

The initial training of Physics teachers from the perspective of a liberating practice aimed at the inclusion of students with disabilities⁺*

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Abstract

This research deals with the initial training of Physics teachers by investigating the contributions of certain activities aligned with special education and the perspective of inclusive education. These activities were organized and developed based on concepts from Paulo Freire and applied at the Federal University of Uberlândia, under a participative research methodology. Participant observation was chosen to enhance the interaction with students and face-to-face contact with the object of study, taking into account data collected through diagnostic assessments, class transcriptions and notes from the authors' field diary. We conclude that the dynamics contributed to students expanding and diversifying the sources of teaching knowledge from an inclusive perspective. Furthermore, the organization of a training space/time, embodied in Freirean concepts, enabled future Physics teachers to carry out important reflections on educational processes and the possibilities for organizing their teaching action, with a view to guaranteeing access to knowledge for all.

Keywords: *Initial Training for Physics Teachers; Special Education; School Inclusion.*

⁺ A formação inicial de professores de Física na perspectiva de uma prática libertadora voltada para a inclusão de estudantes com deficiências

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I. Introduction

With the democratization of education, inclusion is one of the biggest challenges and, therefore, the creation of conditions for everyone to remain and develop adequately in the school environment. Inclusive education seeks to adapt the educational system to meet the needs of all students, especially those who belong to historically marginalized groups, such as people with disabilities, students from different cultural, ethnic or socioeconomic backgrounds. To achieve this, it is necessary for schools to implement differentiated pedagogical practices that recognize and value diversity (Silva; Bego, 2018).

In this sense, teacher training courses play a crucial role, as they are responsible for preparing educators to deal with diversity in the classroom and create a learning environment that favors the participation and development of everyone (Bazon; da Silva, 2020). This includes reviewing their pedagogical projects with the aim of aligning teacher training with professional, social, cultural, emotional and pedagogical skills that promote an education that not only offers access to students, but also ensures conditions for their permanence, inclusion and quality teaching for all (Ainscow, 2009; Brasil, 2001; Freitas, 2006; Jannuzzi, 2004; Mantoan, 2011; Vitaliano, 2007).

Given this, the present research was planned based on the challenge of schooling people with disabilities and the interface between special education and the training of Physics teachers (Camargo; Nardi, 2006, 2010; Dickman; Ferreira, 2008; Picanço; Serrano; Geller, 2024; Pertence, 2021).

The discussions and theoretical analysis of different scientific products contributed to the mutual construction of knowledge and to the planning of the discipline “Teaching and inclusion of people with disabilities”, taught in the Physics course at the Federal University of Uberlândia. The proposed activities were built on the foundation of the collaborative and investigative process between the researcher-student of the Graduate Program in Science and Mathematics Teaching, the supervising professor and the professor teaching the discipline and co-supervisor of this research, inspired by the liberating practice defended by Freire (2001) (Guedes; Kagimura; Arantes, 2023).

In this context, the present study presents the results of the application of these activities to Physics graduates, aiming to understand what the contributions were to the future inclusive educational practices of future teachers. Thus, the methodological path adopted in this research sought to understand the possible collective ruptures regarding the theme, both in relation to conceptualization and awareness and reflection on inclusive teaching practice, in the context of participative research.

II. Freire and Teaching Practice

Although Paulo Freire's work does not directly deal with special education, it proposes a liberatory education that, together with the subject, builds true inclusion (Esquisani, 2021;

dos Santos, 2021). These reflections supported the systematization of the applied activities and the analysis of the results of this research, taking a line of action of analyzing conceptions about the key concepts regarding ethics, incompleteness, dialogicity and criticality in an attempt to identify the aspects that lead such concepts to expand and diversify the sources of teaching knowledge. As a way of highlighting his conceptual and philosophical frameworks about teaching know-how and the demands of teaching that go beyond technical-scientific skills, Freire (2003) organized the political and anthropological foundations of his proposal into three pillars: 1) there is no teaching without learning; 2) teaching is not transferring knowledge; and 3) teaching is a human specificity. From different angles, the central theme of his work interconnects teacher training with reflection on progressive practice in favor of students' freedom.

Freire (2003) argues that education starts from a problematizing conception in which the resulting knowledge, in addition to being critical and reflective, requires ethics and aesthetics. Ethical conduct must permeate from the broadest to the most consensual objectives of educational action and must be associated with the value of the incompleteness of human beings and their constant search and ability to transform the reality around them.

Therefore, to be aware of its incompleteness, it is important that moments of communication, debate and reflection are created in the training process, since human beings, alone, are not born with this awareness. Brandão correlates Freire's dialogical education with an education reverberated by transformations:

"The dialogical relationship" advocated by Freire must be revisited by all those who carry out education and who seek inclusion as a weapon for transforming the society we have, into the one we want, as the aforementioned author is and will always be an example for Brazilian (inclusive) education because he bases the interactive relationship on true dialogue, guided by the political commitment of his peers. (Brandão, 2002, p. 5).

Freire (2003) reinforces that ethical training takes place in education, more precisely in the classroom, when there is a continuous movement towards transformative, dialogic and awareness-raising education. Both teachers and students perceive their realities critically and create knowledge through dialogue.

Therefore, it is clear that the act of educating is always an ethical act, simply because it is associated with the ethical decisions that need to be made in the school context, especially from an inclusive perspective, which ranges from the choice of content to the method to be used or the way of relating with students.

Another important aspect in this training is the relationship between theory and practice, these two dimensions being inseparable and directly dependent on each other. After all, when the teacher appropriates knowledge and benefits from theoretical contributions relating to learning understandings, he or she is able to better analyze ways of working,

overcoming difficulties and clearly seeing new possibilities for quality performance. Thus, the chances of reflection and criticism on teaching practices emerge with greater coherence.

Faced with this fact, Freire points out as a pedagogical alternative for working with students, according to their singularities, the liberating practice through dialogical education, a collective construction of knowledge through dialogue, critical thinking towards the world and the exchange of experiences. It is an action-reflection-action process that, for Freire, constitutes the *praxis*, that is, knowing and intervening in reality, reflecting on theory to act and transform reality. It is based on this direct relationship between theory and practice that teacher training must correlate with criticality, not with the intention of breaking the knowledge of everyday experience with scientific knowledge, but of overcoming this knowledge.

With regard to inclusive education, knowing how to relate practicality to ethics is clear in Freire's defense of education for all, without discrimination of any kind, that is, for school inclusion to be effective in a more significant way, it is necessary to think about and implement an educational process with all students and that is not just focused on people with disabilities, as those who do not "have a disability" have their own particularities that need to be respected and considered during the educational process.

However, overcoming the dichotomy between theory and practice in teacher training is not a simple task and requires research, systematization and reflection, from objectives to their structuring. Perhaps one of the ways to overcome this challenge is to dialogue with the student, seeking to articulate theory with practice, because "those who teach learn by teaching, and those who learn teach by learning, based on a dialogical pedagogy, as both are subjects of the cognizing act" (Freire, 2003, p. 12).

The construction of knowledge does not occur through an authoritarian and vertical relationship, on the contrary, it develops based on the autonomy of students and the appreciation of the knowledge acquired by them in the social reality in which they are inserted. This creates a school that promotes real inclusion through a process of humanization of students and the world, creating the necessary conditions for students, whether disabled or not, to gain the position of subjects in the appropriation and construction of knowledge.

III. Methodological Assumptions

The systematization of inclusive activities was applied to the Physics course, licentiate degree, at the Federal University of Uberlândia, specifically in the curricular component "Teaching and inclusion of people with disabilities" (UFU, 2018), which aims to enable immersion in investigative processes and the discussion/elaboration of theoretical-methodological proposals, with a view to training teacher researchers in educational contexts and their constraints, as well as interfaces within the scope of Natural Sciences, Mathematics and human rights. Furthermore, it is about working with undergraduate students on ways to plan and experience pedagogical and research proposals in different educational spaces, with

interdisciplinary/contextualized dialogues and actions within the scope of Natural Sciences and Mathematics.

The research was systematized based on observations, communications and adjustments made throughout the investigative process, using as a reference the critical-emancipatory approach to participative research. It is important to highlight that the methodology aims to encourage reflection and the construction of inclusive educational practices. The methodological basis in participative research aims to contribute to transforming the practice of future Basic Education professionals and, thus, allow them to expand and diversify the sources of teaching knowledge, mainly in the area of school inclusion (Brandão, 1990).

Participative research not only seeks to promote the updating and transmission of new knowledge, but it guides its action towards the mobilization of the subjects' creative potential, in the search for a different, creative and innovative way of doing things, capable of operating new knowledge through everyday work knowledge developed in the collective. Agreeing with Freire (2005), in this line of thought, change can happen when people capture and understand reality and are not reduced to mere spectators or transformed into an object, fulfilling pre-determined orders.

Thiollent (2011) emphasizes that this is an empirically based methodology, which must be carried out in close association with collective action so that, throughout the process, the researchers and participants can cooperate in a meaningful way, developing strategies to solve problems through transformative action. Given the challenges faced by different educators in Inclusive Education, participative research can be an effective methodological alternative for the reframing of teaching practice (Toledo; Jacobi, 2013).

The choice of participative research was based on the concepts of Gil (2002) and Demo (2004), who highlight the interaction between researchers and participants to promote social transformations. In the context of Physics teacher training, the continuous presence of researchers in the classroom, together with students, enriched the understanding of inclusive practices through detailed observation and *feedback*, aligning with the inclusive and collaborative principles of the approach. Participative research was developed through construction and activities by researchers and the active involvement of both researchers, participants and guests. From the beginning, with diagnostic assessment and student awareness, the activities were carefully planned to promote a continuous dialogue between teacher training and inclusive pedagogical practice, aligned with Freirean concepts. The application of diagnostic questionnaires at the beginning and end of the semester enabled a reflective analysis and *feedback*, essential to adjust practices and infer necessary changes. Constant interaction with the academic community, through debates and collaboration in the production of lesson plans, meets the objective of effectively involving future teachers in a significant and transformative training experience, corroborating the essence of participative research.

Data collection instruments were: participant observation, questionnaires and semi-structured interviews. Participant observation was chosen to enhance interaction with participants and face-to-face contact with the object of study, taking into account both the relevance of the theme and the search for a change from naive curiosity to epistemological curiosity, as highlighted by Freire (2015). Questionnaires and semi-structured interviews were used during the application of the discipline proposal, in order to understand beliefs, attitudes and values in relation to the research theme (Minayo, 2001; Lakatos; Marconi, 2010).

We used different ways of documenting data for analysis, such as electronic forms and recorded classes, as the research was fully applied in distance teaching, in the final half of 2021. Analysis strategies were responses to questionnaires, documents created by undergraduate students in the virtual learning environment, speeches recorded via audio and text during videoconferences, interactions with the proposed activities and recordings, carried out with the authorization of the research participants.

The transcriptions recorded in the logbook were made throughout each practice. At the end of each class, jointly, the researcher, student in the Graduate Program in Science and Mathematics Teaching and also a Basic Education teacher, the supervising teacher and the professor teaching the subject and co-supervisor of this research outlined adaptation strategies for the next classes. It should be noted that, to preserve identity, the speeches and writings presented by undergraduate students throughout the course activities were coded as: Student 1 (E1), Student 2 (E2) and so on.

The guidance in the analysis process was based on the three stages highlighted by Bardin (2016). In the first stage, the introductory ideas were systematized, in order to create a precise scheme for the development of successive operations in an analysis plan. To this end, collected materials were categorized according to the chronological order of the classes and a floating reading was carried out to formulate the hypotheses and objectives that would add to the initial questioning of this research. In the second stage, the material exploration phase, coding was done based on the patterns of expressions and/or words used in each class. Recordings were important at this stage, as they allowed the observation of recurring elements with similar characteristics, such as reactions to the theme addressed in each dynamic. Finally, the third stage consisted of making inferences by identifying patterns and correlating them with the literature.

Therefore, data was analyzed and organized into the categories: awareness (changes promoted by the course) and the contributions of inclusive activities to academic and professional life.

IV. Presentation and analysis of results

The construction of the didactic proposal took into account the idea highlighted by Monico, Morgado and Orlando (2018) of building a dialogue between the initial training of Physics teachers and pedagogical practice from the perspective of Inclusive Education. The

didactic proposal was built based on participative and collaborative work between the authors, consolidated from “unprecedented-viables” and, therefore, on overcoming “limit situations” (Freire, 2011, p. 25).

The discipline began with a diagnosis of the students' experiences with the process of including people with disabilities in everyday school life, followed by awareness raising that addresses the topic of privileges and meritocracy.

Next, the historical context of the different phases of schooling for people with disabilities (exclusion, segregation, integration and inclusion) was discussed, in addition to federal, state and municipal legislation, and its impact on those involved.

In order to promote some reflections about inclusion in Basic Education, a series of virtual debate sessions were organized, in which students with disabilities, their parents, Basic Education teachers and SES (Specialized Educational Service) professionals who experience the inclusion process (or not) in schools were invited. The Individual Development Plan (IDP) of the State of Minas Gerais and the role of the teachers in its preparation were also analyzed.

To complement learning, the advancement of assistive technologies as tools to support inclusive teaching was discussed. The study culminated in the elaboration of lesson plans and the development of accessible materials aimed at teaching physics from an inclusive perspective by students. This systematization of activities aimed to prepare future teachers, from reflecting on their personal conceptions to implementing this knowledge in their future teaching practice.

The activity proposal was applied during the second semester of 2021, to a class with 23 students, of which 22 agreed to participate in the participative research, signing the consent form on the first day of class. The age range of the student body was between 16 and 25 years old.

Classes were taught remotely, with four weekly synchronous class, which were recorded for later analysis. Around 90% of the class had access to good quality internet connection in their homes, while the others accessed classes from the homes of friends or relatives. It is noteworthy that synchronous activities (carried out during classes) were prioritized, as, at that time, more than half of the class was working at least half the day. It is believed that this choice ensured the participation and collaboration of all students during the process of building knowledge on the topic. The class demonstrated interest in the topic, interacting significantly via audio and chat on the videoconferencing platform, presenting concepts, doubts and opinions when questioned by the teacher. Despite resistance to the use of open cameras, involvement, dialogue and participation took place in a natural and democratic way.

To gather information that supports the objectives, it was decided to prepare two different diagnostic questionnaires, applied at beginning and end of the academic semester, containing open and closed questions that covered everything from sociodemographic data to aspects related to the course. The first questionnaire contained questions regarding conceptions about school inclusion and the profile of the interviewees. The second questionnaire was

prepared in order to analyze the contributions both to the teaching practice of teachers in training and to the process of self-reflection about the school inclusion process in Brazil. Student contributions were also analyzed throughout each activity.

This data was analyzed and cataloged, according to Bardin's content analysis (2016), and information such as responses and comments made during classes were analyzed according to the following categories: awareness (changes that the course provided) and contributions of activities from an inclusive perspective to academic and professional life. These categories will be presented below.

IV.1 Awareness/Changes that the discipline provided

To analyze the students' previous conceptions and pedagogical practices regarding Inclusive Education from the perspective of Special Education, the answers given in the first questionnaire were considered.

Initially, the answers given to the following question were taken into consideration: "Did you have any colleagues during Basic Education with a disability?" 54.5% of the class had no contact at all. The other students had classmates with visual and/or hearing impairments. This percentage showed that, despite the legal apparatus that governs school inclusion, the inclusive process is still presenting difficulties in its implementation, as 80% of participants completed high school in 2018 in public schools.

Such factors highlighted in this question served as validation for the importance of addressing historical aspects of inclusion in Brazil, some of the legal situations and professional experiences lived in different contexts so that teachers in training could reflect on their future practices and expand their perspectives and scientific knowledge on the subject.

Regarding the particular perception of an inclusive society, the following question was presented: "In your perception, is the society we live in inclusive for people with disabilities? If yes, cite examples of situations experienced that support your answer." Around 70% of the class wrote that today's society is not inclusive, as represented in the students' statements:

At the school I attended during elementary school, I witnessed an interesting reality. I had a Libras class once every 15 days, and we could interact with the students. However, they were only in the room for the interaction, because in terms of content there was nothing focused on their learning. Some days they would stay in separate rooms, with a teacher who taught them different things. (Statement from E1)

We try to describe ourselves as an inclusive society, but our practices don't even come close to that, we can see this from "little jokes" at school, lack of access, etc. (Statement from E2)

It is interesting to note that the students' idea of an inclusive society is not limited to accessibility. As mentioned, factors that still need to be modified concern the individual,

prejudice and attitudinal change that breaks paradigms in relation to Special Education. Souza and Machado (2024) state that ableism highlights exclusionary beliefs and practices in schools, making it necessary for initial teacher training to be guided by anti-ableist and inclusive principles.

Still along these lines, the following question was asked: "In your opinion, what is necessary for access and learning for all students, including those in Special Education?" The class took the opportunity to highlight their conceptions, their suggestions and their concerns about the process. When asked what would be necessary to guarantee learning, student E6 commented that:

It depends on the type of disability and the needs of each person. In the case of deaf students, there could be an interpreter in the room and the students could have access to Libras classes. In addition to understanding the subject, disabled students can also socialize and create bonds in the school environment. I believe that it is very important for students, in general, to feel part of the educational environment and feel that it makes sense to them, in a way this stimulates the search for knowledge. (Statement from E6)

Similarly, student E8 said that:

More complete training for teachers, so that they know how to deal with special needs students. I believe that a reformulation is necessary in undergraduate courses, especially in hard sciences. (Statement from E8)

Such statements are in line with different authors, such as Pimenta (2005) and Damázio (2007), who state that inclusion must occur from basic education to higher education, ensuring the use of methods that help people with disabilities overcome the obstacles that the educational process places on them, enjoying their rights and exercising their citizenship.

Other information, obtained from the questionnaire administered at the end of the semester, that deserves to be highlighted within this category correlates with the feelings aroused throughout the course.

[...] there was a certain feeling of gratitude, for being able to have contact with this type of information, and understanding how necessary and important it is to have these discussions in order to improve more and more. (Statement from E2)

[...] the main feelings awakened were empathy, tolerance, patience, creativity and the love of teaching. [...] listening to all the reports makes me reflect on my future practice, as it could happen that I teach a student with a disability [...] this type of reflection is necessary and there is nothing better than doing it with my colleagues. (Statement from E10)

These statements speak to the idea defended by Freire that awareness is a process of taking possession of reality, which reveals the incompleteness of being, an incessant movement of transformation, because the creation of a new reality, as indicated in the previous criticism, cannot exhaust the process of awareness (Freire, 2001). In this way, awareness consists of the individual's ability to criticize the world from the moment they are aware of themselves as an unfinished being, as well as the recognition of their reality, thus seeking to propose transformative actions and possible solid constructions of knowledge about practices.

Under this aspect, students realized through the activities and debates the importance of being a reflective teacher in the face of their practice, the context and the limitations of the school reality.

[...] talking about individual school trajectories without generating inequality, for me it does not involve just one subject [...] I think it is very complex for a single teacher to work individually within their context. (Statement from E1)

The teacher's main strategy is to get to know the students, understand a little about each one in order to work in the best way possible, this way it would be easier to prepare what will be presented, because, considering that his class may have one or more students with disabilities, he needs to adapt to this reality to find ways to teach without excluding anyone. (Statement from E3)

In line with inclusive practice, student E5 took the opportunity to complement, highlighting that:

[...] it is important to be in the classroom knowing the class and its limitations and to be able to adapt and complement the class using resources and activities that are possible for all students. [...] knowing the potential and difficulties of students is very important to be able to explore the best in everyone without inequality. (Statement from E5)

These arguments signal the importance of moments of reflection, because the more someone is led to reflect on their totality, the more they will emerge conscious, charged with commitment to reality. And in this time of exclusion, the convergence between awareness and education makes it possible to eliminate indifference to construct history as a possibility (Agostini, 2018).

IV.2 Contributions of activities from an inclusive perspective to academic and professional life

When it comes to validating activities from an inclusive perspective, in light of the principles contained in current Special Education educational policies, different conceptions are presented by students. It is worth presenting a comparison between the links highlighted in the questionnaires and the production of collective and cognitive ruptures. The methodological

choice and the adopted framework were relevant to support the discussion of the collected data, after all, the proposal to design the research based on Paulo Freire's concepts allowed us to problematize and overcome the naive conception of the world through a slightly more objective vision, starting with the possibility of a transformative action (Franco, 2016). So much so that this proposition was evident in the questions asked in the first and second questionnaires about possible strategies to include all students in the school context. In the first anamnesis, student E4 expressed that:

Firstly, an assistant teacher would be needed, who could accompany or assist the student with disabilities within the classroom. (Statement from E4)

After the dynamics, debates and conversations about the inclusive process for the Special Education public, the same question was asked in the second questionnaire. This same student wrote that:

[...] we can, through well-designed practices and lesson plans, include all students in developing a more welcoming space. (Statement from E4)

The inclusive lesson plan, prepared collaboratively, proves to be a viable strategy and can result in planning that meets the learning specificities of students, special education audiences (da Silva; Viana, 2021). In this context, Franco (2016) explains that the mutual protagonism between teacher and student plays a fundamental role in the awareness process. This process seeks to create conditions that break with naive consciousness, opening space for reflections and discussions that favor the development of a critical consciousness. Such dynamics can manifest themselves in the particularities, experiences and different forms of participation that each member of the discipline presented throughout the classes.

So much so that the participative investigation and insertion in the research context made it possible to verify such propositions. In one of the proposed moments of conversation with some guests, the students felt comfortable and expressed their doubts through the video conference chat. The interactions with the themes proposed in each class and the dialogues formed throughout the course highlighted the interest in understanding the barriers to inclusion and the importance of collaborative work in the school context.

Students asked guests different questions, such as:

What are possible ways to assess students with disabilities? Would the test be the same for everyone? (Statement from E3)

You all have many experiences with special education, have you ever experienced any discrimination, whether social, ethnic, of gender or because you work with children and adolescents with some type of disability? (Statement from E4)

Furthermore, these questions highlighted the involvement, participation and interest of the students with the topic addressed during the guests' speeches, as it was not a previously organized interaction. It was a movement that happened spontaneously and questions arose as the narratives were presented. This made it possible to infer that each person's life stories not only described their experiences and worldview, but inevitably made the class identify the challenges of the school inclusion process, as well as the different strategies for reorganizing and overcoming each condition.

In the dialogical relationship, teaching and learning are possible when "the critical thinking of the educator is surrendered to the curiosity of the student". But, for this to happen, dialogue cannot become a freewheeling chat that happens at random between teachers and the student (Freire, 2003, p. 118).

Another factor that may have contributed to fostering this interaction was the distribution of activities in the first classes, such as the development of an inclusive lesson plan. As it is a challenging process, thinking about teaching practice from an inclusive perspective can open up a possibility for the "awakening" of critical curiosity. This curiosity occurs as naive curiosity, without ceasing to be curiosity, becomes more and more critical through education, becomes rigorous in methodological terms and achieves the conditions for a broader understanding of reality.

Certainly, the idea of creating situations for teaching from an inclusive perspective combined with reports of experiences led the class to discover, reflect and transform meanings, that is, it culminated in a collective reflection. Freire (2017) highlights that this dynamism can be attributed to a reading of the world, a relationship between language and context. Believing that this relationship is indisputable, it is only possible to attribute importance and relevance to school reading practices when the reader is elevated to the status of subject, in parallel with active work with their peers in the search for understanding different aspects of reality through texts and dialogues.

Melo (2018) comments that teaching action needs to go through the process of constant reflection, after all, the teacher who mediates knowledge needs to value heterogeneity as a relevant point in the teaching and learning process. In this sense, it is argued in this research that the training received directly reflects on the professional who is trained, their way of intervening in school realities and teaching situations provided to students.

In the second form, when asked about the most important activities for teacher training, more than 80% of the class mentioned the reports of experiences by Basic Education professionals about the school inclusion process. This exchange of experiences presented itself as interactivity, being cited as a differentiator in order to understand the individualities and difficulties of the subjects in the inclusive process, valuing the potential of each one.

Among the speeches, one of the invited teachers told the students that:

Initial teacher training in inclusive education is of paramount importance. (Teacher's speech)

This statement made by the teacher was consolidated in the students' responses about how the activities were conducted throughout the course.

Talking about inclusion was important to understand some things I was confused about, differences between segregation, exclusion, inclusion, etc. I'm sure I'll take this subject for life, as I had no idea how to organize my classes if I had a student with a disability. However, after the activities I was able to understand at least a little the process for teaching and developing activities. (Statement from E8)

It was possible to infer the importance of the historicity of inclusion and also of the reports, after all, the students had the opportunity to reflect, even in a small sample space, on the challenges inherent to a classroom. This fact was evidenced in the speech of a student, who said that:

[...] in addition to broadening our horizons with the guests' reports, [...] all the dynamics made us think and imagine what it would be like in teaching practice, although this type of experience we can only acquire with time and dedication. (Statement from E10)

In this sense, there is a range of contributions of activities from an inclusive perspective that deserve to be highlighted.

[...] difficult to describe the amount of contributions. Before this subject, I didn't even imagine many of the different scenarios we learned about. This subject was really a huge change for me, an innovation and excellent personal, academic and professional growth. (Statement from E12)

[...] the opportunity to enter a new world, knowing the difficulties and expectations of the teacher, the students, the school and even the family. I researched an inclusive school and dreamed of being able to contribute to this. I observed that many of the difficulties come from prejudices that we don't even imagine as part of us and we blame society without thinking that we are a part of it. For me, it was the best discipline of this period. (Statement from E9)

Better understanding of my role as a teacher in relation to inclusive education for students with disabilities, the subject also contributed to a better understanding of the pedagogical proposals for inclusive education in physics teaching. The subject contributed a lot so that I could not only worry about teaching physics to students with disabilities, but understand that each student has a more effective way of absorbing the content, and that it is up to the teacher to approach and understand the needs (especially students who have a high level of support in some cases), without isolating the student from the class.

This argument comes to reinvigorate the act of teaching because, “[...] teaching is not transferring knowledge, but creating possibilities for its production or construction” Freire

(2003, p. 47). Thus, we believe that in the process of school inclusion, the practice of otherness should be prioritized, avoiding the reproduction of an education model in which intolerance and discrimination predominate, with this motto being defended and exposed to students of the subject throughout the course. According to Costa and Diez (2012, p. 5), otherness “is an opening that challenges the subject to respond in each new situation to the concrete requests of the other”.

Among the highlighted contributions of the pedagogical practices developed throughout the course, it is important to also comment on the challenges imposed by teaching in a remote format and here a critical reflection is necessary, after all, according to Freire (2003), when it becomes an epistemological curiosity – that is, capable of reflecting on the nature, stages and limits of knowledge – curiosity becomes rigorous in methodological terms and conquers the conditions for a broader understanding of reality.

The difficulty of getting contact with Physics teachers from the Basic Education network, schools closed for face-to-face attendance and the restrictions from the pandemic context were preponderant factors for the challenges of establishing a partnership between university and school. In fact, student E1 wrote that:

[...] when classes are in person, students will be able to enjoy the topics covered much more, as it may be possible to visit a special school, an inclusive school, so that they can learn in practice the difficulties faced by these students and professionals. (Statement from E1)

Another suggestion that deserves to be commented on is the systematization of the inclusive lesson plan. For the E2 student, future practices may address:

[...] more presentations on the development of lesson plans, so students with another topic could have more contact with the creation process of this one, giving suggestions and ideas, making all plans a shared creation. (Statement from E2)

This argument correlates with an observation made when sharing each group's lesson plans. Therefore, it would be interesting to use more than one class to construct the class script, which may include the organization of objectives, the culmination of skills and the systematization of the methodology to be adopted. It is also a suggestion, after preparing these scripts, to organize a moment of socialization so that each student can comment on their ideas.

It is worth reinforcing the contributions of participative research in these situations, after all, complete immersion in the context of this research allowed us to analyze speeches, writings and, mainly, reactions not present in the lines of the forms. One behavior noted during the presentation of the lesson plans was the groups' difficulty in organizing the methodological script for a class, as few had contact with the school context. Beforehand, it is worth highlighting that it would be a class for a room with at least one student with a disability. To this end, the subject teacher made available in the course's virtual environment a model plan containing each step that should be followed.

It is interesting how the particularities of each disability were carefully adopted by the groups and how the dialogues carried out throughout the classes contributed to this. In some scripts, the students named the characters in the room, chose assistive technologies according to the tips given by the guest teachers and approached the content in an interactive, inclusive and collaborative way between the subjects who would be part of the rehearsal. Once again, it is important to emphasize that the focus of this practice went beyond knowing how to do it. The key idea was both to create an inclusive Physics class, that is, one that would involve everyone's participation in the process, and to stimulate critical curiosity in students. After all, there would be no creativity without that curiosity that worries us when faced with so many doubts about this world which, as it is undergoing transformation, requires participation (Freire, 2003).

V. Final considerations

Although legislation ensures the right of access to regular education for students with disabilities, their inclusion faces several challenges, including the lack of qualified professionals and accessible teaching materials to guarantee an education of quality. Therefore, initial teacher training needs to prepare students to deal with the diversity of needs, the scarcity of accessible materials and the ableism that still persists among students and educators.

Therefore, the central objective of this research was to investigate and analyze the main contributions of the development of inclusive activities, in light of the principles of Special Education, applied in a discipline of the Physics course, licentiate degree, at the Federal University of Uberlândia.

Participant observations carried out throughout the implementation of the activities found that the main contribution was the production of collective and cognitive ruptures regarding the challenges inherent to inclusive education, especially with regard to special education. From the data collected and analyzed in this study, it was possible to understand the plurality that constitutes the educational processes of undergraduate students, so that the construction of knowledge about inclusive education was triggered by elements of different dimensions.

Therefore, the importance of dialogicity during the implementation of activities was observed as a way of understanding the experiences of undergraduate students in the field of inclusion of people with disabilities. The responses in the questionnaires validated the idea that empathetic listening and the collective construction of knowledge were preponderant factors for the students to expand and diversify the sources of teaching knowledge, in an ethical and collaborative way.

Students also had the opportunity to give new meaning to their conceptions about Inclusive Education and Special Education, based on the confrontation between theory and practice and the reports made by the various guests, in conversation circles that dealt directly or indirectly with the process of school inclusion. Training was carried out that included studies,

debates and incentives for the construction of scientific research on the context of school inclusion and practices that trivialize discrimination of any nature.

Given this, the organization of a training space/time based on Freirean concepts enabled future Physics teachers to reflect on educational processes and the possibilities for organizing their teaching action, with a view to guaranteeing access to knowledge for all students. Furthermore, learning was also consolidated for the author, a Basic Education teacher, with a complete immersion in the context, provided by participative research, which took place under the aegis of participation and made her reflect and problematize her own teaching practice.

Undoubtedly, the methodological strategies adopted in the discipline provided different and important reflections. As highlighted by Freire (2001), the idea was not to feed the passivity of students in training in accepting their current condition, but to encourage them to modify their performance through active transformation. In this context, discussing the inclusion of people with disabilities in initial training is fundamental, as it prepares future educators to adopt inclusive pedagogical practices, respecting the specific needs of each student, promoting an anti-ableist environment and ensuring a fairer and more equal education. Furthermore, this approach contributes to the creation of more accessible, appropriate and genuinely inclusive educational spaces for all students.

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