An experience in training for teaching in higher education is presented in the subjects encompassed by the Supervised Internship Program for Teacher Education. The main challenges reported by graduate students were: generational conflict; the empirical learning of the teacher's doing; the fragile appropriation of educational concepts. The challenges faced by teachers in conducting the disciplines permeate the mediation of learning by breaking paradigms and encouraging reflection of the practice and meaningful learning. The subjects allowed, in the student evaluation, the critical analysis of their social role; the management of the educational process; the approximation of educational concepts and strategies; and changes in practice. It is hoped that this report can inspire other programs and support initiatives that consider reviewing the role of graduate studies in teacher education.

Keywords: Teacher education. Higher education. Active methodologies. Meaningful learning.
Introduction

Contemporary education and the training of future teachers for higher education is a relevant topic as well as an open debate. Challenges are identified on two fronts: in the teaching performance due to the reproduction of the vertical transmission of knowledge to students; and in graduate courses, most of which prioritize researchers’ training to the detriment of pedagogical training1-8.

The scientific community’s concern with teacher training has been growing given the complexity and social challenges of the 21st century that demand professionals with more tools to solve problems and face the unpredictability of situations, allowing them to integrate theory and practice and favor the transformation of reality9-12.

The literature shows that teaching, research, extension and management are roles to be played by the teacher, which requires skills to be accomplished and translates the complexity of the formation in graduate programs13-20. It is also possible to see successful initiatives that seek to overcome the weaknesses of teacher training21-23 in articulation with moments of practical teaching practice24, interprofessionalism and collaborative practice20.

We seek to present the experience in teachers’ training in higher education with the disciplines encompassed by the Graduate Program in Science, Technology and Society (PPGCTS in the Portuguese acronym) that meet the Program for Supervised Internship in Teachers’ Training (PESCD in the Portuguese acronym). Moreover, we intend to contribute to the discussion of innovative educational initiatives for teaching in the post-graduation stricto sensu by pointing out feasible possibilities for its realization.

The PESCD at PPGCTS: presenting the context

The PPGCTS is a Postgraduate Program focused on the field of Science, Technology and Society (CTS in the Portuguese acronym) and is constituted as an academic field of research and interventions. It studies the interactions and social determinations of science and technology, in their socio-historical and cultural factors that influence scientific-technological changes, forming an interdisciplinary field25.

The PESCD is aimed at improving the training of graduate students at the master’s and doctoral levels, offering them pedagogical preparation through supervised internships in undergraduate teaching activities26. The two PESCD disciplines in the Program are: a) Supervised Internship in Teacher Training in Science, Technology and Society (PESCD 1); b) Teaching Practice in Science, Technology and Society (PESCD 2). From 2007 to 2014, the postgraduates’ activity consisted of teaching internship through the monitoring of undergraduate classes with the supervising teacher, as required by the Coordination for the Improvement of Higher Education Personnel (CAPES in the Portuguese acronym)27. The responsibility for the PESCD was with the program coordination, which received the scholar’s plans and reports for internal filing.
Since 2015, we took on the PESCD as professors of the Program after understanding that the design of the discipline previously offered did not reach the perspective of critical reflection regarding educational practice. In general, the postgraduates reproduced forms of teaching based on the traditional model of education, showing a mechanistic, individualistic, uncritical and reproductive professionalization of work.

From this context, we suggested the Program take over the two disciplines and proposed the following changes: 1) In terms of the composition of the group: opening up enrollment to non-granting post-graduate students, real integration between master’s and doctoral students in the same academic semester and a limit on the number of participants for small-group work. 2) In terms of concepts: introduction of collective reflection meetings on teaching practice with the facilitators between undergraduate practical training periods, valorization of interdisciplinarity, the ethical-dialogical approach to competence and the horizon founded on social transformation.

In 2017, a post-doctoral student of the Program was invited to join the group of teachers for having previous experience with active methodologies. Such participation was incorporated as an activity to her postdoctoral work plan developed in the Program, resulting in the writing of this manuscript.

**The methodological path**

This is an experience report of the PESCD 1 and 2 courses of the PPGCTS. The construction of the article was developed by two professors and a post-doctoral student of the Program, in a reflective and analytical effort of this experience. We used as material for analysis our field diaries composed by the written records from the observations during the courses; and by the personal impressions (meanings, emotions, visions and perceptions) after the end of the activity.

We also organized ‘trigger questions’ as analytical routes of the experience: What is the approach of postgraduates in the integration of educational theories with practice focused on student learning? What changes do we see in the graduate students as transmitters of content to facilitators of the teaching-learning process? What clues do we find in the perspective of critical and reflective teachers? How was the educational initiative a driver for changes in practice?

We seek to bring elements of the process for constructing the knowledge woven with the postgraduates in this educational initiative. We used the concept of experience which states that “experience is not the path to an expected goal that is known in advance, but an opening to the unknown” (p. 28).

In each group we experienced a new path towards the unknown, and the singularity of each one of them is not the focus of this text. We intend to bring in this text a synthesis, pointing out aspects that were common to all the groups and that, in our opinion, show a panorama of the experience.
The proposition presented is the result of a construction of a repertoire unifying experiences, knowledge, theories, and techniques. At some point they may seem contradictory, but it is in the dialectics that we understand that there is potency for construction, and not in the proposition of a single perspective. We seek to expand tools and strategies to deal with the unexpected, and in the integration, we seek coherence, reinvention, and flexibility to plan throughout the process - calling it an educational process - based on the essence of each group and the context experienced by all.

**The educational experience with active teaching-learning methodologies**

We intentionally structured the courses by using active teaching-learning methodologies so that the postgraduates could experience the experience while reflecting on it and their practice in the field, as well as regarding: the role of teachers and the construction of his/her identity in the 21st century; constructivist learning in small groups; the focus on student learning; and educational strategies for their future work as teachers.

Active methodologies provide engagement of students in the educational process, from the development of critical and reflective capacity, proactivity and team collaboration, contextualized learning and intervention in reality. In the interactionist theory, the focus is between the subject that learns and the knowledge, so that the learning process is influenced in multifactorial ways and the gain is mediated by prior knowledge and new knowledge linked to meaningful experiences.

The educational strategies we have proposed (Chart 1) are grounded in the theoretical approaches to learning: Lev Vygotsky’s social interaction; David Ausubel’s meaningful learning; John Dewey’s learning by experience; and Paulo Freire’s pedagogy. Other authors helped in the operationalization of the proposed strategies, with many of the sources being from the health area, as a result of our activity area.
Frame 1. Educational strategies developed in the disciplines

<table>
<thead>
<tr>
<th>STRATEGIES</th>
<th>TRIGGERS</th>
<th>INTENTIONALITIES</th>
<th>METHODOLOGY</th>
<th>THE ROLE OF TEACHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Strategy: Round of Talk</td>
<td>Eye-to-eye conversation.</td>
<td>- Horizontality and dialogue in the teaching-learning process.</td>
<td>- Seating in a circle. - Limited number of participants (small group).</td>
<td>- Participants from the collective, but with the responsibility of facilitating the activity. - Meditation to ensure space for everyone to speak, respect and freedom of expression.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Approach and bond building between faculty and postgraduates from their life stories.</td>
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</tr>
<tr>
<td>Day 1: Introduction of the participants; Working pact; Expectations.</td>
<td>Didactic Contract⁶</td>
<td>- Construction of a dialogical relationship between professors and postgraduates. - Collaborative planning and management of the discipline. - Encouraging commitment, participation, compliance with pacts and negotiations, flexibility and decision-making by all involved.</td>
<td>- Triggering question: What elements do we consider important for the work to be meaningful, collaborative, and committed? The proposals are summarized on a flip-chart placed on the wall. - Essential items: respect for everyone and for diversity, ethics, balance between speaking and listening, commitments, collaboration, and practical rules of operation. - Signature on the flip chart to symbolize the commitment to the proposal, which may be changed throughout the meetings, if the group wishes.</td>
<td>- Facilitation. - Participants of the activity in the complementation. - They sign the document together.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Intersection of wishes, desires, expectations and proposals between professors and postgraduates.</td>
<td>- Each participant writes down three expectations about the discipline. - Mobile visualization technique with flipcharts, with grouping of expectations in nuclei of meaning.</td>
<td>- Facilitation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Construction of the baseline: starting point of previous knowledge.</td>
<td>- Technique of mobile visualization and nucleus of meanings with cards and subsequent thematization.</td>
<td>- Facilitation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Construction of meanings and representations.</td>
<td></td>
<td>- Facilitation.</td>
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<tr>
<td></td>
<td></td>
<td>- Identification of learning gaps.</td>
<td></td>
<td>- Facilitation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sharing of knowledge, perceptions, feelings and previous values of each postgraduate.</td>
<td>- Reading of the narratives of all participants, with the intention that the oral reading be done by a person from the group other than the author himself. Listening to the narrative in the voice of a colleague can stimulate insights and sensations.</td>
<td>- Facilitation.</td>
</tr>
<tr>
<td>Culture Circle⁶</td>
<td>Challenges and potentialities of the 21st century professional</td>
<td>- Sharing of the participants’ vocabulary universe, from which generating words are extracted.</td>
<td>- Provisional Synthesis: small-group discussion with identification of problems and/or challenges, construction of explanatory hypotheses and formulation of learning questions. Everyone searches for answers to the same questions as a strategy for analyzing and comparing different sources and authors.</td>
<td>- Facilitation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Technique of mobile visualization and nucleus of meanings with cards and subsequent thematization.</td>
<td>- Scatter activity (individual activity): search the scientific literature for answers to the learning questions.</td>
<td>- Remote support.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Round of uncertainties, doubts and/or motivations for study/ deepening in a later meeting.</td>
<td></td>
<td>- Facilitation.</td>
</tr>
<tr>
<td>Constructivist Spiral⁶</td>
<td>Reflective narrative about a significant educational experience.</td>
<td>- Survey of perspectives and interpretations. - Sharing of explanatory systems. - Identifying knowledge gaps.</td>
<td>- New Synthesis 1: sharing of individual study based on the findings of the benchmarks. - New Synthesis 2: if desired by the group, the contents are deepened through seminars, dialogues with specialists, etc.</td>
<td>- Facilitation.</td>
</tr>
</tbody>
</table>
The profile of 21st century students as seen by postgraduate students

One of the central discussions brought up by the postgraduates is about teacher-student relationships. There are challenges in the generational conflict based on the reference of what it is to be an undergraduate student from the postgraduates’ point of view - the 3D generation (dispersed, dis-focused and distracted) - as it was “nicknamed” by one of the classes directly related to the difficulties in dealing with technologies in the school environment and stimulating student proactivity.

The main explanatory hypotheses of the graduate students for these problems lie in the lack of knowledge about how technologies can support teaching; the discontinuity of educational policies and programs that hinder planning; the limited governability of the teacher to macro-political decisions; the fragmented curricular organization; the different expectations in the teacher-student relationship; and the lack of prior training for teaching.

The concerns of the graduate students also shed light on the difficulty in disentangling the role of the teacher in the centrality of the teaching-learning process, and that their performance is intuitive. The groups presented a low appropriation and application of educational concepts to their teaching practice. The reflections showed that most of the decisions were either authoritarian or contradictory.
A study points out that educational programs are organized through contradictory structures, in which aspects such as methodology, theoretical conception, and bureaucratic issues merge with the teacher’s other demands, bringing into play the existence of ethical dilemmas during interactions in the classroom environment.

Stimulating the breaking of paradigms is not a simple process to conduct in the role of facilitators: to mediate the discussion; to welcome the speeches; to bring in the emotions-affects-attitudes; to identify the nature of the problems; to enable meaningful learning; to include mistakes as the essence of learning. It is necessary to overcome the alienating and authoritarian relationship imposed through love, freedom, and dialogue, in a construction process that can make sense to both. The perspective is for postgraduates to be creative and critical producers of new knowledge, from the recognition and a metalanguage exercise about emotions.

Reflection of the teaching practice: pedagogical option on the path to praxis

Reflection of the practice is a collective and protected space in which postgraduates bring and discuss elements of the practice of teaching in the internship with the undergraduate and put them under analysis, build new knowledge and seek actions and solutions to return to the same scenario. The reports are experiences from the perspective of the person who experienced them, and the group acts collaboratively. It is in the moment of reflection-on-action that can be gained awareness of the process, identifying beliefs and developing self thinking, establishing the link between theory and practice.

It is important to note that we distinguish between reflection in practice and reflection of the practice. They are differentiated by the moment in which they happen: reflection in practice occurs during the action, while reflection of the practice occurs after the event. We understand that reflection of the practice is more powerful because it presupposes a distance from those who have lived a certain situation, allowing for distinct associations, cognitive and emotional processes. Besides this, the problematizing support of the facilitators and the contribution of other colleagues in the group can add other worldviews and stimulate new connections.

As a trigger we used the technique of the critical incident, which is:

[...] an event delimited in time and space that, by crossing a certain emotional limit of the teacher, puts in crisis or destabilizes his conventional way of acting. (p. 60)

We use the path described by Domingos in three steps: 1) the postgraduate places the critical incident in the context, defining its meaning and other elements he/she deems important for understanding; 2) the group analyzes the development of the critical incident, by means of the destabilizing motives, the behaviors, the decisions taken and
the emotions and feelings provoked and the consequences of the same; 3) the reflection returns to the post-graduate who brought the situation for a new interpretation of what happened. We make room for several possibilities of incidents: didactic, organizational, in the teacher-student relationship, and affective aspects.

The post-graduate students revealed that the role of the teacher, the teaching and evaluation methodologies were little or not discussed during the internship with their supervisor. In general, the experiences took place with the supervisor accompanying and/or replacing him in the activities with the undergraduate students. The main and most recurrent teaching strategy used was the lecture classes, with an opportunity to ask questions at the end. Some postgraduates had the experience of taking over the class without prior contact with the class.

The discomfort and conflicts were part of both the individual perspective, of the small group, and the institutional perspective, since the evaluative culture and self-evaluation were not quite present in the experience of the post-graduates and their supervisors. Different situations were raised: conflicts with the supervisor when questioned about his practice; some post-graduates risked changing the previous planning of the class by offering other teaching-learning strategies; others reported they could not because the study of the content to be taught took up all the planning time; others thought about changing, but could not because the nature of the content was too operational. These elements appear in line with the literature, from the perspective that only the mastery of specific knowledge is not enough for future teachers to deal with the uncertainties of their actions in work situations and that the traditional model of teaching through the transmission of knowledge is still used by many university professors1,12,16,47.

In the field diary analysis, we verified that the post-graduates’ reflections started at a more superficial level translated into aspects of the event itself, increasing in depth proportionally to the number of meetings bringing reflective elements such as the competencies and the professional identity of the teacher.

The role of teachers in transforming reality: a path to follow

From the viewpoint of exercise as a social practice, the professionalization of the university teacher was evaluated by the post-graduate students as one of the strategies for rethinking the daily routine of doing and their role in society.

It is common in the first meetings to hear from post-graduate students about their tiredness and frustration, even though they are beginners in the academic career. One of the first factors they present is the lonely work of the teacher. They do not find room for exchange and sharing of ideas, teaching methodologies, and decision making with their colleagues. In addition, they have a relative hopelessness in teaching due to the precariousness and low valuation of education in the country.
Thinking about change from traditional education to a progressive perspective demands interaction among teachers\(^1\text{a}\), since the material and formative structures have not always kept up with the contemporary demands of teaching\(^2\text{a}\).

The problematization that we brought from the postgraduates’ reports about the teaching model they adopted was recurrent and its understanding was being sedimented through the perspective of spiral learning\(^3\text{a}\), accessing different layers of knowledge and deepening them with each retake.

These successive approaches allowed us to go beyond the discourse of reduced teaching practice linked to the model of their masters, the low transposition of the content passed on, the lack of meaning, and the dissociation between theory and practice, providing us with understandings that: a) the teacher-student relationship should be dialogical; b) the teacher also learns; c) it is important to pay attention to singularities for learning; d) student permanence is relevant, considering social exclusions and diversities; e) the intersection of emotions and rationalities is relevant.

**Our self-evaluation: limits and possibilities of the proposal**

The proposal presented was conceived based on the analysis that the qualification for teaching in the post-graduation courses in Brazil has remained in the background, with the PESCD being one of the few offerings.

We evaluated that PESCD 1 works as a trigger for a first approach to the themes, presenting limitations as to the depth of the nature of the change in the teaching role when the postgraduate enrolls only in PESCD 1. Most students decide to continue their studies in PESCD 2. Although it is mandatory for PhD scholarship students to take the course, the other students in the program are interested and take it as an elective. We evaluate that in PESCD 2, the postgraduate students advance in gaining awareness and temporal permanence of the change in practices. Although we are teachers from the health area, and sometimes do not know the technical specificities of other areas, we believe that this did not interfere much since our role is to facilitate the teaching-learning process. To assume and develop this role is not simple because it requires continuous planning, flexibility, and mediation of the post-graduate students’ initial strangeness with the methodology. Moreover, there is a need for ongoing faculty training and development to play the role of facilitator of student learning-centered processes.

We have made many criticisms of the fad of active methodologies in the form of application of more dynamic techniques and methods, but translated into practices that are still reproductive of teacher sovereignty and/or instrumental application of the content presented. We understand that the application of active methodologies without the proper theoretical and methodological understanding that subsidize them can generate the overlapping of fragmented strategies that do not seek dialogical educational processes, which empower and transform reality.
It is our consensus that knowledge is a process built over time, with lived experiences and critical reflection of oneself and one’s surroundings. For this reason, the disciplines have limitations and this isolated initiative does not guarantee changes in the practices of future teachers.

Another weakness we recognize is the fact that there is still no direct dialogue with the supervising teachers of the PESCD. The fact that they come from different fields of knowledge and are allocated in different centers of the university can be an explanatory hypothesis, but the most likely is that in this historically complex process, the time for a closer relationship has not yet come.

However, the challenges faced with this proposal are grounded in our commitment and the ethical imperative to contribute to the country’s education. We need to resist and be creative, even in difficult contexts. Paraphrasing one of our experiences with a group of trainers in educational processes in health, we need gas in resistance! We hope that this work can inspire other Programs and support new initiatives that consider reviewing the role of graduate studies in training for teaching.

**Authors’ contribution**

All authors actively participated in all stages of preparing the manuscript.

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**Conflict of interest**

The authors have no conflict of interest to declare.

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Apresenta-se uma experiência na formação para a docência do ensino superior nas disciplinas que compõem o Programa de Estágio Supervisionado de Capacitação Docente. Os principais desafios relatados pelos pós-graduandos no contato com seus estudantes foram: o conflito geracional, a aprendizagem empírica do fazer do professor e a frágil apropriação de conceitos educacionais. Os desafios das docentes na condução das disciplinas perpassam a mediação da aprendizagem na quebra de paradigmas; e o estímulo à prática reflexiva e à aprendizagem significativa. As disciplinas permitiram, na avaliação discente, a análise crítica do seu papel social; a gestão do processo educativo; a aproximação de conceitos e de estratégias educacionais; e mudanças na prática. Espera-se que este relato possa inspirar outros programas e apoiar iniciativas que considerem rever o papel da pós-graduação na formação para a docência.