and learning process step by step. Through it, the results that are obtained from the joint work of the teacher with the students are compared with the proposed objectives, in order to verify progress,

difficulties, and reorient the work towards the necessary corrections (LIBÂNEO, 1994, p. 195).

It is necessary to understand that assessment is part of the entire instructional-educational process and must be understood as a vitally important element in the development of the student's learning. And even if the purposes and words are unequal, in the observation, in the opinion and in the regulation, the evaluative measure must consider the acquired knowledge and competences. Furthermore, these logics will not be prevented from coexisting and, at times, from opposing each other (PERRENOUD, 1999).

It is understood that it is not ideal to disaggregate the act of transmitting knowledge from the act of measuring the learning process. It is also mandatory to observe the difficulties that the student finds in his process of absorbing the content. Educational practice and evaluative practice complete the learning process (LUCKESI, 1997).

In view of this, it is also noted that the evaluation present in the school space still has another purpose that meets the social bureaucratic requirements. In the context of formal education, the teacher is required to prove and measure the student's learning, quantitatively presenting the learning results. And these, in turn, are obtained through tests and tests that, in most cases, do not contribute to the construction of student knowledge. In this way, the student ends up memorizing the content to be evaluated, failing to develop the learning that is essential in their training process (MORETTO, 2005).

In this context, Moretto (2003) also points out the issue of memorization present in the requirements that the student needs to know to take the test, so that, if he does not know, it is common for the subject to resort to the famous “cheating”. Thus, this confirms that the teacher, when preparing the tests, is more concerned with formulating questions that require memorization to the detriment of skills that lack

reasoning and reflection. In this way, the assessment does not propose an expressive learning for the student, since the student is only concerned with memorizing or gluing to answer the test questions.

With this, it is understood that educators, normally, intend to direct their efforts to the quantitative aspect of the evaluation, valuing and investing less in the qualitative aspect of the students' development diagnosis. This happens, perhaps, because the task of evaluating qualitatively requires much more time from the educator, which triggers greater dedication on the part of the educator. However, the reality experienced by these professionals makes it impossible to better support, organize and plan their educational activities. This usually happens to the detriment of this professional's low remuneration, leading him to take on double or even triple shifts. In addition, this issue is also influenced by the demand of the school management to comply with the syllabus in a timely manner, limiting the teacher's autonomy to develop the pedagogical action in the perspective of qualitative evaluation (PERRENOUD, 1999).

According to Rabelo (1999), an evaluation project must be prepared that, in the first instance, and through the instruments established therein, can be used at all times as feedback to evaluate not only the student and his/her knowledge, but also the entire the school's proposal, thus making it possible to validate and/or show the need to reassess the pedagogical work (RABELO, 1998).

In this view, the evaluation is conceived as an instrument that will interfere in the planning not only of the teacher, but of the entire team, culminating in the definitions that will guide the guidelines of the School's Pedagogical Political Project. Thus, in view of a Political Pedagogical Project committed to an emancipatory understanding, it is essential to admit that the quantitative aspect of the evaluation must complement the qualitative, understanding that both are necessary and add to the student's schooling and training process (LIBÂNEO, 1994).

Quantitative assessment, developed by teachers, needs to take into account that evidence of learning through tests cannot continue to be used to classify and select students. On the contrary, the quantitative assessment will complement the qualitative aspect as the results achieved in the tests and tests carried out by the students provide the educator with feedback and reflection on their pedagogical practice. In this way, this exercise to be practiced by the teacher will help his planning so that he can detect and overcome the difficulties of the students, thus resorting to new teaching strategies and allowing their learning (PERRENOUD, 1999). Also remembering that the legislation (LDB - Law 9394/96) advocates in its art. 24, subsection V, subparagraph a: continuous and cumulative assessment of student performance, with prevalence of qualitative aspects over quantitative ones and results over the period over those of eventual final exams (BRASIL, 1996).

Therefore, it is understood that the law, by guaranteeing the evaluation from a qualitative perspective, is predicting the need for a diagnostic action in the evaluation process. In this aspect, this measure will bring about positive results, because, evaluating the learning process, it will be possible to identify the difficulties and provide essential interventions for the student's development (RABELO, 1998).

The teaching practice must constantly seek the effectiveness of the student's learning. The teacher cannot hold back the task of simply transmitting the culturally accumulated and systematized contents. This action favors the formation of a type of human being decontextualized with contemporary reality. Therefore, it is vital to have the articulation of knowledge with life (RABELO, 1998).

Immediately, the academic training of the teacher, although not the only preponderant factor, has an essential role in the performance of this professional, as it cooperates with its foundation. And it is from this foundation that the reflections of his pedagogical practice are triggered, generating a modification in the educational action, being able to improve the conditions of the teaching-

learning process, since the educator is committed to the student's learning (LUCKESI, 1997).

Evaluating learning, therefore, is strongly associated with the conception one has of the teaching-learning process, so it needs to be coherent with the way of teaching. In this aspect, the teacher's conception of what knowledge is, will decide his teaching process, where, if the teaching approach was within the principles of knowledge construction, the learning evaluation will adopt the same orientation. Therefore, it is understood that the evaluation will become a privileged moment of study and not a settling of accounts or a form of punishment (LUCKESI, 1995).

In this scenario, new technologies and the mediation of the teaching-learning process at school are themes that cause a series of reflections and consequent actions in the people involved with the educational task, in an attempt to seek ways that increase the quality of teaching and learning (LÉVY, 1993).

There are a variety of learning insights that can be employed by education professionals. Any educational circumstance has as its starting point a significant medium, be it the teacher's exposition, a linear text or a non-linear text (MORAES, 2006).

The creation of a new teaching method demands a restructuring of those that already exist and a questioning about how each of these methods have affected students in order to arouse curiosity, pleasure and desire to seek and share knowledge with other people, of building and looking at the world outside the school environment (MORAES, 2006).

In this perspective, Papert (2008) defends the use of technology in education in the constructivist expectation, whose teacher's performance tends to generate student learning so that he/she builds his/her knowledge in an environment that challenges and motivates him/her to develop concepts according to its context. The teacher

acts as a mediator of the expressive teaching-learning process, when he works with knowledge articulated with the interests and needs of his students.

For Valente (1991, p. 17), by altering the school's issues, the teacher's role is modified, at the same time, from a transmitter of information to a facilitator in the teaching-learning process. Therefore, technology is an instrument of motivation for students and teachers as long as its inclusion is not authoritative, but defined and understood by the teacher. New technologies are not simply a collection of machines and their accompanying software. They embody a way of thinking that leads a person to face the world in a particular way, since computers imply a way of thinking that is primarily technical.

For Valente (1998), the pedagogical use of the computer allows the teacher to go through perceptions of learning that contrast with the classical school, where the relationship that the subject establishes with the object defines new universes of knowledge construction. In this case, the objective of training this professional does not need to be the acquisition of teaching techniques or methodologies, but to have a thorough understanding of the learning process.

Even today, most schools maintain teaching in orality and technology, making students just listeners. The school that surpasses this level and turns its students into class participants improves the learning process. At this important moment, the educator and the student go through a similar process of osmosis, absorbing knowledge without excessive expenditure of energy and without excessive study, but through direct assimilation (KENSKI, 2006).

Today, much of the transmission of knowledge is devoid of method and logic. Part of the teachers are also unprepared to face the classes and the State itself is indifferent to education (GAMA, 2020).

3. GROWTH AND DEVELOPMENT

Childhood is one of the stages of life where the greatest physical and psychological changes take place. These changes mark child growth and development, and need to be closely monitored. In this sense, the monitoring of growth and development covers the health and life conditions of the child, with a view to promoting and maintaining their well-being and intervening on factors capable of compromising their health (SIGAUD, 1996).

According to Marcondes (1992), a child can grow and not develop, and vice versa. Growth and development make up the final result of a series of factors, which can be divided into extrinsic (environmental) and intrinsic (organic). Intrinsic factors are represented by genetic inheritance and the neuroendocrine system, and extrinsic factors are environmental and nutritional factors.

The primary characteristic of the child is the intellectual development that grows, changes and guarantees itself as an individual. By meeting their fundamental needs, day by day, their harmonious growth and development is guaranteed and the child is prepared for the future. Development also includes health. There cannot be sufficient growth or development if the child's health is compromised by chronic problems such as malnutrition (MANCIAUX, 1984).

An individual's growth and development are heavily compromised by his or her early childhood experience. Several studies corroborate that this phase is essential in the life of any individual. The experiences lived during it make their effects felt on the physical, intellectual, emotional and social development of the individual for a long period, until adulthood (LELOUP, 1998).

Early childhood, a stage of development that comprises between 0 and 6 years of age, has been increasingly addressed and discussed by experts in different areas

such as psychologists and sociologists, among others who have reached a vast consensus as to the primordiality of the development of childhood early.

Vygotsky (1994) emphasizes that the child is a subject, like every human being, who is introduced into a society that must guarantee an enriching childhood in terms of their psychomotor, affective and/or cognitive development.

In this context, it is highlighted that children are influenced by the social and cultural environment in which they settle. They have their own peculiarities and analyze the world and the behavior of the people around them in a very different way. In addition, they also learn through the accumulation of knowledge, the creation of hypotheses and lived experiences.

For this reason, in Wallon's view (1994), the child needs to be analyzed in the succession of development phases, marked by the functional domains of affectivity, motor act and knowledge, perceived as being developed primarily by the social environment.

Thus, Piontelli (1995) highlights that the periods of development are:

- Período sensório-motor (0 a 2 anos): o desenvolvimento advém a partir da atividade reflexa para a representação e soluções sensório-motoras dos problemas;
- Período pré-operacional (2 a 7 anos): aqui o desenvolvimento acontece a partir da representação sensório-motora para as soluções de problemas e segue para o pensamento pré-lógico.

According to Wallon (1953), the stage, which lasts until the age of 6, is extremely important for the formation of personality. For the author, from the age of 3, the stage of personalism takes place, the time of the constitution of the self, in which the child in his confrontation with the other goes through a certain personality crisis, differentiated by changes in his relationships with his surroundings and the beginning of new skills. Therefore, Piaget (1971) states that the stages of children's

development are of ultimate value for the integration of playful activities and their results in childhood.

According to Lordelo *et al*. (2007), monitoring the child's development in the first two years of life is important, as it is at this stage of extrauterine life that the organism grows more and matures, thus being more subject to injuries. Due to the great plasticity of the brain, in the early years the child responds better to therapies and to the stimuli he receives from the environment.

Despite individual variations, the learning of movements is configured in similar and common patterns. Human beings are born with genetic potential for growth and development, which may or may not be achieved, depending on the living conditions that are provided for them. In children under five years of age, the influence of environmental factors is much more important than that of genetic factors for the expression of their growth potential. A good part of the research carried out mentions the influence of the socioeconomic level (in the pre, peri and postnatal aspects) on the child's neuropsychomotor development.

The higher the mother's level of education, the better the organization of the physical and temporal environment, there is a greater chance of variation in daily stimulation, with the availability of appropriate materials and games for the child, and the greater the mother's emotional and verbal involvement with the child. In early childhood, the main bonds, as well as the essential care and stimuli for growth and development, are provided by the family (ANDRADE *et al*., 2005).

That said, Guerra (2002) highlights that, following the child's growth, it is possible to observe the moment of building motivation. One way to elucidate this process in child psychology is through the analysis of acquired competences. Becoming competent in their social environment leads the child to motivation. A particular motor skill in sports can be developed and this factor is capable of activating the urge to undertake such an activity with a certain effort. In this context, external

reinforcement, referring to the performance of skills acquired from parents and acquaintances, allows for the encouragement of motivation.

If the performance is perceived by the child, its improvement, then, can lead to a good self-esteem and, also, to an intrinsic or internal motivation. On the other hand, if the child has little understanding of his/her skills, he/she commonly has low self-esteem, is confirmed apprehensive and sees little expectation of improvement in his/her skills, thus needing greater external stimulation (GUERRA, 2002).

3.1 BACKGROUND PERSPECTIVE OF MODERN SYSTEMS

The systemic perspective of development appeared with the convergence of theoretical formulations from different disciplines, which shared a holistic view of the objects or phenomena treated. Which demonstrated that they had an interdependent relationship with their context, molding a whole, whose characteristics are not reducible to its components (FOGEL, 1993). In Developmental Psychology, the ideas of Kurt Lewin (1890-1947) had a particular impact. According to his field theory, conduct cannot be considered independently of the field or context in which it occurs. Individuals and their world come together in a close relationship called life space (LEWIN, 1998).

In 1933, Bertalanffy published "Modern theories of development: An introduction to theoretical biology", where he presented his system theory as an alternative to mechanistic and vitalist explanations of development. In this regard, the author expressed himself as follows:

> A solução para este antítese em biologia tem de ser procurada usando uma teoria organismica ou sistema no organismo, que, por um lado, e em oposição à teoria da máquina, podem descobrir que a essência do organismo está em harmonia e coordenação entre processos, e que por outro não interpreta essa coordenação como vitalismo que, usando uma enteléquia mística, mas, considerando os pontos fortes iminente do próprio sistema de vida. (tradução livre, pp. 177-178)

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In this context, the term "system" refers to wholes that are constructed in an ongoing transactional process with their surroundings.

Assuming the isomorphism of systems that had been studied by different disciplines, Bertalanffy proposed a series of general principles, which can be applied to the development of systems, regardless of the type of element it or the forces involved form. Among the principles included, there are two that can be expressly incorporated into the holistic perspective.

The first is complexity, which refers to the interdependence between the different parts of a system, between the system as a whole, and between its parts and components. And the second is related to the organization of the system, as it occurs differently from the organization of the parts separately, characterizing a hierarchical pattern in the global organization. In this context, finally, two other principles would bring directionality to transactions between the parts of a system, namely: the principle of self stabilization, determining that systems include mechanisms to maintain their state or trajectory; and the principle of equifinality, establishing that different operations can lead to a limited number of organization patterns (BERTALANFFY, 1968).

That said, among the first applications of systems theory in the field of developmental psychology, the work of Heinz Werner was of particular importance. He analyzed psychological processes in the context of the global organismic system. Thus, he assumed that developmental psychology was formed by different parts, such as locomotion, vision and thought, which would go through phases of imbalance that would cause structural reorganization, leading, in turn, to different types of behavior (WERNER, 1948).

As a guiding principle, Werner considered embryogenesis and orthogenesis, applied to mental development, as a trajectory from a state of relative globality and

lack of differentiation, leading to a state of increased differentiation, articulation, and hierarchical integration.

From Werner to modern times, systemic principles have been present in Developmental Psychology, being interconnected with integrated dialectics and contextualist proposals. For example, Jean Piaget (1896-1980) described development as a process of adaptation, where the biological and psychological characteristics of the organism interact with its environment. This would facilitate the process of integrating the environment into the subject's knowledge structures and the transformation of these structures by the action of the environment. A dialectical balance would be established between the two sub-processes, assimilation and accommodation, respectively named, which would lead to forms of organization of increasing complexity (PIAGET, 1969).

Lev Semenovich Vygotsky (1896-1934) was also inspired by dialectical principles. However, its main contribution to the systemic view would be the relevance given to contextual factors in explaining development, both at the interindividual and sociocultural levels.

Vygotsky considered that superior functions had their origins in the child's relationship with more competent children or with adults. They were then reconstructed internally, this process being called internalization. The author also pointed out that, during development, subjects' thoughts are shaped according to cultural norms. On the other hand, culture itself was considered by the author as a result of the contributions made by individuals over successive generations.

Systemic, dialectical and contextualist components have permeated the developmental formulas of followers of Piaget, Vygotsky and other influential contemporaries, such as lifespan and ecological theories (BRONFENBRENNER, 1979; BALTES, REESE and LIPSITT, 1980), which are still valued today. In this

context, their points of convergence with the most recent systemic theories will be referred to in the next chapter.

4. BASIC CONCEPTS OF THE MODERN SYSTEM

The central assumption of the modern system perspective is still holistic and understands that the individual “develops and functions psychologically as an integrated organism. Maturational, experiential and cultural contributions are merged in ontogeny. Singular aspects do not develop in isolation and they should not be separated from the totality in an analysis” (MAGNUSSON and CAIRNS, 1996, p. 12).

Therefore, as Lerner (1998, p. 1) states, for contemporary development theories, the person who is in development is not biological, psychological or socialized, but 'systematized'. Modern Developmental Psychology studies individuals within their context, analyzing the person-environment system (LERNER, 1998; MAGNUSSON and STATTIN, 2006).

In line with the systemic principles of complexity and organization, the person-environment system is considered to be composed of multiple and integrated levels, organized in qualitatively different ways (GOTTLIEB, 1991; LERNER, 1985). According to the principle of hierarchical systemic testing, each level of the system is considered simultaneously as a totality seen in relation to lower levels and as a subsystem in relation to higher levels (MAGNUSSON and STATTIN, 1998, 2006). Furthermore, it is also assumed that the more complex levels adopt the laws of the simpler levels and add new laws of their own country.

In this context, the subsystems specified and/or analyzed by different theories and investigations, which fit the current perspective system, are part of the organismic, psychological and environmental levels. However, they are treated in varying degrees of detail, meaning that they can scale from a psychobiological-

developmental approach to a contextual developmental approach, using terms introduced by Gottlieb (1997) and Lerner (1991), respectively.

The psychobiological extreme includes approaches that differentiate sublevels within the biological level and consider other levels more generally. The contextual extreme, in turn, comprises approaches that analyze the environment in more detail. Therefore, the former includes approaches that adopt a comparative strategy or that focus on the exchange of material or energy between subsystems and the latter tends to focus on the exchange of information between individuals and to consider both social and cognitive phenomena (LERNER, 1991).

In this regard, the psychobiological extreme of the continuum of system approaches present in the work of Greenough (1991) stands out. In an attempt to illustrate the various ways in which the organism's external environment can influence gene expression, the author identified the following biological sub-levels: DNA, cell nucleus, cytoplasm, cells and organs. In this way, he detailed the processes of interaction between the levels that influence the expression of genes.

Among other examples, the author refers to the role of visual experience in activating the gene that encodes it for tubulin, a protein integral to the axons and dendrites that support the functional connections of the visual system. In this context, in more recent studies, Greenough *et al*. analyzed the effects of experience on brain development (DONG and GREENOUGH, 2004; GROSSMAN *et al*., 2003).

On the other hand, Gottlieb (1991, 1997) distinguished the biological levels of neural activity and genetic activity, a third level of behavior and the last formed by the physical, social and cultural aspects of the environment. With this, the author aimed to demonstrate the integration of biological and social factors in determining intersensory development. He performed a series of strategic manipulation experiments considering sensory experiences of the development of birds and their

neural and/or behavioral responsiveness to multimodal information (GOTTLIEB, 1997; GOTTLIEB, WAHLSTEN and LICKLITER, 2006). In addition, he also explored the interaction between a particular genotype and rearing conditions as a determining factor for certain central nervous system deficits or psychopathological behaviors (GOTTLIEB, 2007; GOTTLIEB and TUCKER, 2002).

That said, it is mentioned that Magnusson's work on personality development in adolescence (MAGNUSSON, 1998) represents a midway point in this psychobiological-contextual continuum. It includes the interdependence between the subject's hormonal, cognitive, affective and social function, bringing up the importance of the role played by the adolescent's self-concept with regard to the association of biological maturation during puberty with the indicators of the socialization process.

The work of Lerner and Bronfenbrenner, on the other hand, is closer to the contextual end of the continuum of system approaches, which establishes sub-levels within the environmental level, considering the organismic and psychological levels in a lesser degree of detail. In this perspective, Ford and Lerner (1992) and Lerner (1995a) described the biological, psychological, interpersonal, social, cultural, physical-ecological and historical components of changing the subject's developmental niche, as needed in the definition of individual development.

On the other hand, Bronfenbrenner's ecological theory and its more recent reformulation, the bioecological model, also divides the environment into different levels, namely: the microsystem, the mesosystem, the exosystem and the macrosystem (BRONFENBRENNER, 1995; BRONFENBRENNER and MORRIS, 1998; BRONFENBRENNER and EVANS, 2000).

Therefore, in addition to the levels described, the most consistently characteristic of the different systemic approaches is the interdependence between the intra and inter processes of the level of change. It is assumed that changes in an element of

a level can respond to others that occur in other elements of the same or another level which, in turn, can affect this and/or other elements (LERNER, 1985; LERNER, SKINNER and SOREL, 1980). The influence that some elements can have on others, can either have higher or lower levels, or can be kept at the same level (GOTTLIEB, 1997). The relationships that exist between the elements are considered to be bidirectional or reciprocal, where one element that affects the other can be influenced by it in the same way. Therefore, it is noteworthy that this type of relationship was several times referred to as transaction (BALTES and GRAF, 1997; SAMEROFF, 1975, 1989; SCARR, 1982), coercion (GOTTLIEB, 1997; GOTTLIEB *et al*., 2006), co-construction (BALTES, LINDENBERGER and STAUDINGER, 2006; KINDERMAN and VALSINER, 1995; VALSINER, 1996), congeners (HERBST, 1995; VALSINER, 1995), merger (LERNER, 1989, 1998) or interaction (BRONFENBRENNER and MORRIS, 1998; LERNER, 1978, 1985; MAGNUSSON and STATTIN, 1998).

The latter term often appears as a dynamic interaction, referring to complementary relational characteristics. In view of this, Lerner (1978, 1985, 1989) makes a distinction between the conventional version of the notion of interaction that he refers to as weak or static and another that considers it as strong or dynamic, and illustrates the difference, referring to the triadic relationships established between the organism, the environment and the behavior. Thus, he considers that the conventional notion is present in explanations that impose the unidirectionality of a given relational vector.

Thus, as an example, Lerner mentions the work of the behaviorists Bijou and Baer (1961) with regard to development, saying that the authors' use of the term "interaction" was weak, as they established the relationship between past experience (contained in the organism) and concrete experience (determined by the environment), which are qualitatively identical. In addition, they also rejected the influence of the organism on the environment and the influence of development produced by the interaction of the organism and the environment.

Likewise, Lerner also points out that another example of the concept of weak interaction is included in Piaget's theory, which understands that the effect of the environment and individual behavior facilitates or inhibits development, but does not affect the direction, the sequence or the quality of it (LERNER, 1985, 1989).

In this context, Magnusson and Stattin (1998, 2006) indicate that, like reciprocity, dynamic interaction involves non-linearity, that is, the lack of obligation to meet a linear function. This resource is considered to be a focal point of system dynamics theories, and is operationalized through the application of the mathematical models used in thermodynamics (FOGEL, KING and SHANKER, 2008; THELEN, 1989; THELEN and SMITH, 2006; VAN GEERT, 1994;).

That said, this relational perspective of development processes that has been described involves a relative interpretation of its results, since these depend on the specific characteristics of the related components. For example, in the case of interactions between the organism and the environment, the developmental implications of a particular organismic attribute will vary according to environmental conditions, where the influence of a given type of environment will not be the same in different organisms. (BRONFENBRENNER and EVANS, 2000; LERNER, 1998, 2006).

This type of reasoning is typical in contextualist perspectives and has been expressed mainly in the importance given to environmental aspects and transformations that they undergo as a source of intra- and inter-individual variability in development (BALTES, 1987; KINDERMANN and VALSINER, 1995; LERNER *et al*., 1980; REESE, 1991). However, more recent theoretical proposals have included an interest in the role played in diversity by organismic and psychological characteristics themselves, and have underlined its transitory nature (BALTES, LINDENBERGER and STAUDINGER, 2006; BRONFENBRENNER, 1995; LERNER, 1996; MAGNUSSON, 1998).

In any case, relativism means transcending normative development, focusing on diversity. In the words of Lerner, Fisher and Weinberg (2000, p. 26), "Social and behavioral scientists have shown increasing appreciation of the diversity of patterns of individual and family development that exist and constitute the range of human structural and functional characteristics."

Having said that, it is worth noting that the characteristics already discussed in this article (holistic, multilevel analysis, relationism and relativism) lead to a dispersive perspective of development, which accepts the novelty as a possibility and denies the pre -determinism or the idea that development follows an unalterable and inevitable course. Therefore, the term “novelty”, in ontogeny, has been attributed either to the instructions contained in the genetic code or to the incorporation of information from the physical or social environment of the individual.

In both cases, emergent properties are assumed to exist before their appearance in the developing person and, therefore, are not really new, except in the individual (DENT-LEIA and ZUKOW-GOLDRING, 1997; LAUTREY, 1998; THELEN, 1989). Systemic theories, however, adopt the principle of self-organization to explain novelty. According to this principle, reorganization occurs as a response to disturbances at different levels of the system, leading to new structural and functional forms (MAGNUSSON and STATTIN, 1998, 2006; SAMEROFF, 1989).

The present proposal is related to the dialectical principle of transforming quantity into quality, which establishes that, when the magnitude of the intrinsic properties of the phenomenon exceeds certain limits, the quantitative change causes a qualitative or structural reorganization of a higher level, which leads to the emergence of a recent phenomenon, controlled by a new set of laws (HOPKINS and BUTTERWORTH, 1990; WOZNIAK, 1975).

Therefore, it is understood that self-organization is fundamental to modern theories of nonlinear dynamical systems. As Van der Maas and Hopkins (1998, p. 2) have

stated, "What is interesting about discontinuous change in the collective variable of a nonlinear system is that it is triggered by a change of an existing linear parameter (control), without the addition of a new variable". Thus, as the individual experiences changes in the characteristics of the environment during the process, which, in turn, can cause confusion in the individual, he becomes the co-producer of his own development (BALTES and GRAFF, 1997; LERNER, 1995b; MAGNUSON, 1995; SAMEROFF, 1989).

Therefore, the current systemic view paves the way for individuality in ontogeny, a characteristic that is reaffirmed by the intentional nature attributed to human conduct (BRANDSTÄDTER, 2006; LERNER, 2006; MAGNUSSON, 1998; SPENCER *et al*., 2006; VALSINER, 2006).

According to the person's lived experiences and needs, goals and plans, development takes on a particular character. For Magnusson and Stattin (1998), this is a fundamental aspect that reveals a clear difference between the dynamic processes produced in the person-environment system and other holistic processes.

In this context, there is an interesting application of the idea of the development model related to selection, optimization and compensation proposed by Baltes and Baltes (1990), where the first term refers to the prioritization of development goals; the second term refers to the acquisition of specific competences related to the objective; and the third term consists of the investment of additional resources in response to some kind of decline in the competent means, with the aim of maintaining the desired level of functioning.

Dispersion, however, has limits in the way the systems are viewed, which are found in the internal logic of the organism (GOLLIN, 1981; SAMEROFF, 1989; SCARR, 1982) and in the regularities of the environment (DANNEFER and PERLMUTTER, 1990; DOWD 1990; GOTTLIEB, 1997; VALSINER, 1997).

First, development is interpreted as the individual's adaptation to successive organismic (maturational) and environmental changes, which have their own internal organization, based on genetic and socio-cultural aspects (BALTES, 1987; COLE, 1992; GARIÉPY, 1995; GOTTLIEB, 1991; SAMEROFF, 1989). Second, according to the systemic principle of self-stabilization, the organism is defended as one that tends to respond to any changes produced by these changes with homeostatic or hermetic processes, which are intended to maintain states or to maintain sequences or trajectories, respectively (SAMEROFF, 1989; MAGNUSSON and CAIRNS, 1996; THELEN, 1989, 2005). Therefore, this tendency is generally attributed to the plasticity of the sensitive organism (GOTTLIEB, 1991; GOTTLIEB, WAHLSTEN and LICKLITER, 2006) or its impermeability through changes that can lead to the collapse or destruction of the system, referred to as allostasis (MAGNUSSON and STATTIN, 1998). Thus, thirdly, the developmental environment is considered to delimit an effect that Gottlieb (1991) and Valsiner (1997), to compare the role played by the organization of genes, defines as rhetoric.

In a recent study, Grossman *et al*. (2003) incorporated dual regulatory genetic and environmental actions in an attempt to explain pathological deviations from normal psychological development. For this, they considered Waddington's channeling metaphor and included non-genetic experiments, concluding that they were absent from the original proposal.

In Gottlieb's concept of probabilistic epigenesis (1998, 2007), it is possible to find a clear reflection of systemic dispersiveness and its limits. In this context, Gottlieb (1998, 2007) affirms the emergent nature of the development process and rejects that this process follows an unalterable course, which is conceived as probable in relation to the normative. Thus, Magnusson and Stattin (1998, p. 687) echo this idea when they state that psychological development processes "are licit, but unpredictable."

The impossibility of accurately predicting developmental processes is not only the result of intra- and inter-individual variability and self-organization, but is also a consequence of accepting a type of causality that, until recently, had no development explanations.

That said, this type of causality is referred to by Lerner (1996, 1998) as configurational or field causality, and implies that none of the levels of the person-environment system, or the elements of any of these levels, are considered to be primordial in terms causal. In this sense, Magnusson and Stattin (1998, p. 702) defined this idea in the following terms:

> No processo de interação dinâmica [...] o que inicia um processo específico e mantém ao longo do tempo pode variar. Um fator psicológico pode iniciar um processo biológico, o que é então mantida por fatores fisiológicos [...] da mesma forma, fatores psicológicos podem manter um processo que afeta o seu próprio ambiente de diversas maneiras, direta e indiretamente... a implicação dessa visão é que os conceitos de independente e dependente, e de preditores e critérios, perdem o sentido absoluto que eles têm na pesquisa tradicional, que assume causalidade unidirecional. O que pode funcionar como um critério ou variável dependente em um determinado estágio de um processo pode, a próxima fase, servir como um indicador ou variável independente (tradução livre).

Furthermore, configurational causality is relational. Kindermann and Valsiner (1995), for example, indicate that development is not determined by individuals or their contexts, but by the complex of interconnections that are produced between them. Thus, they argue that developmental psychologists should focus on these interconnections rather than the separate elements.

Likewise, Gottlieb (1996, p. 69) states that:

> [...] os resultados comportamentais (ou orgânica, ou neural) de desenvolvimento são a consequência de, pelo menos (no mínimo) dois componentes específicos de coação (por exemplo, pessoa-pessoa, organismo-organismo, organismo-ambiente, célula-célula, núcleo-citoplasma, sensorial sistema

> de estimulação sensorial, comportamento da atividade-motor), a causa do desenvolvimento - que faz com que o desenvolvimento aconteça - é a relação entre os dois componentes, e não os próprios componentes" (tradução livre).

That said, recently Gottlieb and Tucker (2002) reaffirmed the role of this type of relational causality in explaining normal and abnormal development.

Finally, Gottlieb (1996) refers directly to the novelty component that is implicit in this type of causality. According to Gottlieb (1996, p. 74), "an important characteristic of developmental systems is that causality is often not 'linear' or simple. In developmental systems, the joint action of X or Y, W, often produces a little more than X or Y, or some variant of X or Y".

In conclusion, the development of the individual is considered, in modern systemic terms, as a process where new properties arise as a result of dynamic interactions between different levels of the person-environment system, and whose product is not certain, but probable. More specifically, its main premises are:

1) The object of study of Developmental Psychology is the person-environment system. Therefore, as the individual develops as an integrated organism, experience or culture must not be analyzed separately.

2) The people-environment system is formed by several levels of organization, which are qualitatively different and integrated.

3) There are dynamic interactions between the different levels and two-way transactions that have the ability to modify the elements.

4) The effect of these operations depends on the characteristics of the elements that interact, and on the moment in which this takes place.

5) Development does not follow an unalterable course: it responds to certain laws, but it is unpredictable.

4.1 GENERAL RESEARCH IMPLICATIONS AND CHALLENGES

The conceptual framework described in development research has several implications. First, systemic relativism is concerned with the external validity of the investigation, as well as the possibility of generalizing the results (LERNER, 1995b, 1998; LERNER *et al*., 1980; MAGNUSSON and STATTIN, 1998). Consequently, investigations that focus on individual and contextual diversity are more widely accepted than those that focus on "typical" individuals and "standard environments". In view of this, Magnusson (1998, 2000) and Magnusson and Stattin (1998, 2006) emphasize the benefits of longitudinal and cross-cultural research that aim to expand the generalization margins imposed by the age of the subjects and the analyzed context.

In this context, Lerner (1995b) and Lerner, Fisher and Weinberg (2000) indicate that explanatory studies with "ecological" concerns can take the form of intervention policies and programs. As "experimental manipulations" in the "real world", which can provide data on the person-context relationship and the plasticity available to improve human development.

To understand the reciprocal nature and dynamics of systemic relationships, it is important to adapt the investigation methods used according to the characteristics of the variables being analyzed, avoiding any compromise of qualitative methods in the analysis of whole and molecular processes (FOSTER and KALIL, 2008; LERNER, 2006; LERNER *et al*., 1980; MAGNUSSON and STATTIN, 1998).

Systemic dispersion implies abandoning prediction as the ultimate goal of scientific research. According to Magnusson and Stattin (1998), this should be replaced by the understanding and explanation of the processes that lead to individual functioning and development. Bronfenbrenner and Morris (1998, 2006) highlight a type of investigation that, by adopting a discovery mode, would allow hypotheses

to be created and explained with sufficient precision to be able to be subjected to empirical testing.

This basically consists of the "successive confrontations between theory and data that lead towards the ultimate goal of being able to formulate hypotheses that are susceptible to scientific evaluation in verification mode" (BRONFENBRENNER and MORRIS, 2006, p. 802).

However, perhaps the most direct implication of the holistic systems perspective is the way it pays little attention to studies that analyze isolated aspects of the person-environment system and to multidimensional studies (BRONFENBRENNER, 1995; LERNER, 1991, 1995b, 1998; MAGNUSSON, 1995, 1998). These evaluations are usually accompanied by the call for interdisciplinary collaboration in the effort to create a science of development that, using the theoretical framework described, seeks to propose investigations that consider the variables of different systemic levels (BRONFENBRENNER e EVANS, 2000; COLE, 1996; LERNER, 2006; MAGNUSSON, 1995). This call for collaboration, which was present in early works on the systemic perspective and socio-cultural and life extension movements, has gone from strength to strength, and has received institutional support.

In particular, the Nobel Symposium in 1994 stands out, which brought together specialists from the fields of medicine, biology and psychology to reflect on the possibilities of contributing, within their respective disciplines, to the understanding of human development from a holistic and interactive (DIAMOND, 2007; MAGNUSSON and CAIRNS, 1996).

In addition, mention is also made of the appearance of the journal "Applied Developmental Science", edited by RM Lerner and CB Fisher, and the "Carolina Consortium on Human Development", which is part of the Center for Developmental Science at the University of Carolina of the North, under the

auspices of RB Cairns, and with the participation of Elder, Gottlieb, Magnusson and Sameroff, among other scientists firmly committed to creating a new synthesis on development (CAIRNS, ELDER and COSTELLO, 1996; GOTTLIEB, 1991; MAGNUSSON , 1998).

However, it is observed that, despite these movements, the practical application in the investigation of methodological proposals inspired by the systemic perspective was not as widespread as expected, judging by publications in developmental psychology journals. In this perspective, some years ago, Thelen (1989) complained that any theoretical-systemic considerations were generally relegated to the discussion section of articles, which, paradoxically, confirmed the insufficiency of traditional explanations based on main effects and interaction.

Thelen (1989) claimed that the systems view included a number of important obstacles to empirical analysis and that, for that reason, most researchers remained firmly attached to the "old habits". Thus, in more moderate terms, Gottlieb (1991) denounced researchers' lack of sensitivity to human diversity and contextual variation.

In turn, Bronfenbrenner (1995) called the attention of researchers to consider personal variables, as well as contextual variables.

In this perspective, Valsiner (2006, p. 168) also denounced that "most of child psychology continues to thrive on the basis of reducing the complexity of average data and considering these averages as general established norms".

The slow acceptance of the empirical research point of view can be attributed to theoretical and practical reasons. First, its adequacy to previously incompatible interpretations of development can be interpreted as ambiguity, especially with regard to its dispersive nature. Taken to the extreme, which adopts, for example, a perspective that Baltes (1987) refers to as radical contextualism and Lerner and

Kaufman (1985) consider as pure contextualism, the dispersibility of the model can lead to a concept of development that is completely random.

The proposed limits for dispersibility (the organism's internal logic and environmental regularities) are similarly ambiguous, although it would be reasonable to expect much precision in general theories of development.

However, this does not mean that investigators have to make their own decisions about where the boundaries lie in each specific developmental phenomenon under study.

Regarding concerns about methodological clarity, it is highlighted that the systemic model is eclectic, but tremendously demanding. He does not reject the use of any type of design or technique, but places emphasis on the study of different levels of person-environment and the interactions between them.

Therefore, according to Magnusson and Stattin (1998), acceptance of the systemic model does not imply that the person-environment system needs to be studied in each investigation. Instead, researchers should just make sure that the level of complexity of the phenomenon studied is explicit, having plans for their work designed around a systemic analysis, based on observing the phenomenon at a specific level.

Using the systemic model guarantees a reference in a common space for scientific concepts in the interpretation of results. In the same vein, Witherington and Margett (2009, p. 255) argue that:

> [...] qualquer investigação empírica do desenvolvimento compromete necessariamente a complexidade do sistema como um todo, analisando apenas algumas das inúmeras relações que vão no sentido de estabelecer o todo. Estudos de desenvolvimento envolve a escolha uma alternativa viável - e, portanto, limitado - conjunto de relações em um sistema para estudar (tradução livre).

In this respect, Witherington and Margett (2009) take some of the pressure off researchers faced with something as ambitious as the systemic model. However, it is opportune to mention one final cause for concern: the emphasis that has been placed on relativism.

As the model accepts any possibility for determining the development of its products, the applicability of research results becomes less and less reliable and converts the intervention into a type of experience.

Without denying the transient nature of our knowledge and the intervention strategies based on that knowledge, the formulation of the systemic model is extreme enough to create a sense of dismay among developmental psychologists interested in the applied perspective of developmental psychology.

Therefore, it is understood that these controversial points are not limitations, but challenges to be faced. As Magnusson and Stattin (1998) state, the complexity of the systemic model corresponds to the complexity of the object of study in our discipline, and this is something that should not be overlooked.

5. FINAL CONSIDERATIONS

In order to reflect on Developmental Psychology, this article raised the following guiding question: what theoretical assumptions about Developmental Psychology applied to the teaching and learning process are in force in the literature?

Therefore, based on the bibliographic research, it was possible to verify that, since its origins, Developmental Psychology has been characterized by the coexistence of theoretical perspectives, mostly incompatible. For this reason, developmental psychologists often denounce the fragmentation of the discipline and call for a unifying framework.

Thus, it is worth noting that now may be an appropriate time to achieve this objective, judging by the support being given to the systemic view, enriched by dialectics.

Important figures in current Developmental Psychology such as Bronfenbrenner, Gottlieb, Lerner, Magnusson, and Thelen have championed the idea that this perspective can become a "new theoretical framework" to guide future investigation and interpretation of development (BRONFENBRENNER and EVANS, 2000; GOTTLIEB, 1997; LERNER, 2006; MAGNUSSON, 1998; THELEN and SMITH, 2006). Furthermore, this view seems to be consistent with the assumptions of the new "relational meta-theory" proposed by Overton and Ennis (2006) to integrate views of traditionally opposing worlds.

Therefore, with the objective of presenting an introductory and synthetic approach to the current theoretical assumptions in Developmental Psychology regarding the teaching and learning process, different points of view and different crucial factors were mentioned, in order to present as many views as possible on the subject.

However, it is understood that the field of study is still very new, and it is necessary to carry out other studies so that all questions about this subject can be answered.

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