

Formação crítico-social e colaborativa de professores no âmbito do Programa de Residência Pedagógica: análise de um subprojeto de Física em uma universidade pública de Recife-PE

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Resumo

O objetivo deste trabalho foi analisar as orientações crítico-social e colaborativa na formação de professores de Física no âmbito do Programa Residência Pedagógica, em uma universidade pública de Recife-PE. Utilizou-se a Metodologia Interativa, que tem o Círculo Hermenêutico-Dialético como técnica para a construção dos dados, e a Análise Hermenêutica-Dialética como ferramenta para análise das falas de quatro participantes, os quais representam todos os grupos envolvidos no programa (dois residentes, um professor preceptor e um professor orientador). Como resultado, verificou-se que o programa adota a orientação crítico-social, oferecendo uma formação mais holística, diversificada, voltada para questões sociais e colaborativa de forma abrangente para os participantes. Identificaram-se também alguns desafios na realidade do programa, tais como a infraestrutura das escolas e as expectativas em relação ao ensino-aprendizagem, bem como a falta de recursos para aquisição de materiais, produtos e serviços necessários à realização de experimentos e à produção de trabalhos científicos voltados à análise do contexto escolar.

Palavras-chave: Formação colaborativa. Formação de professores de Física. Metodologia Interativa. Orientação crítico-social. Programa Residência Pedagógica.

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Critical-Social and Collaborative Teacher Training within the Pedagogical Residency Program: an Analysis of a Physics Subproject at a Public University in Recife, PE

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Abstract

The objective of this study was to analyze the critical-social and collaborative orientations in the training of Physics teachers within the scope of the Pedagogical Residency Program at a public university in Recife, PE. The Interactive Methodology was used, which has the Hermeneutic-Dialectical Circle as a technique for data construction, and the Hermeneutic-Dialectical Analysis as a tool for analyzing the speeches of four participants, who represent all the groups involved in the program (two residents, one preceptor teacher, and one supervising teacher). As a result, it was found that the program adopts the critical-social orientation, offering a more holistic, diversified training, focused on social issues and more broadly collaborative for the participants. Some challenges were also identified in the program's reality, such as the schools' infrastructure and expectations regarding teaching and learning, as well as the lack of resources for the acquisition of materials, products, and services necessary for conducting experiments and producing scientific work aimed at analyzing the school context.

Keywords: Collaborative Training. Physics Teacher Training. Interactive Methodology. Critical-Social Orientation. Pedagogical Residency Program.

Formación Crítico-Social y Colaborativa de Profesores en el marco del Programa de Residencia Pedagógica: análisis de un Subproyecto de Física en una Universidad Pública de Recife, PE

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Resumen

El objetivo de este trabajo fue analizar las orientaciones crítico-social y colaborativa en la formación de profesores de Física en el marco del Programa Residencia Pedagógica en una universidad pública de Recife, PE. Se utilizó la Metodología Interactiva, que adopta el Círculo Hermenéutico-Dialéctico como técnica para la construcción de los datos, y el Análisis Hermenéutico-Dialéctico como herramienta para el análisis de los discursos de cuatro participantes, que representan a todos los grupos involucrados en el programa (dos residentes, un profesor preceptor y un profesor orientador). Como resultado, se verificó que el programa adopta la orientación crítico-social, ofreciendo una formación más holística, diversificada, orientada a cuestiones sociales y colaborativa de manera más amplia para los participantes. También se identificaron algunos desafíos en la realidad del programa, tales como la infraestructura de las escuelas y las expectativas respecto a la enseñanza-aprendizaje, así como la falta de recursos para la adquisición de materiales, productos y servicios necesarios para la realización de experimentos y la producción de trabajos científicos orientados al análisis del contexto escolar.

Palabras clave: Formación Colaborativa. Formación de Profesores de Física. Metodología Interactiva. Orientación Crítico-Social. Programa de Residencia Pedagógica.

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Introduction

The initial and continuing education of teachers is an important and long-standing discussion in Brazil. Teacher education programs have expanded across the country due to the increase in the number of public and private Higher Education Institutions (HEIs) (Corbucci, 2016). Educational processes are frequently reinvented and restructured over short periods due to prevailing educational policy frameworks, which aim to keep pace with social transformations. Silveira (2017) highlights an urgent issue in the training of Science teachers, which has raised concerns among governments and education specialists in Brazil. Despite the growing number of HEIs, teacher education programs fail to meet current needs due to the precarious working conditions and the lack of professional recognition in the country.

Bortolini (2009) argues that it is essential to value both initial and continuing education to help Science teachers define their professional roles and emphasize their importance in shaping individuals to promote citizenship. Thus, developing projects and programs that contribute to the professional training of teachers serves as a pathway to redefining which pedagogical, social, and human practices and models can foster advancements in education.

The initial education of teachers takes place primarily within HEIs, and the importance of this foundational training for their professional future is widely recognized (Mello, 2000). However, the expansion and practical application of professional knowledge occur in schools, specifically within the classroom.

According to Bourdieu (1991), the school environment is understood as a structured space governed by the logic and interests of a professional group, with its own set of rules. It is within this specific field in the classroom that teachers integrate scientific knowledge with pedagogical knowledge, developing their unique professional culture and expanding the possibilities for more accessible school-based knowledge.

Teachers' continuing education takes place when graduates from universities immerse themselves in the professional field and acquire new information, knowledge, techniques, methodologies, responsibilities, and qualifications during their practice (Garcia, 1999).

Nóvoa (1999) advocates for continuing education not merely as retraining but as a process of professional qualification tailored to the evolving roles of schools and teachers. In this sense, continuing education must embrace the perspective of ongoing professional development. Additionally, continuing education is crucial as it deepens knowledge, provides access to new

concepts, enhances the analytical capacity of teaching practices, and contributes to the development of both the professional and the institution where they work.

Conceptual guidelines represent a set of belief systems that address the paradigms, ideologies, and approaches in teacher education programs. They outline the content, methods, and strategies aimed at achieving a specific outcome for "being a teacher." Each program adopts an educational ideology determined either by the advising teacher or the teacher training institution. According to Garcia (1999), the conceptual guidelines of a teacher education program encompass the set of ideas regarding the objectives and means to shape the ideological profile of the teacher to be developed. Garcia identifies five types of orientations in teacher education: academic, technological, personalist, practical, and social-reconstructionist (critical-social).

In this study, we will focus on the critical-social orientation, which emphasizes reflection on the social context of educational practices and collaborative training. This type of education equips teachers to become political beings committed to their era, social justice, and ethical and democratic values. It also incorporates critical thinking about curriculum and teaching, enabling teachers to examine the social context surrounding teaching and learning processes while fostering collaborative and coordinated work. Furthermore, it better prepares teachers to transcend the assumptions of academic and technical rationality that dominate most teacher education programs.

Recently, the Federal Government and Higher Education Institutions have sought to offer programs aimed at enhancing the value of teachers and their initial education. The Pedagogical Residency Program (PRP) was launched in 2018 to promote the integration of theory and practice in teacher education programs in partnership with public basic education networks. Scholarship students are introduced to the school environment to engage with technical-scientific and theoretical-practical issues. The Pedagogical Residency (RP) program aims to address the limitations of initial teacher education, including: the active theoretical-practical exercise of teaching in its complexity, the gap between schools and universities, the structuring of supervised internships, and the alignment of curricula and pedagogical proposals with the guidelines of the National Common Curricular Base (BNCC) (CAPES, 2018).

This research is justified by the need for a deeper understanding of the implementation process of the Pedagogical Residency within Physics Education and by the pursuit of a more holistic analysis of this formative process for Physics teachers. These professionals, in some cases, may appear disconnected from the social and intrinsic issues of their professional development and the teaching category, which includes understanding the situations, problems, and demands of the different social

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actors involved in this reality. Based on these premises, the research problem was defined as: How is the critical-social and collaborative orientation of training being developed within the Pedagogical Residency Program in the Physics core at a public university in Pernambuco?

To address this question, the study aimed to: analyze the critical-social conceptual orientation, collaborative training, and their influences, limitations, challenges, and possibilities in shaping the participants of the Physics core within the Pedagogical Residency Program in Recife, PE. This qualitative research was conducted with a public school teacher involved in the program, a supervising professor, and two undergraduate Physics students from a public university who participated in the program.

Therefore, this article focuses on the constructions and reconstructions from the critical-social perspective of the interviewed participants, who immersed themselves in the complexity of engaging in dialogue with themselves and others. It seeks to describe a reality of teacher education based on the experiences and activities developed during the implementation of the PRP.

Theoretical Framework

Critical-Social Orientation in Teacher Education

The social-reconstructionist or critical-social orientation encourages reflection and develops the ethical and social commitment of teachers, aiming to transform educational and social practices to make them more just and democratic. This orientation is closely linked to critical theory as applied to curriculum and teaching. "Teacher education should develop students' ability to analyze the social context surrounding teaching and learning processes" (Garcia, 1999, p. 44).

In teacher education, political, social, and cultural content must be included as key categories for understanding schools and contemporary societies. Authors such as Feiman (1990), Liston and Zeichner (1996) agree that particular attention must be paid to the critical-social orientation, as there remains a lack of reflective practices concerning teacher education curricula. These curricula are often stagnated in theoretical analyses and, thus, disconnected from teaching practice. Smyth (1989) adds to the discussion by advocating for "a notion of reflection in teacher education that is both active and militant, introducing into the discourse on teaching and schooling an ethical, personal, and political concern "(Smyth, 1989).

Pedagogical Residency

The Pedagogical Residency Program (PRP) is a federally funded initiative managed by the Coordination for the Improvement of Higher Education Personnel (CAPES) within Higher Education Institutions (HEIs). In this program, students enrolled in undergraduate teacher education programs participate in public basic education schools to design and implement pedagogical projects that foster the connection between theory and practice and enhance educational outcomes.

The Pedagogical Residency Program (PRP) aims to bridge the gap between theory and practice in teacher education by fostering a shared training approach among universities, teacher candidates, and schools. The objectives of the PRP include: enhancing residents' professional skills through projects that consolidate their professional development; restructuring supervised internships; strengthening the relationships between Higher Education Institutions (HEIs) and schools; and aligning curricula and pedagogical proposals with the National Common Curricular Base (BNCC).

The Pedagogical Residency is a training activity undertaken by a student enrolled in an undergraduate teacher education program, supervised by a university professor and a school-based mentor, and conducted in a public basic education school. The PR includes a total of 440 hours of activities, distributed as follows: 60 hours for familiarization with the school; 320 hours of immersion, including 100 hours of classroom teaching that involves planning and executing at least one pedagogical intervention; and 60 hours for preparing the final report, evaluation, and dissemination of activities.

The Institutional Pedagogical Residency Project spans 18 months, divided as follows: 2 months for training preceptors and preparing students for the beginning of the residency activities; 4 months of joint guidance (university supervisor/preceptor), during which residents familiarize themselves with the school and develop their Activity Plan, completing at least 60 hours at the school; and 10 months dedicated to the 320 hours of school immersion.

The key participants in the PRP include: the institutional coordinator, the supervisor, the preceptor, and the residents. The institutional coordinator is a university professor responsible for the institutional Pedagogical Residency project at the selected HEI. The supervisor is a university professor who coordinates the program's core group and guides the experiences of the residents and the preceptor, facilitating the integration of theory and practice. The preceptor is a public basic education school teacher who mentors and supports residents in practical activities at the school. The

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residents are students enrolled in the undergraduate Physics teacher education program at a public university in Recife, Pernambuco, starting from their fifth semester.

Collaborative Training

Collaborative training involves the participation of teachers in collective actions within their social and professional environments, as well as in their teaching practices, alongside the active engagement of all individuals involved in these actions. Roth and Tobin (2001; 2002; 2004) argue that apprentice teachers acquire new competencies, skills, and knowledge through participation in communities of educational practice. According to them, these communities of practice expand the challenges of teaching work, making it more meaningful and opening up opportunities to learn from others, not only explicitly but also tacitly, through dialogue and practical engagement.

The term *collaborative teaching* originates from the concept of collaborative work. According to Hargreaves (1998), collaborative work is defined by the following aspects: voluntariness, identity, spontaneity, shared leadership or co-responsibility, support, and mutual respect. The development of these characteristics is a prerogative of collaborative groups. Fiorentini (2004) and Hargreaves (1998) describe collaborative groups as environments where shared action and reflection, dialogue, mutual trust, negotiation, and other similar dynamics take place.

Furlong et al. (2000) explain that community actions through collaborative partnerships create viable connections between universities and schools. In collaborative partnerships, participants create opportunities to work together on the stages of planning, implementation, and critical discussion of pedagogical practices, valuing and recognizing differences as legitimate. Furlong further argues that partnership is not merely an organizational concept but a practice that incorporates important epistemological and pedagogical dimensions.

Methodology

This research adopts a qualitative approach, which, according to Minayo (2024), "deals with the universe of meanings, motives, aspirations, beliefs, values, and attitudes, corresponding to the deeper realm of relationships, processes, and phenomena that cannot be reduced to the operationalization of variables" (Minayo, 2004, p. 21-22). In this context, the data were obtained through interviews conducted using the Hermeneutic-Dialectical Circle (HDC) and were

subsequently analyzed using Hermeneutic-Dialectical Analysis. According to Oliveira (2014), this method represents the full application of the Interactive Methodology.

Operationalization of the Interactive Methodology

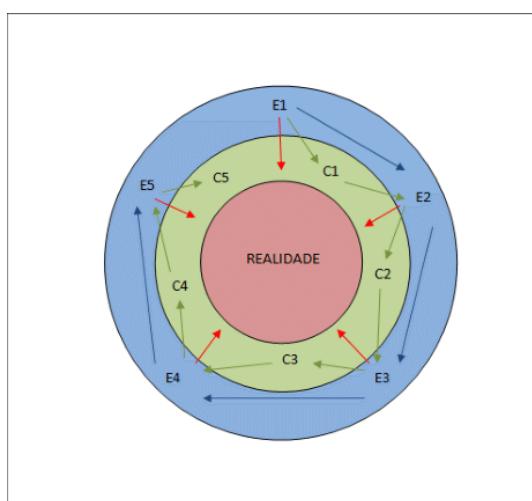
According to Oliveira (2014), the Interactive Methodology consists of a data collection technique and a data analysis method, respectively, the Hermeneutic-Dialectical Circle (HDC) and Hermeneutic-Dialectical Analysis (HDA). The HDC offers the advantage of facilitating interaction among interview participants through constant dialogue between the researcher and the subjects. It is a tool that activates social actors through a continuous back-and-forth process, enabling a deeper understanding of the reality under study by fostering an encounter among the researched groups.

Silveira (2017), on the other hand, states that HDA is a way to study social practice and human action by considering the traditions, cultures, and praxis involved in the researched social context.

Hermeneutic-Dialectical Circle

The Hermeneutic-Dialectical Circle (HDC) is based on dialogue among interview respondents to describe reality and the participation of different social groups. Figure 1 illustrates the functioning of the HDC as described by Oliveira (2014).

Figure 1: Hermeneutic-Dialectical Circle.



Source: Adapted from Silveira (2017).

The larger circle, in blue, represents the interviewees, while the second circle represents the back-and-forth process of constructing and reconstructing the researched reality (the synthesis of each

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interview). Each interviewee is represented by the letter E, and the synthesis of the interviews by C (construction of reality).

The circle begins with E1, chosen by the researcher, who participates in an interview to freely share their perceptions of the reality in which they are involved.

Following the interview with E1, the synthesis of the first interview (C1) is prepared. Next, interviewee E2 is engaged using the same interview guide, and afterward, they are presented with the synthesis of C1. E2 provides comments and adds new elements to C1. This process continues sequentially with each subsequent interviewee until the final one.

At the end of the circle, the interviewees are invited to participate in a moment of reflection, negotiation, and the inclusion of new elements into the reality they described, culminating in a final synthesis created by the researcher. The third (central) circle represents the reality, i.e., the outcome.

Hermeneutic-Dialectical Analysis

The Hermeneutic-Dialectical Analysis (HDA) was described by Minayo (1996) as the analytical method that:

is the analytical method most capable of providing an approximate interpretation of reality? This methodology situates speech within its context to understand it from within and within the historically specific and totalizing framework in which it is produced (Minayo, 1996, p. 231).

We present a brief summary of the method and the basic principles of analyzing the collected data. This method consists of two levels of data interpretation:

- I) Level of Fundamental Determinations: This pertains to the socio-historical context of the social groups, which constitutes the fundamental theoretical framework for the analysis.
- II) Level of Engagement with Empirical Facts: This is based on encountering the facts suggested during field research; it involves studying reality in all its dynamism. At this level of interpretation, the Hermeneutic-Dialectical Circle (HDC) processes the synthesis of information from each group.

Results

The critical-social theoretical category of teacher education proposed by Garcia (1999) and the empirical categories derived from the interviews constitute the two levels of data interpretation outlined by the Interactive Methodology. The empirical categories are determined by exploring reality through the themes addressed in each question, as answered by each participant of the Hermeneutic-Dialectical Circle (HDC). At this level of interpretation, the following are included: the Pedagogical Residency, the activities and actions undertaken, the guidance provided by the preceptor and supervisor, the contributions and influences on the participants' formative process, as well as the program's positive and negative aspects.

The research involved four subjects: two residents, one preceptor, and one supervisor. Pseudonyms were used to protect the identity of the HDC participants. Thus, the first resident will be referred to as Maxwell, the second resident as Planck, the preceptor teacher as Dalton, and the supervisor teacher as Newton. These pseudonyms are intended to facilitate the understanding of our analysis, with the empirical categories shaping the interpretation of the participants' statements.

The Pedagogical Residency

When referring to the program, elements of a critical-social teacher education approach can be identified in the preceptor teacher's statements. According to Garcia (1999), this orientation is closely aligned with social issues and the challenges of the teaching profession, as the teaching activity embodies the ethical and social commitment of educational and social practices in a more just and democratic manner. Silveira (2017) asserts that this orientation encompasses the uncertainties and professional challenges teachers face in their work environment.

The preceptor teacher, Dalton, highlights aspects of critical-social education by stating: "In the Residency, they were able to experience the challenges of teaching and confirm their professional calling. Some students, with this opportunity, realized that teaching is not their path and have already decided not to pursue it." This statement also aligns with the "reality shock" proposed by Veenman (1984), as the resident may come to understand during their Residency period that teaching is not their professional field. This early realization allows them to exit the profession, recognizing the incompatibility between the demands of the field and their future aspirations. Conversely, this period can also represent precisely what they envision for their professional future, providing a preview of their anticipated career path.

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“[...] This is what sets the Residency apart: presenting students with their profession while they are still in training. [...]” In the excerpt above, the preceptor teacher highlights the importance of training within the profession, an idea also supported and argued by Nóvoa (2009). Nóvoa expands the justifications for this work-integrated training through five key point:

Practices (P1): Teacher education must embrace a strong practical component, focused on student learning and the study of concrete cases, using schoolwork as a reference point.

Profession (P2): Teacher education must take place within the profession itself, that is, it should be based on the acquisition of a professional culture, granting experienced teachers a central role in training younger teachers.

Person (P3): Teacher education must pay special attention to the personal dimensions of the teaching profession, developing relational and communication skills that define pedagogical tact.

Sharing (P4): Teacher education must value teamwork and the collective exercise of the profession, emphasizing the importance of educational projects within schools.

Public (P5): Teacher education must be guided by a principle of social responsibility, fostering public communication and professional participation in the public sphere of education (Nóvoa, 2009, p.6).

In the second point, the author highlights the need to ensure that practicing teachers can contribute to the training of future colleagues. This is similar to what occurs in professions such as medicine, engineering, and architecture, where more experienced professionals play a significant role in mentoring younger ones. The Pedagogical Residency Program (PRP) seeks to return the teacher education process to the school environment, fostering collaboration between universities and schools.

Activities and Actions of the RP

The reflection on teaching practice among PRP participants aligns with a collaborative approach to teacher education. According to Guba and Lincoln (2011), as the hermeneutic circle is conducted and analyzed by the researcher, increasingly complex and stable agendas are generated. When successive respondents are asked to comment on and critique the constructions already developed, a collectively constructed reality emerges. This collective construction may differ significantly from individual constructions, as it is shaped through a hermeneutic-dialectical process.

We observed, based on this, a sense of similarity and shared responsibility in the respondents' statements. The preceptor teacher mentions, "We did many things together..." resident Planck states,

"And we managed, starting from the meetings [...]," and resident Maxwell reaffirms, "We did some things together, like [...] some research that eventually resulted in articles [...]." According to Hargreaves (1998), collaborative work incorporates aspects of voluntariness, identity, spontaneity, shared leadership or co-responsibility, support, and mutual respect. Both Hargreaves and Fiorentini (2004) view collaborative groups as environments where shared action and reflection, dialogue, mutual trust, and negotiation take place. These statements represent collaborative work and the sharing of tasks and responsibilities aimed at completing an activity and/or product that the Residency participants set as a common goal.

According to Garcia (1999), the critical-social orientation is closely connected to the practical orientation, incorporating an ethical and social commitment that goes beyond a purely technical or practical analysis. The preceptor teacher recognizes the limitations of residents at the beginning of their professional careers. "I noticed all those initial challenges of the profession uncertainty, shyness, difficulty writing on the board, and so on. They were able to gain a reference for their future work." According to Kemmis (1985), Dalton's statement reflects an action-oriented approach, referring to the relationship between thought and the historical situations in which an individual finds themselves.

The Preceptor Teacher's Guidance

In this empirical category, there is a sense of collectivity in teaching practice through dialogue among group participants. In the guidance provided by the more experienced school teacher, we observe a strong practical orientation in teacher education, in which collaboration among participants was evident. Resident Maxwell mentions, "The preceptor was always very helpful to us. Whenever we had any doubts about what we could teach or what different approaches we could bring to the students, he was always there, assisting us with whatever we needed." According to Garcia (1999), experience holds significant value as a source of knowledge about teaching and learning to teach, even acquiring a mythical value. This can be seen in this context, as the teacher with more classroom experience is consistently consulted to help mitigate the challenges faced by novice teachers during their initial experiences in the profession.

Zeichner (1980) highlights the belief that practical experiences in schools necessarily contribute to the development of better teachers. It is often assumed that even a short period of experience is better than none. Resident Planck reflects on the teaching practicum and the guidance

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provided by the preceptor teacher as essential to effective classroom practice: "[...] during our teaching practicum, based on the lessons we were teaching, the preceptor teacher would give us feedback and provide direction on how we could improve our classroom performance."

It is common for novice teachers to have methodological questions about what to teach and how to proceed. One of the responsibilities of the preceptor teacher is to guide residents in developing their lesson plans and implementing pedagogical practices.

From the statements of residents Maxwell and Planck, the concept of collaborative work emerges. According to Parrilla (2004), collaborative groups are those in which all members share in decision-making and take responsibility for the quality of what is collectively produced, according to their abilities and interests. Costa (2005) distinguishes between cooperation and collaboration. The author suggests that cooperation involves mutual assistance in completing tasks, but its goals are not necessarily negotiated by the group, potentially leading to unequal and hierarchical relationships among members. Collaboration, on the other hand, is based on joint work where group members support one another to achieve common goals negotiated collectively, emphasizing non-hierarchical relationships, shared leadership, mutual trust, and co-responsibility.

Preceptor Dalton exemplifies the concept of collaboration in the context of teaching practices within his group: "[...] After that, we listened to and got to know each of them—some were more eager to teach, others more hesitant. I let them feel comfortable proposing their own activities, and together, we developed others. It was a true exchange. We shared and carried out the proposed activities during the regular meetings of the Physics Residency group. I had no difficulty guiding them according to the demands of the actions we planned and implemented."

Therefore, as noted by Fiorentini (2004), Hargreaves (1998), and other scholars, the PRP can be considered a collaborative group that fosters the development of shared actions and reflections. These are collectively conceived and negotiated through dialogue among the group members.

The Guidance of the Supervising Professor

The statements regarding the guidance of the supervising professor reveal some interesting components of critical-social education, highlighting analyses of the social context surrounding the teaching and learning processes within that PRP core group. For instance, in the excerpt, "[...] One of the residents worked side jobs as a bricklayer, and another lived far away, spending money on four bus fares to reach the school. So all of this was carefully considered and evaluated." This statement

clearly reflects a commitment to democratic values, social justice, and equal opportunities, emphasizing the importance of ensuring fair conditions for individuals to secure their place in society.

Furthermore, Silveira (2017) argues that the critical-social orientation must question reality and, consequently, the conditions under which it is understood. The scholarship received by the participants represents a socioeconomic aspect, and the social, political, and economic circumstances of each PRP participant, when observed, constitute a reality that must be addressed and adapted to the theoretical and methodological conditions of the PRP.

For this reason, Garcia (1999) suggests that social issues should be included in teacher education curricula. Giroux and McLaren (1986) take a strong stance on this, advocating for a teacher education curriculum as a political and cultural tool, where social, cultural, political, and economic dimensions are the key characteristics for understanding the contemporary school.

Newton, when referring to his contributions in guiding the PRP participants, shares his perspective: “I felt confident in assigning responsibilities to the preceptors, right? I always tried to stay closely connected to them, holding separate meetings with the preceptors. But, you know, I gave them freedom in pedagogical matters, right?” He adds, “[...] I gave them freedom, I think that’s the right word, because I trusted them, knowing the three preceptors well, you see.”

This statement highlights at least two elements of collaborative training: shared responsibility and mutual trust. According to Bastos (2014), the collaborative approach is built on interdependence, co-responsibility, sharing, trust, negotiation, openness, instability, and security, enabling the changes, adjustments, and developments necessary for teaching practice.

Contributions and Influences on the Participants' Training Process

Criticism of the theorization of teaching finds meaning within the critical-social orientation of teacher education when teachers reflect on practice and understand the discrepancies between what is studied at the university and what is observed in the Pedagogical Residency. Resident 2 illustrates this situation in the following statement: “For example, in theory, we have this very utopian idea where everyone in the classroom wants to learn, and everyone is interested in the lesson you are teaching, but in reality, that’s not what happens.” According to Alarcão (1996), reflective teacher education assigns reflective practice the ability to (re)construct knowledge and reduce the gap between theory and practice. For Garcia (1999), reflecting on practice makes teachers flexible, open to change, capable of analyzing their teaching, self-critical, and proficient in a wide range of cognitive

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and relational skills. It also equips teachers to address teaching situations using elements drawn from their own reality.

When comparing the Pedagogical Residency Program (PRP) to supervised internships, Planck questions the course curriculum, suggesting that both are initiatives to integrate teachers into schools, but the support, systematization, organization, and duration are more advantageous in the PRP. He also highlights the adoption of practical guidance: "[...] because when comparing it with supervised internships, the classroom and school experience is very punctual and short-lived. With the Pedagogical Residency, the duration was much longer two years. We had full support for planning, guidance, and implementation in the classroom."

According to Silveira (2017), the critical-social orientation is directly linked to a critique of curriculum and teaching. Garcia (1999) asserts that the teacher education curriculum plays a crucial role in shaping all dimensions of teaching through practice. Authors such as Feiman (1900), Liston, and Zeichner (1996) agree that reflective practices concerning teacher education curricula are still underdeveloped, remaining stagnant in theoretical analyses.

The collaborative interaction with PRP residents enabled the preceptor teacher to overcome fears of stagnation in the profession: "Personally speaking, I'm afraid of falling into the complacency that our profession can sometimes offer. The Residency was extremely important in my teaching practice." According to Feitosa (2010), the main reasons for professional stagnation among some teachers include excessive workloads and additional professional responsibilities within a globalized society. Lorenzato (2006) emphasizes that for teachers, time and energy are reflected in willpower, decision-making, study, dedication, reformulation, and constant reflection. This is essential because students have the right to, and need, good teachers a strong argument for continuously improving our teaching practices, especially those intentionally conducted in the classroom. Pereira (2000) stresses that reflections on continuing teacher education contribute to the understanding that the professional's training does not end with their graduation from the training institution but is completed in-service.

Positive Aspects of the RP

Among the positive aspects mentioned by the program participants, the following stand out: reflection on the importance of the school's physical structure and the teaching-learning process of students, the closer connection between schools and universities, and the development of research within the school environment.

Maxwell highlights the importance of the school's physical structure for effective pedagogical practices "The contact with the school, the contact with the school itself, I mean the building, the place whether you come from a private or public school, you have some notion of what it's like [...], but as a teacher, you notice the structure much more and see how important it is to have good infrastructure. Without good infrastructure, lessons become very deficient."

Immersed in the school environment, he raises the issue of the lack of infrastructure in public schools and compares it to private schools, concluding that public schools fall far short of the ideal. Education, in turn, requires construction and participation; it needs a curriculum, buildings, equipment, but above all, good teachers, creative management, and a constructive, participatory environment, including constructive and engaged students, to achieve quality education (Demo, 2001).

Maxwell also addresses the learning relationship with students and comments on the neglect of their learning process:

"Another topic would be the contact with the students. We also notice that most students aren't interested in learning. We'll need to instill that interest in them, and having this contact allowed us to start thinking of ways to spark that interest in students..."

From his perspective, there is a lack of interest in studying, but he identifies the solution as rethinking teaching methodologies and techniques.

Bini and Pabis (2008) emphasize that many teachers complain about students' lack of interest and motivation. Situations such as the lack of participation and interest in lessons, failure to complete assignments, talking with peers, and wandering around the classroom while ignoring the teacher reflect this issue. These authors argue that the problem of disinterest and lack of motivation may lie in the way teachers approach their work. They recommend carefully modifying teaching practices to create environments that foster student interest, encouraging them to strive for learning.

Reflecting on the lack of school infrastructure and student interest, Maxwell develops a perspective aligned with the critical-social orientation of teacher education. Garcia (1999) defines this orientation as incorporating a social and ethical commitment to educational and social practices in a more just and equitable manner, as well as addressing social issues to overcome their challenges. This reflection leads the resident to compare and analyze the gaps in infrastructure quality between public and private schools, exposing the broader inequality in education and considering alternative approaches to address student disinterest.

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The supervising professor, Newton, highlights as a key point the opportunity for teacher trainees to remain in the school environment: "It allowed students to stay in the school, enabled me to get closer to the reality of the school, and gave students and the preceptor the opportunity to develop teaching and research [...]." In addition to this point, Newton identifies two others: the closer connection between universities and schools, facilitated by university professors re-engaging with the dynamics of school life, and the development of teaching and research outside of higher education institutions. Gadotti (1998) emphasizes the social role of university professors and primary school teachers in fostering exchange processes between these two institutions. One institution should not be disconnected from the other, and it is the responsibility of their agents to seek alternatives for sharing experiences and knowledge essential to building a better educational system.

Moreira (2011) believes that actions to strengthen the partnership between higher education institutions (HEIs) and public schools do not require excessive complexity. Starting with simple initiatives and progressing gradually can lead to significant improvements in this collaboration. Fagundes (2013) points out that internships should be planned based on collective reflection, involving pedagogical dialogue between university professors and school/campus teachers, with clear objectives and responsibilities for each institution. Couto (2017) views educational research as a new way of conceptualizing teacher education, aligning teaching with research as political, educational, and formative strategies for universities (the setting for initial teacher education) and schools.

Aspects of the RP Needing Improvement

Unanimously, the lack of financial resources for more systematic and pedagogical work was considered the "Achilles' heel" of the Residency. Resident Maxwell highlights a vulnerability that compromises the program's progress: "Regarding things that could be improved in the Pedagogical Residency, for now, I can only think of more financial resources, for example, because, like it or not, teaching Physics requires experimental equipment that, unfortunately, students need financial means to provide." The lack of investment in the development of projects and activities within schools makes teaching work more deficient. The critical-social orientation emerges when analyzing the lack of investment in schools and universities in political, social, and economic terms. According to Terra (2019), Brazilian universities are facing a very difficult situation. On the one hand, they are under pressure from financial constraints and political instability in the country; on the other, they must

address numerous challenges, such as the necessary internationalization of science and technology production and the various local demands.

The PRP is funded by the Federal Government and represents a significant investment for public finances, as it provides financial aid scholarships to participants. Despite being compensated, participants, especially the residents, often used the scholarship funds to cover the costs of experiments, program participation, and university expenses. Efforts were made by the group to finance the purchase of materials for setting up experiments. Resident Planck states: "We had to mobilize, get together, and buy equipment of course, at a low cost but it was still an expense we incurred. We had to pool resources to carry out some experiments because the project didn't provide them for us. The school also lacked materials, so we needed to combine our resources from the Residency to contribute funds and make purchases. I think this is an issue that needs to be reviewed; it's a negative point." The critical-social orientation is evident in this situation. Students and teachers worked together to overcome the lack of resources, even using their scholarship funds for this purpose. This motivation to carry out the work reflects the commitment of everyone involved in the process. However, it does not necessarily represent a critical reflection on the allocation of scholarship funds or the potential use of alternative and more affordable materials for these experiments.

Resident Maxwell confirms Planck's idea: "We tried as hard as we could to cut prices, we tried as hard as we could to do simple things that could explain the subject, but it's much, much, much more difficult without this subsidy, right, because we didn't have the financial resources ourselves." He highlights the simplicity of the experiments as a way to present the subject matter and enhance student learning. Blosser (1988) identifies the objectives of experimental teaching activities as the development of:

1. skills - such as manipulating, questioning, investigating, organizing, and communicating;
2. concepts - for example: hypothesis, theoretical model, taxonomic category;
3. cognitive Skills - critical thinking, problem-solving, application, synthesis;
4. understanding the Nature of Science - including scientific endeavors, scientists and their work, the existence of multiple scientific methods, and the interrelations between science, technology, and various scientific disciplines;
5. attitudes - such as curiosity, interest, risk-taking, objectivity, precision, perseverance, satisfaction, responsibility, consensus, collaboration, and enjoyment of science.

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Azevedo (2004) highlights that investigative lessons are a way to provide students with the opportunity to actively participate in the learning process. Students need to recognize that the content addressed in the classroom is of great importance to their everyday lives. Preceptor Dalton supports the residents by pointing out the same negative aspect of the program: "Another difficulty we faced in the Residency was the lack of financial resources to cover expenses for experiments and equipment that could be used in the classroom. We received no support in this regard; the scholarship we received only covered our food and transportation costs, and with the little that was left for some, it was only possible to buy personal necessities or even help out at home. For the experiments, all the materials came out of our own pockets." Dalton's statement reflects concern for the socioeconomic challenges faced by residents and the limited assistance provided by the scholarship. Sousa (2005) observes that with the expansion of university enrollment opportunities, young people from lower-income classes gained greater access to higher education, which created demands for specific actions to support this demographic. Young people requiring financial assistance for their academic education began advocating and fighting, often alongside the student movement. This led educational institutions to assume responsibility for addressing some basic needs of students lacking resources. In this context, economic difficulties can significantly affect the academic trajectories of low-income students, whether through the inability to access important cultural goods and practices or the need to balance studies with work (Vargas, 2008, p. 50).

It is undeniable that the program is deficient in this regard. All PRP participants emphasize the need for financial resources beyond the scholarship. Newton points out that Physics is an experimental and inherently expensive science: "The other issue materials, resources, those things left a lot to be desired. The necessary resources, you see, Physics is an experimental science, right? Setting up experimental activities requires purchasing materials, you understand... In short, we needed more substantial resources to address these issues, didn't we?" This statement echoes Garcia's (1999) concept of academic orientation, which highlights the need for training that conveys scientific knowledge and the culture of the specialist. Finatti et al. (2007, p. 248) assert that "for students to fully develop academically, it is necessary to combine the quality of the education provided with an effective policy of support, in terms of housing, food, health, sports, culture, and leisure, among other conditions".

Final considerations

This article aimed to analyze the critical-social conceptual orientation in teacher education within a Pedagogical Residency Program (PRP) for undergraduate Physics teacher training. Through the statements of the research participants, we interpreted and understood the contributions, influences, limitations, challenges, and possibilities of this conceptual orientation in initial and continuing teacher education. The investigation revealed the importance of the PRP as a tool and environment for teacher education, valuing the integration of novice teachers into the workplace, their engagement with the school community during their undergraduate studies, and their exposure to the challenges and adversities of the profession. The context of the actions and activities, along with the circumstances in which they occur, is an integral factor in the participants' training. Collaborative training among participants highlights a new perspective on teacher education, emphasizing shared action and reflection, dialogue, mutual trust, negotiation, and a strong sense of responsibility.

This cooperation facilitates the exchange of experiences and practices, enabling the continuity of teachers' professional development throughout their careers. We also conclude that the Pedagogical Residency provides diverse opportunities for continued education, deeper knowledge, and the updating of professional skills. This professional qualification bridges the gap between universities and public schools, advocating for better working conditions and improved teaching and learning quality for basic education students, enabling them to fully exercise their citizenship equally and transform their realities.

Furthermore, we observed the political engagement of scholarship recipients in advocating for better management of resources and investments during their participation in the program. They also demonstrated a critical stance regarding the relationship between theory and practice, the school infrastructure, the adequacy of the scholarship for student assistance, the challenges of conducting experiments, and carrying out research within schools. The critical-social orientation, combined with a collaborative perspective among teachers at different levels of professionalization, strengthens the democratic process in the relationships built through shared choices, alliances, and oppositions. These dynamics make this teacher education program a comprehensive space where participants engage with each other's academic and technical knowledge while also considering the personal and emotional dimensions of individuals in implementing and reflecting on classroom actions. In this context, Physics teachers in training experienced the complex variables of their field, workplace, and teaching and learning environments, both for their own development and for others.

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Our article reveals the significance of this teacher education program as a tool for the professional development of teachers, bringing academic training closer to the realities of the classroom. Additionally, the PRP provides practical experiences in the profession, enabling appropriate training for participants at different stages of their education. We believe that our research can assist others interested in this type of training, helping them to uncover new approaches to its development. Thus, we recognize that this work contributes to improving the understanding of the PRP within its operational context, acknowledging the collective interactions that shape a reality to be analyzed.

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