

Learning To Teach: Continued Training Of Physical Education Teachers In Developmental Didactics¹

Aprender Para Ensinar: Formação Continuada De Professores De Educação Física Na Didática Desenvolvimental

Marcos Jerônimo Dias Júnior²

Raquel Aparecida Marra da Madeira Freitas³

RESUMO

O artigo apresenta a síntese de uma pesquisa que investigou a aprendizagem de professores de educação física em formação continuada. Com base na Teoria Histórico-cultural e na Teoria do Ensino Desenvolvimental, objetivou-se identificar e analisar as contribuições da formação continuada orientada pela Didática Desenvolvimental para a aprendizagem e desenvolvimento dos professores de Educação Física. Metodologicamente, a pesquisa é empírica, de cunho qualitativo, e foi realizada por meio de um experimento didático formativo com docentes de Educação Física da Rede Estadual de Educação em Goiás, na cidade de Anápolis. A análise dos resultados, no contexto de

ABSTRACT

This article presents a synthesis of a study that investigated the learning of physical education teachers in continuing training. Based on the Historical-Cultural Theory and the Theory of Developmental Teaching, the objective was to identify and analyze the contributions of continuing training guided by Developmental Didactics to the learning and development of physical education teachers. Methodologically, the research is empirical, of a qualitative nature, and was carried out through a didactic formative experiment with physical education teachers from the Rede Estadual de Educação in Goiás, in Anápolis city. The analysis of the results, in the context of contradiction between work and training, highlighted the

¹ English version by Ana Carolina de Sousa, E-mail: carolinasou26@gmail.com

² Pós-Doutor em Educação pelo Programa de Pós-Graduação em Educação da Pontifícia Universidade Católica de Goiás (PPGE/PUC/GO) 2024, na linha de pesquisa Teorias da Educação e Processos Pedagógicos; Doutor em Educação (Faculdade de Educação da Universidade Federal de Goiás -PPGE/UFG, na linha de pesquisa Formação, profissionalização docente e trabalho educativo, 2020); Mestre em Educação Brasileira (Faculdade de Educação Da Universidade Federal de Goiás PPGE/UFG, 2016); Pós-Graduado Lato Sensu em Docência do Ensino Superior pela Faculdade Apogeu-Centro Integrado de Educação (2010); Graduado em Licenciatura Plena em Educação Física (Faculdade de Educação Física e Dança da Universidade Federal de Goiás- FEFD/UFG, 2009); Graduado em Pedagogia (Centro Universitário Internacional Uninter); Trabalhador da Educação com o cargo efetivo de Professor-PIV na Secretaria de Estado da Educação de Goiás; Diretor/Gestor do Colégio Estadual Polivalente Frei João Batista e Integrante pesquisador do Grupo de Pesquisa Teorias da Educação e Processos pedagógicos (CNPq), na Linha Teoria histórico-cultural e práticas pedagógicas, da Pontifícia Universidade Católica de Goiás. Orcid: <https://orcid.org/0000-0001-8340-7647> E-mail: mjrgoias2013@gmail.com

³ Doutora em Educação. Docente nos Programas de Pós-graduação em Educação da Pontifícia Universidade Católica de Goiás (Mestrado e Doutorado) e da Faculdade de Inhumas (Mestrado). Docente no Mestrado em Atenção à Saúde (Pontifícia Universidade Católica de Goiás). ORCID: <https://orcid.org/0000-0003-3978-0238> E-mail: raquelmarram@gmail.com

contradição entre trabalho e formação, evidenciou a importância e as contribuições da Didática Desenvolvimental, bem como o modo de ação geral da práxis de si para o pensamento teórico e, por fim, do saber docente dialético para o desenvolvimento do movimento corporal consciente de seus (suas) alunos(as).

Palavras-chave: Ensino de Educação Física. Didática Desenvolvimental. Formação continuada de professores.

importance and contributions of Developmental Didactics, as well as the general action mode of the praxis of self for theoretical thinking and, finally, of dialectical teaching knowledge for developing the conscious body movement of their students.

Keywords: Physical Education Teaching. Developmental Didactics. Continuing teacher training.

1 Introduction

This empirical and qualitative research was conducted through a formative didactic experiment with physical education teachers from the State Education Network in Goiás, from the city of Anápolis. Such teachers participated in a continuing training course on and in the theoretical-methodological foundation of Developmental Didactics.

To achieve the research objectives, we carried out a didactic-formative experiment with six physical education teachers through a continuing training course on Developmental Didactics as an extension course. The course was offered in Anápolis and took place in the format of fortnightly classes, totaling 12 meetings and corresponding to 60 hours. At the end of the course, the teachers received a certificate issued by the Pontifícia Universidade Católica de Goiás (Pontifical Catholic University of Goiás in English). The course was composed of a study activity with three study tasks developed based on Davidov's propositions (Davidov, 1988; 1999; Davidov; Slobódchikov, 1991; Davýdov, 1982; Davydov, 2017, 2019).

These tasks were carried out over ten months and throughout twelve meetings with teachers in the area between February and December 2023. The entire didactic experiment was duly recorded through filming, which allowed us to select episodes, as Cedro and Moura (2004) and Moura (2010) highlight.

The reason for the course was the need to strongly oppose the predominant conceptions of neoliberal orientation, a view exposed in Brazier (2020), by adopting a counter-hegemonic stance (Bandeira, 2017), as well as the need to produce research on the subject, given the absence of studies addressing the proposed scope.

The question that guided the research was: How can conditions for changes in the knowledge and practices of physical education teachers in work activity be established, given the school education project for the students' human development? Given this, we proposed to explore the possibilities of continuing teacher training from the perspective of Developmental Didactics.

In this sense, and based on an in-depth investigation of the educational, curricular, and pedagogical assumptions of physical education in connection with a concepts system on Developmental Didactics, our research aimed to highlight the need to organize a continuing training for physical education teachers from the perspective of Developmental Didactics.

The paper is organized into two parts: First, we present the contributions of the theoretical-methodological foundations to the study activity of physical education teachers from the perspective of Developmental Didactics. In the second, we present and discuss the results of our investigation based on the analysis of certain learning episodes.

This research is linked to the Research Group Theories of Education and Pedagogical Processes (Cnpq) and the Postdoctoral internship in the field of education and didactics, carried out in the Postgraduate Program in Education of the Pontifícia Universidade Católica de Goiás.

2 Study activity and the concept system of Developmental Didactics: contributions to the continuing training of physical education teachers

Currently, the teachers who participated in this continuing training are in a contradictory school context, constituted by a dualism: on the one hand, there is an initial education with a strong tendency towards the disappearance of theory

due to the emphasis on the practice by practice; on the other, the tendency towards a purely theoretical continuing training of a neo-technical nature.

According to Bandeira (2017), in the work environment, these teachers must adapt to a school education that constantly seeks results to meet training demands that interest the market, which directly influences the teachers' work and training. So, from a critical-emancipatory perspective, continuing teacher education for physical education that overcomes this context appears to be a need in the contradiction.

To this end, one way is to provide the means of conceptual formation and assimilation of knowledge of didactics to develop abilities and skills in teaching knowledge. In addition, training that articulates the principle of cultural, philosophical, and scientific formation must be proposed and articulated with the social and material conditions of the teachers' daily lives, centered on developing a pedagogical praxis.

As human knowledge and school discipline, we consider physical education to be a sociocultural practice that deals with the apprehension of the signs of body culture, which is essential for the development of all people (Taffarel, 2012). In this research, based on the Historical-Cultural Theory of human development, we defend the idea that knowledge about Developmental Didactics related to the area's object of knowledge and transmitted in a continuing training course plays a fundamental role in teachers' development, both in changes involving the assimilation of conceptual knowledge and in teaching practice.

According to Leontiev (2018), it is through activity that the subject relates to the world around him and to other men while appropriating material and non-material culture through the mediation of others and constituting a conscious social being by internalizing culture.

The concept that underlies this investigation, namely that of Developmental Education, gave us the necessary understanding of the particularities that characterize the adult period, which is concretely expressed in the relationship between study activity and work as primary activities of this

life period, established in the contradiction between training and work, according to Elkonin (2017).

Under this perspective, in the study activity, the process of internalizing a system of concepts through a continuing training course will improve the thinking formation by concepts and develop higher psychic functions.

For Davidov (1988), the correct organization of the study activity allows scientific concepts to be assimilated, which is the genesis of the formation of a new and special type of psychic neoformation the author calls theoretical thinking. In short, theoretical thinking is the ability to operate mentally with the concept, reproducing the dialectical movement from the abstract to the concrete through abstractions and substantive generalizations.

In this investigation, we assume that during the study activity, the teachers' learning and development are necessarily related to the contradiction between training and work and Developmental Didactics and body culture.

Therefore, the study activity in continuing training takes place in tasks that lead teachers to the need to solve problematic situations in their daily classroom practice. They require mastering abilities and skills of dialectical teaching knowledge composed of scientific concepts in a way that consciously constitutes their pedagogical praxis. In this, “[...] the conscious character can be truly made only if students do not receive ready knowledge, if they themselves reveal the conditions of their origin” (Davydov, 2017, p. 219).

In our didactic-formative experiment, the pedagogical-didactic steps that initially guided us in planning the study tasks were based on didactic principles and the general way of organizing teaching, re-developed to meet the specificities of physical education. Thus, based on what Sforzi (2015, 2017) and Freitas (2016) present about the conceptual principles of Developmental Didactics, these study tasks were developed to lead teachers to carry out certain actions and operations necessary for their fulfillment and resolution.

3 The study tasks and evidence of learning of physical education teachers: relations between dialectical teaching knowledge and educational praxis for development

From the perspective of Developmental Didactics, the continuing training of physical education teachers aims to promote a study activity directed at a special type of development, one called dialectical didactic-pedagogical praxis.

Teacher trainers/researchers developed and guided the tasks so that the teachers carried out certain actions and study operations in an active and participatory way to influence the change of their school practices.

The greatest goal to be achieved was developing the theoretical thinking and the qualitative transformation of the psyche expressed by mental processes. In this sense, the subject is able to incorporate both mental actions and the abilities and logical procedures linked to the concepts (Libâneo, 2016).

According to Davidov (1988), the study task is one of the best ways to place the teacher in continuing training, who is the conductor, in the concept system. Thus, according to the author, it is this activity that “introduces the student to the sphere of theoretical knowledge and ensures the development of consciousness and theoretical thinking” (Ibid., p. 245).

Regarding the constitution of this activity, the author also highlights that it “includes components such as the need and cognitive school motives, the study task and the corresponding actions and operations.” Besides, its specificity is that, during its solution, students master the general procedure of solving all particular study tasks (Ibid., p. 245).

The study activity of teachers in training was made in a way that, when trying to carry it out, allowed their objectives to transform into conscious reasons for possible changes in their work practice. Besides, it allowed us to reflect on the concepts of Developmental Didactics within the field of Physical Education, in addition to articulating the development of theoretical thinking of the self and the projection of this knowledge to students, as well as making analysis, reflections, and syntheses based on abstractions and substantive generalizations.

During the didactic-formative experiment, the general objective of the continuing training of physical education teachers was creating new didactic conditions to make them assume an active and creative position. This was achieved when teachers, while studying the concept of Developmental Didactics, discovered an investigative mode based on problematization and began to identify generalized forms of action that are essential for solving problem issues, which is consistent with the premises of Davidov and Slobódchikov (1991).

The researcher can act in the didactic experiment as a teacher or with the teacher of the students' group. In this investigation, the researcher acted as a teacher trainer.

The form of organization of the activity sought to reflect the principles of the theoretical foundation of the research, that is, in the proposal of Developmental Didactics (study tasks, actions, and operations).

Data analysis was based on content analysis, seeking to examine the nature of actions, operations, and discourses. It was carried out in seven steps: 1) description of the videos; 2) pre-analysis; 2) coding of meaning units (also called units of context); 3) identification of the main themes and sub-themes from the regrouping of meaning units; 4) identification of categories from an analysis grid based on the conceptual framework and the production of an organizing classification of learning evidence; 5) evidence (highlighting, interpretation of frequency and recurrences of teaching episodes, evidence of learning).

The data analysis focused on what we call "teaching episodes." The "evidence of learning" (Cedro; Moura, 2004; Moura, 2010) was constitutive in them.

We sought to identify and analyze the mental actions carried out by the participants, expressed in the process of carrying out the tasks, based on the study actions proposed by Davidov(1988): transformation of the task data or the problem situation proposed by the researcher to discover the fundamental relations of the concept; concretization of the fundamental relations of the concept through modeling (writing and body movements of capoeira, in this research); transformation of the model(s) in order to study its essential

properties; resolution of particular tasks and problems in which it is necessary to express the general concept assimilated; control of previous actions and learning assessment. Next, Table 1 shows a synthesis of the developed system.

Table 1 – Summary of the task system developed for the didactic-formative experiment

Study tasks	Objectives and general actions of the study tasks	4. DIDACTIC PROCEDURES
<p>1st (first) study task: Approach to the concepts of body culture and Developmental Didactics</p> <p>Organize and present a class demonstrating different propositions (conceptions) and approaches to the knowledge object of physical education.</p>	<p>Leading students to approach the concepts of body culture and Developmental Didactics and begin to abstract the essential elements that constitute the universal relationship of these concepts. In addition, to make possible a general diagnosis of the teachers' previous knowledge and direct in the assessment, the necessary changes in the continuity of the didactic experiment.</p> <p>Encouraging teachers in continuing training to reproduce the historical process of production and development of body culture and Developmental Didactics in this dynamic to perform mental actions and operations with a higher level of specificity, such as deduction, reflection, analysis, comparison, synthesis, and practice of body movements of the particular and singular elements that compose the concepts' system.</p> <p>1) Analyzing and transforming the task data to discover the general and fundamental relations of the concept. 2) Materialization of the fundamental and universal relations of the concept through modeling (written, oral, and body movements).</p>	<p>1) Discuss the expectations, propositions, and possible challenges for the continuing training course. Triggering problems: what are the main challenges for the physical education teacher's pedagogical practice in the school environment? How do you perceive that the continuing training course's organization and theoretical-methodological foundation can help your knowledge and pedagogical practice?</p> <p>2) Develop a set of ideas aimed at understanding the concepts of body culture and Developmental Didactics to identify teachers' current level of approach.</p> <p>3) Present the first study task. In a theoretical-practical class, demonstrate propositions (conceptions) the general object of</p>

	<p>3) Transformation of the model, identifying particularities to study its essential properties.</p> <p>4) Preparation and resolution of tasks and particular problems in which it is necessary to express/use the general concepts assimilated.</p> <p>5) Practice of body movements</p> <p>6) Control of actions.</p> <p>Learning assessment.</p>	<p>knowledge of physical education that teachers in training bring into their daily experiences.</p> <p>4) Rescuing the logic and history of body culture as a form and content for the planning and organization of the task.</p>
<p>2nd (second) study task: study activity and Developmental Didactics</p> <p>A group of students from a school unit had learning difficulties in the discipline of physical education throughout the year. For the next year, propose pedagogical-didactic changes in the structure and organization of the teacher's teaching activity and in the students' study activity, given the school education project for the human development of students from the perspective of Developmental</p>	<p>The purpose of this task was to direct the mental actions of teachers in training for analysis and reflection as an investigative process regarding the concepts, as well as provide the exercise of creativity, enabling the dialogue and discussion of concepts in the collective debate generated by the task.</p> <p>1) Analyzing and transforming the task data to discover the general and the concept's fundamental relations.</p> <p>2) Materialization of the fundamental and universal relations of the concept through modeling (written, oral, and body movements).</p> <p>3) Transformation of the model, identifying particularities to study its essential properties.</p> <p>4) Development and resolution of tasks and particular problems in which it is necessary to express/use the general concepts assimilated.</p> <p>5) Practice of body movements</p> <p>6) Control of actions.</p> <p>Learning assessment.</p>	<p>1) Build, do and present an interview script between the group members, consisting of 4 questions on the theme: "the object of knowledge of physical education."</p> <p>2) Ask 10 questions that involve the concepts' system, the form, and the content of the arguments used to develop the questions to help teachers get on the path of the essential links of the university and the concept's particularities.</p> <p>3) Socialization of two questions from each teacher with the justification of choice with the purpose that they perceive the main questions that run through the doubts, statements, and questions about the concepts and the opening for possible</p>

<p>Didactics.</p>		<p>paths to appropriate new knowledge.</p>
<p>3rd (third) study task: Study task, didactics, development, and body culture</p> <p>Develop a sequence of lesson plans for a bimester in the theoretical-methodological foundation of Developmental Didactics to boost the development of the students' conscious body movement, having as a product a report on their interventions in a school that is in regency.</p>	<p>Apprehending and deepening the particular and singular aspects of the universal basis, constitutive of the system of concepts on Developmental Didactics, but not through the oral exposition of the teacher trainer. Provide the development of an investigative attitude, which, in Developmental Teaching Theory, is fundamental for the analysis, reflection, and synthesis with and on the concepts.</p> <p>1) Analysis and transformation of the task data to discover the concept's general and fundamental relations. 2) Materialization of the fundamental and universal relations of the concept through modeling (written, oral, and body movements). 3) Transformation of the model, identifying its particularities to study its essential properties. 4) Development, and resolution of tasks and particular problems in which it is necessary to express/use the general concepts assimilated. 5) Practice of body movements 6) Control of actions. Learning assessment.</p>	<p>1) It is a situation of open and dynamic learning, which enables innovation, the exchange of experiences, the development of and contact with knowledge of more in-depth and elaborate analysis. 2) Organization of a dialogic exposure open to students' questions, seeking conceptual links that favor the development of a thought unit in the diversity of knowledge about the concepts of study task and Developmental Didactics. 3) Demonstrate some central points about the study task in order to broaden the dialogue with teachers and direct the opening of conditions to overcome the contradiction between training and work in apprehending particular and universal issues of concepts. 3) Presentation of the task, requiring teachers to build a framework of arguments and make connections for the presentation within a conceptual system.</p>

Source: Prepared by the researchers from the data collected, 2024.

From Davidov's (1988) perspective, we call these concepts “nuclear” or “cells.” They are composed of knowledge about school education and about the object of knowledge of physical education and Developmental Didactics.

These concepts contained in the study tasks are the axis of the investigative path teachers have to follow in the learning process based on abstractions and conscious generalizations. As is well known, only dialectical consciousness and thought are capable of solving contradictions. Therefore, what is usually called “theoretical thinking” actually is dialectical thinking (Davidov; Slobódchikov, 1991, p. 137, our translation).

Evidence of learning was identified during the resolution of the study tasks, according to certain methodological procedures and teaching episodes.

In the didactic-formative experiment, the first evidence of learning to be highlighted was the moments of collective dialogue. These moments emerged from the contradictions posed by the study tasks, which challenged teachers to think about the relationship between training and work. One of the characteristics present in this collective dialogue was the principle of necessity and the internal reasons that teachers in training constituted to find investigative means and modes.

These collective dialogues enabled the analytical survey of knowledge of the content of Developmental Didactics. They also enabled an analysis of the real conditions of the mode of thought actions to discover the origin and links of knowledge in the field of body culture with its concepts system in the area.

Reorganizing thought actions established by dialogue intensified the need and motives of teachers in training to broaden the understanding of the concept system with their daily practice. There was also the diagnosis, at several times, of the development of teachers’ perception of the complexity of teaching knowledge arising from the difficulties they presented while resolving the study tasks.

During the investigative process, as study actions were carried out, there were changes in the operations of the perception dynamic of the complexity of

knowledge about Developmental Didactics. Teachers formed general approaches to deal with very particular problems of their teaching practice, which allowed them to understand the emergence and transformations of the concept system, initiating the formation of a general way of thinking.

In establishing the collective dialogue, an interesting issue involved this action. The beginning or continuity of the practice occurred through questions, doubts, or questionings. By working this way, they sought to overcome their own difficulties so they could take the learning challenges of their students into account.

In this process, the teachers in training developed several particular tasks, which became new problems. Hypotheses, problems, and objectives arose to be achieved. At that moment, they were encouraged to find, detect, and reflect on the properties of the objects of the study activity as a special condition to develop cognitive activity.

Still, in these collective dialogues, we noticed that an analysis mode was developed, which led to changes in teachers' awareness about the study and work activity, including the tasks and how teachers solved them. This assumed that the attention of the teachers in training was directed to the content of their own actions, to the examination of their fundamentals, as well as their internal motives, according to the correspondence with the result sought and the requirement of the driving forces of the action modes of the study task.

An important category called "teacher empirical deduction" stands out in this process. It expresses teachers' actions in unveiling their daily teaching practice, in self-transformation and self-mastering conduct.

Self-mastering conduct develops as situations that require operations are triggered so that instruments that enable new action on the object are socially made available. For this to occur, it is necessary that cognitive operations are mediated, that is, they are previously performed by someone who has already mastered them, to be later appropriated by the subject through a modeling process (Sforni, 2004, p. 40).

The teachers in training who had the opportunity to attend a *Strictu Senso Postgraduate Course* showed evidence of more complex discussions. Besides, it was easier for them to discuss the psychological and pedagogical principles of Developmental Didactics. One of the points we can highlight is that: “[...] to think about any didactic proposal that involves a good teaching of physical education it is necessary to discuss education, including theoretical foundations that I only learned in the master’s degree” (T1).

In the collective discussions, in favor of solving the study task, they emphasized the need for pedagogical, psychological, and didactic analysis regarding the field of physical education. They highlighted the lack of discussion within the network about such concepts and the gap in the initial training itself when dealing with these issues. These statements point to a scenario that portrays the possibility of, and need for, Developmental Didactics being addressed in continuing training.

Teachers always brought their own pedagogical practice to the analysis by stating that they did not master nor had clarity of the theoretical basis that supported their teaching activity. This indicates a reflection on the need to investigate modes of thought actions to appropriate and carry out Developmental Didactics. The exchange of empirical knowledge, in the form of their experiences in the classroom, gained prominence and allowed them to ask questions, which were analyzed from the theoretical perspective.

In this process, the teachers’ thinking with traits in common aligned with the questioning thinking of scientists in this field. The reactions were clear when their daily practice was confronted with theoretical knowledge and when they started to show problems and challenges as investigative means. According to Davidov (1988), this can be confirmed by the understanding that teachers resort to investigation to problematize and identify the challenges in assimilating knowledge.

The teachers in training were transformed with each challenge, contradiction, and problem they faced. In this process of analysis and investigative reflection, teachers started to create hypotheses on how to

assimilate the concepts of body culture and Developmental Didactics so they could be instruments to transform their own practice in their work environment and study activity.

In this context, teacher T2 highlighted the importance of understanding the formation of oneself as a researcher of one's own study activity, for whom: "If we use the logic already presented that we must seek a student researcher, we, teachers, have to make this diagnosis, we ourselves, in this continuing training, must become a researcher."

In these dialogues, new learning conditions were set. One of the challenges faced in this process was doing a planning that considered this nexus.

A particular type of cognitive procedure was established in the form of dialogues between teachers in training and the teacher trainer, seeking to unveil the contradictions of pedagogical practice, theoretical knowledge, continuing training, and the teacher's daily lives. The study tasks started to stimulate, from problems and contradictions, the teachers' thinking in order to explain what was still unknown and assimilate new knowledge, concepts, and action modes.

This first evidence of learning was fundamental to highlight eleven general principles of Developmental Didactics that teachers in training considered as important didactic-pedagogical purposes: 1) The relationship between empirical thinking and theoretical thinking; 2) The need, desires, and motives; 3) The structure of the study task; 4) Organization of teaching by the contradiction of objects; 5) The general (unique) generalized way of solving problems and learning challenges; 6) Awareness of the foundations of their own actions in teaching and study activity; 7) The theoretical generalization of the teacher's study activity and for students; 8) The full assimilation of the concepts of the object of study of physical education; 9) The active and creative forms of methodological procedures of study and teaching; 10) Dialectical logic as an intellectual productive activity; 11) The construction of reasons for being in study activity.

Faced with the first evidence of learning, one of the main challenges for its fulfillment was the longer time used for each dialogue. This was intensified when teachers expanded the concept system by bringing examples from their daily

practice. In this context, the problematization starts to have a sense of generalization, which made it difficult to plan the didactic experiment. However, at the same time, it made searching for relationships between theory and practice easier, as well as between the particular and the universal, in order to expand the ability for creation and imagination.

Methodical doubt arose during all study tasks, mainly due to the need to discover the conditions of origin and changes in knowledge of the object of physical education and Developmental Didactics. During the tasks resolution, the teachers were challenged and questioned about their own daily practices in schools. Doubt, in turn, became an object that composed the general action modes of teachers before concepts were formed, expanding their forms of reasoning from the most generic to the specific.

Methodical doubt became the second evidence of learning to be highlighted, considered one of the main axes of the characteristics that make up the development of dialectical thinking of the knowledge of the teacher in training. In the process of developing methodical doubt, we highlight the dialogue between teacher T1 and teacher T5 when confronted by the first study task in order to analyze general data to build a general action mode.

T1: “To begin solving the task, we first need to understand what it brings to challenge us, and the first one is to know which conceptions of physical education.”

T5: “How can we understand the conceptions of physical education? What are approaches?”

T1: “Conceptions are ways of thinking and looking at everything that involves the school, the human being, and society. Ways of physical education dealing with the object of physical education

T5- “[...] But what is the object of physical education?”

T1: “I know it's body culture, but I ask the question for us: how do we understand body culture as an object that helps us understand the approaches?”

T5: “Then I have to question myself. In this sense, I asked myself, or that is, the task imposed a question”.

Thus, from the perspective of Developmental Didactics, the study activity in the continuing training of teachers must bring methodical doubt as a learning

principle. It is a mode of reasoning composed of doubt, investigation, reflection, contradiction, creativity, questioning, and criticism.

The third evidence of learning involved the need for teachers to assimilate logic and history in the ontological and epistemological dimension of the object of knowledge of physical education. Therefore, they needed to master knowledge about the object of knowledge of the area of expertise.

The absence of this knowledge made it impossible to carry out the study activity, as teachers were identifying, at each task, the need to understand the paths that researchers took between the logic and the history of the object of study. So, for one of them:

If the task has to reach a place of non-knowledge and student doubt, then I, as a teacher, already have to know all the way? I myself am now in the midst of several doubts about the object of knowledge of physical education. If I, as a teacher, do not master what I am going to teach, there is no way to build the task, much less lead my students (Sic.) to the path of investigation (T2).

By considering this principle of assimilating logic and history of the object of study, they created better conditions to understand the theoretical knowledge of Developmental Didactics as they advanced in appropriating the concept of body culture. Mastery of the object of knowledge, both by the teacher trainer and teachers in training, has become a main principle for organizing the activity of studying themselves and their students as an analytical-synthetic action of cognitive mediation.

According to Davidov (1988), two aspects generally determine the study activity and development: the mastery the teacher who will carry out the teaching activity has of the contents to be assimilated, and the type of material implemented in the assimilation process. These aspects emphasize the need for and importance of teachers in training appropriating the logic and history of the object of knowledge of physical education.

In all meetings, it was necessary to revisit the tasks data, expanding the conditions of the teachers to build new questions and continue to form the

conceptual system. These moments were a third evidence of learning. In this process, it is clear that, when returning to the data of the study tasks, the discussions established did not reproduce the identical form and content of the previous class.

Teachers in training expanded the concepts' system on most of the occasions they returned to the tasks' data. Besides, the discussion of theoretical knowledge was deepened, and new elements of criticality emerged in the development of the theoretical model. Therefore, returning to the previous class as part of the task resolution is equivalent not to reviewing knowledge in the reproduction format but to asking new questions through new actions and study operations.

Thus, according to the main difficulties diagnosed in previous meetings, each class always began with new questions from both the teachers in training and the teacher trainer. At each new meeting, they showed to master the learning process. This was because they deduced limits and challenges and evaluated ways to promote changes in their work activity and in the very study activity they were performing.

Therefore, we realized that these mental operations promoted theoretical reflections as an image of the real, which was considered the fourth evidence of learning.

This generalized action mode, composed of theoretical reflection and based problematization, helped teachers specify the path and particularities of the investigative process and develop a general logic of thought. One of the reasons that made it necessary to develop this general logic was the need for them to carry out inquiries and problematizations related to theoretical research based on their own practice. Therefore, this logic involves perceiving and deducing particular and universal relations, performing a synthesis in an analytical-synthetic process of conceptual construction to seek the origin of the integral object studied, as Davidov (1988) points out.

At the end of resolving the study tasks, using this general logic of thought, the teachers in the formative process always started to compare the ways of

solving other particular tasks with those present in their daily practice. One of the expressions that highlight the development of this logic is the speech of teacher T3, who began to see “[...] now the possibility of thinking about any content of the curriculum related to body culture, based on Developmental Didactics, even though he has not yet mastered everything about this theory”.

Thus, we emphasize the need for all study tasks to be built based on facts, problems, challenges, and contradictions of the teachers’ own practice that led to an investigative process to a reflection of their pedagogical conduct.

The fifth evidence of learning involves problematizations, which were transformed into particular tasks for themselves in the movement of dialectical thinking by teachers in the training process. The problematizations that emerged became, for teachers, a form of reflexive, analytical, self-critical, and synthesis manifestation of the process of contradiction between the historical, logical, and psychological of this formation.

The methodological procedure of problematization created opportunities for them to seek the necessary synthesis between empirical and theoretical thinking in the contradictions of concrete reality. Thus, they realized that the scientific knowledge involving Developmental Didactics is not the simple continuity of daily experience on how to teach but the articulation between conceptual formation and the critical appropriation of knowledge. The set of these problem questions, developed while solving the tasks, constituted what we call a network of problematizations.

They were based on several elements, such as the daily teaching practice, empirical knowledge, questions about the problems of previous activities, structural theories, the field of pedagogy, the purposes of school education, the specific assumptions of physical education teaching, and others.

One of the challenges in this problematization process was that with each question that arose, the concepts’ system was expanded. So, there was a need for the teacher trainer to work pedagogically on these concepts as prerequisites to continue solving the study task. This point had not been considered in the teaching plan, which required a new look from its occurrence.

Thus, the teacher trainer used problematization to overcome such challenges. In addition, we perceived the need for teachers to use the problematization network at each transition of study action during the tasks, which would allow greater clarity in the investigative path that was beginning.

Faced with this network of problematizations, a new way of thinking about the study and work activity emerged, which was considered the sixth evidence of learning. The thought actions involving the generalization of the content, the analysis of the general relationship between the study activity and the work activity, as well as the movement of the essential interconnections of Developmental Didactics in the field of physical education, were considered.

Instead of worrying about the external characteristics of the object of study, the teachers in training sought, through investigation, a way of thinking that emphasized the analysis of contradictions, origin, development, and multiple determinations of the concepts of Developmental Didactics and its relationship with body culture.

For this to be possible, they had to know their ways of learning and how others learned. In this sense, some statements can illustrate such a movement:

T2 “I wasn't used to walking this path to learn.”

T1 “The best thing is this development; it provides much more learning.”

T6 “It's a totally different logic that, at first, gets a little lost, but then we find ourselves with the knowledge.”

T5 “The interesting thing is that you never answer our questions directly; it always brings clues and conditions for us to seek knowledge, especially by asking new questions on top of ours, bringing new tasks for us to solve.”

The seventh indication of learning is related to the process of investigating the mode of study that teachers in training carried out to assimilate the concepts. This investigation had a double learning movement: on the one hand, they were participating in a process of appropriating the methodology and contents of Developmental Didactics; on the other, they assimilated the knowledge about this theoretical assumption.

In characterizing this investigative process, we highlight the problematization, the search for meanings and meanings of words, and the contradiction between study activity and work activity. At each research operation, an axis of theoretical and practical discussion was built between teachers in training and teacher trainers.

One of the challenges encountered was the continuous need to bring to the investigative process pedagogical knowledge that constituted prerequisites for advancing in the concepts' formation. There was a relationship between solving study tasks and the complexity of the pedagogical knowledge necessary for their continuity.

Throughout the process, teachers created several practical tasks. This was considered the eighth episode. In this context, several pedagogical skills and abilities were appropriated through the performance of particular actions.

The new episode involves the development of the concept system as an investigative principle. With each new concept, based on the nexus between Developmental Didactics and body culture, there was a need to discuss the relationship of several other concepts. Teachers formed the understanding that concepts are not isolated from each other or from concrete reality, as they form a totality of multiple influences and complex determinations.

Many of the concepts that teachers identified were not in the initial planning of the didactic-formative experiment. They realized that the more they appropriated Developmental Didactics, the more they expanded the concept system in a reciprocal relationship with their own conceptual formation. Thus, the particular actions of each study task prompted the analysis of a new assumption in a general relationship with the established system. Thus, it was up to the teacher trainer to perceive, through control and evaluation actions, the need to analyze and decide whether to intensify or not the expansion of the conceptual system.

An important axis of expansion of the concept system was the relationship between the concepts of body culture and the concepts of Developmental Didactics. Regarding this, teachers recognized that thinking about these

didactics does not only mean thinking about teaching in methodological form but that it is necessary to think about it as a unit of the particular and general processes of student learning.

By perceiving and using the previous ideation, teachers advance in this process in order to travel in advance the path that the student will travel. This was identified as the tenth sign of learning. This previous ideation led to the mutual and continuous movement of thinking as students in learning and, at the same time, as teachers in the teaching process.

Thus, teachers understood that it was necessary to go beyond the teacher's view as a mediator or as a transmitter of knowledge. A rich aspect of this development was their various questions about how, what, and why to teach.

The eleventh evidence of learning involved the construction of the reason for being in the study activity. This was possible with the relationship of the teachers in training with the content and the form expressed in the didactic procedures of the study tasks. There was clear enthusiasm when they realized they were on the formative investigative path and became teachers of themselves, using dialectical logic as a structure for a general action mode to autonomously solve particular tasks.

The evidence of learning described here led teachers to a dialectical teaching knowledge about the development of conscious body movement by the student. Therefore, in this process, they became questioners and investigators of their practice based on the mastery of knowledge about the development of theoretical thinking.

We believe that our research allows us to see that, effectively, according to a very important principle of the Historical-Cultural Theory of human development, the unity between life and consciousness is activity. In this, we reaffirm the importance of organizing a continuing training course for physical education teachers from the perspective of Developmental Didactics as an intellectual, cultural, and educational activity that significantly contributes to the human development of teachers and students by providing the formation and conceptual appropriation of dialectical teaching knowledge towards

developmental, educational praxis.

4 Final considerations

This research allows us to affirm that the continuing training of teachers, within the perspective presented here, can be a promising contribution to teacher development within the relationship between work and training in order to allow the synthesis of the reciprocal and dialectical relationship between theory and practice, between the pedagogical and the didactic, between the organization and the fulfillment of teaching-learning.

Some of the main clues of the contribution of continuing training in teachers' learning are the ability to perceive their practice in the entire didactic process, to carry out teaching in a reflected way, to rescue the historical process of their own training and practice, as well as to think about practice based on the theoretical foundation of Developmental Didactics. Thus, it is essential to consider continuing training projects for physical education teachers based on the theoretical/conceptual foundations of Developmental Didactics.

We conclude by defending that learning and development must be enhanced in the process of continuing training of physical education teachers so they have real theoretical-practical conditions to unveil a more adequate general method of study and teaching based on dialectical teaching knowledge for a pedagogical praxis for their own and their students' development, concerning the formation of conscious body movement, as explained by Dias Júnior (2020).

Thus, we propose a pedagogical-didactic contribution of continuing training to physical education teachers guided by dialectical logic, based on the investigative search for objects within a concepts' system about Developmental Didactics by organizing the teaching process in an autonomous way, oriented towards solving triggering problems that express the contradictions of the teaching and learning process in the tension between teacher training and work.

Aprender A Enseñar: Formación Continua Del Profesorado De Educación Física En La Enseñanza Del Desarrollo

RESUMEN

El artículo presenta una síntesis de investigaciones que investigaron el aprendizaje de profesores de educación física en educación continua. Con base en la teoría Histórico-cultural y en la Teoría de La Enseñanza Desarrolladora, el objetivo fue identificar y analizar los aportes de la educación continua guiada por la didáctica desarrolladora al aprendizaje y desarrollo de los docentes de Educación Física. Metodológicamente, la investigación es empírica, de carácter cualitativo, y se realizó a través de un experimento didáctico formativo con profesores de Educación Física de la Rede Estadual de Educação en Goiás, en la ciudad de Anápolis. El análisis de los resultados, en el contexto de contradicción entre trabajo y formación, destacó la importancia y los aportes de la didáctica del desarrollo, así como el modo general de actuación desde la praxis de uno mismo hasta el pensamiento teórico y, finalmente, de los conocimientos dialécticos de los profesores para el desarrollo del movimiento corporal consciente de sus alumnos.

Palabras clave: Enseñanza de Educación Física. Didáctica desarrolladora. Formación continua del profesorado.

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