

Teacher training in federal institutes and the learning of teaching in practice as a curricular component ^{1 2 3 4}

A formação de professores nos institutos federais e a aprendizagem da docência na prática como componente curricular

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Abstract

This article deals with an investigation on the induction to teaching in disciplines that offer the practice as a curricular component (PCC) in the context of a Federal Institute of Education. In this work we focus on the current work model of PCCs, suggesting some possible means to articulate them with basic education. Data consisted of institutional documents and narratives of undergraduate students of Chemistry and Biology. The initial results indicate that the PCCs comply with Brazilian legislation regarding academic load, institutions implemented several significant practices such as the construction of models, experiments, games, and practical classes. However, they also present weaknesses as to the overvaluation of specific knowledge formation to the detriment of teaching training.

Keywords: *initial teacher training, curricular practice, teaching induction, internship*

Resumo

Este artigo trata de uma investigação que está sendo realizada no contexto de um Instituto Federal de Educação, cujo objetivo é identificar como ocorre a iniciação à docência nas disciplinas que oferecem a prática como componente curricular (PCC). Neste recorte, será focalizado como se dá o atual modelo de trabalho com as PCC e serão sinalizados alguns caminhos para a articulação destas com a escola de educação básica. Utilizou-se, como metodologia, a análise de documentos e a recolha de narrativas com licenciandos dos cursos de Química e de Ciências Biológicas. Os resultados iniciais apontaram que as PCC cumprem o disposto na legislação brasileira em relação à carga horária, verificando-se que várias práticas de inserção à docência estão ocorrendo, tais como a construção de modelos, experimentos, jogos e aplicação de aulas práticas. Entretanto, identificam-se fragilidades, sobretudo, no nível da sobrevalorização da formação dos conhecimentos específicos, em detrimento da formação pedagógica para a docência.

Palavras-chave: *formação inicial de professores, prática curricular, inserção à docência, estágio*

1. Introduction

Teacher training is currently widely debated internationally by scholars and decision-makers. In Brazil, in the last years, there have been many actions aiming to overcome the lack of teachers and to promote pre- and in-service training, to fulfill the demands of socioeconomic and political contexts. Since the promulgation of *Lei de Diretrizes e Bases* (LDB- National Education Guidelines) (Lei nº 9.394, 1996), there have been many reports, guidelines, resolutions, and curriculum parameters created by *Ministério da Educação e Cultura* (MEC- Ministry of Education and Culture) and the *Conselho Nacional de Educação* (CNE- National

Education Council), aiming to think about and implement new processes for teachers' education and training.

From a pre-service perspective, after the promulgation of LDB/1996 the *Parecer* n° 9/2001 of CNE establish the *Diretrizes Curriculares Nacionais* (DCN/2002- National Curriculum Guidelines) for Teaching undergraduate degrees, in all states of the country, which, regulated by reports and resolutions, establish the guiding principles and criteria to organize the curricular matrix of teacher training courses. In 2015, *Resolução CNE* n° 2 from July 2015 approved the current *Diretrizes Curriculares Nacionais* (DCN) to pre- and in-service teacher training. It substantially increased the academic load of Teaching degrees, from a minimum of 2,800 hours to 3,200, mainly in practical teaching activities.

In this scenario of changes, we highlight the movement to create the *Institutos Federais de Educação, Ciência e Tecnologia* (IF- Federal Institutes of Education, Science, and Technology), through Law n° 11.892/2008, who offer at least 20% of their places to Teaching degrees. According to Lima (2013), out of the Teaching degrees offered by IFs, 60% were created after Law n° 11.892/2008.

Despite the many changes in pre-service training, the training process in many higher education institutions (HEI) - including IFs and universities- still has weaknesses, such as the fragmentation of the subjects on the curriculum matrices, the disconnection between teaching practices during the courses and the future work market – the everyday of basic education schools. According to Gatti, Barretto and André (2011), teacher training in Brazil still has fragmented curricula, with excessively generic content, a great dissociation between theory-practice with fictional school placements. If that situation takes place in the scenario of universities, which have a long experience with pre-service teacher training, it is even worse in the IFs with little experience in the field.

In this scenario, IF professors (teacher trainers) join these higher education training institutions with no prior pedagogical formation. A common situation in the HEI, as, according to Pimenta and Anastasiou (2014), many professionals teach in higher education with no idea of what it is like to be a teacher, “though they bring a great knowledge on their areas of research and work, they often have never questioned themselves on what it means to be a teacher” (p. 104). This is especially serious when we know that these professors teach from high school until graduate school in the IF context.

Therefore, the need and importance of this research, conducted by a group of teachers from a unit of IF Goiano with the support of two professors from *Instituto de Educação da Universidade do Minho*, Portugal, aiming to identify how is the induction to teaching in subjects offering practice as a curriculum component (PCC),⁵. In this work, besides focusing on the current work model of PCC, we point out some ways to articulate them with the everyday life of school.

The research was guided by the following questions: How is the ‘induction to teaching’ dealt with in the subjects offering PCC? Which elements, in terms of learning to be a teacher, indicate a process of teacher training?

In the article, we first present the methodological pathway of research, followed by some theoretical assumption on pre-service teacher training, *projeto pedagógico curricular* (PPC- Curriculum pedagogical project), and the analyses on the current work model with PCC of the institute researched.

2. Methodological pathway

The research has a qualitative approach, a term that, according to Bogdan and Biklen (1994), encompasses several study strategies. This type of research is characterized by: the subjects’ environment as a direct source of data, and the researcher as the main instrument; an emphasis on the process rather than the product; following the tendency of analyzing data inductively. The authors affirm that “... by apprehending participants’ perspectives, the qualitative study sheds lights on the dynamic of the situations, a dynamic that is frequently invisible to an outside observer” (p. 18).

As a methodological procedure, we have analyzed documents, conducted, and analyzed narrative interviews. About the documents, we have analyzed the curriculum pedagogical project (PPC), the curriculum matrices, and the syllabuses of the specific subjects that offer PCC in the Chemistry Teaching degree (CT) and Biology Teaching degree (BT).

⁵ According to *Resolução CNE/CP nº 2/2015*, PCC is a set of formative activities that allow students to apply their knowledge or the development of procedures expected to teachers’ work.

To write the interview script and conduct them, we were grounded in several authors, such as Souza (2013), Sarmiento (2009), Clandinin and Connelly (2011), and others. To Souza (2013), the narrative interview “...set in a conversation tone or an everyday chat, reveals the trajectories of families and schooling, allowing us to apprehend aspects of life-education of the subject and their marks on teaching” (p. 133).

Narrative interviews allow interviewees to talk about themselves and their learning, through their personal and professional history, immersed in a sociocultural environment. Nevertheless, oral narrative interviews allow a deeper understanding of the phenomenon observed and the many intervening parts around it, what can be invisible in written narratives, as it does not favor dialogue, a face-to-face connection between interviewer and interviewee. To Souza and Oliveira (2013), “the contact with their experiences and the way it is narrated, allows the narrator to reveal the weaves of personal and professional everyday life...” (p. 134).

We organized and analyzed the data following the three different phases of content analysis: (i) pre-analysis; (ii) exploration of material and data treatment; (iii) inference and interpretation (Bardin, 2013).

The research *locus* institute, IF Goiano has, approximately, 25,799 students in 42 higher education degrees, 38 technical courses, 12 specialization courses, and 15 *stricto sensu* graduate courses. It offers teacher training through undergraduate degrees, in-service training, graduate school, among others. Currently, IF Goiano offers, in different *campi*, the teaching degrees in biology, chemistry, mathematics, pedagogy, and a second teaching degree in pedagogy through the platform Paulo Freire. In the campus *locus* of this research, IF offers the teaching degrees in biology and chemistry.

The research was led by a group of professors working in the Teaching degrees who are part of the research group “Educação” of the institute. The research was registered in the Ethics Committee of *Plataforma Brasil*. In the first phase of the research we collected written narratives of 50 undergraduate students from the analyzed courses. As selection criteria, the student needed to have participated of, at least, two PCCs, and to be interested and willing to participate in the study. After, we selected nine undergraduates (four from CT and five from BT), due to

the representativeness of their answers to the researched problem, to collect their oral narratives⁶.

To safekeep their identities, they are identified by their initial, followed by the initial of their degree. Thus, in the Chemistry degree, we have MC, PC, AC, and FC, and in Biology, BB, CB, MB, NB, and AB.

3. Learning to teach in the school placement and the articulation between PCCs and school reality

Many theorists, amongst which we highlight Tardif (2013), have been defending the importance and the need to approximate Teaching degrees practices to the future work field. To the author, teachers' knowledge is connected to work situations with students, colleagues, parents, in the complex task of teaching, in the classroom, in the historical, and social context of the institution. Thus, it is key that training is effectively linked to the context of basic education schools

This approximation, besides favoring a better understanding of the concepts through a theory-practice relationship, allows several experiences in school and the awakening to teaching. On her turn, Gatti (2013) affirms the need to approximate pre-service training to basic education schools and warns that this training cannot be seen only as from disciplinary areas added to the pedagogical knowledge, "...but it needs to be thought and enacted from the social role typical of basic education, school, and the schooling processes – teaching new generations the accumulated knowledge and consolidate values and practices coherent to our civil life" (p. 59).

Certainly, the future work field of these undergraduates is a key space to be considered in pre-service training as it is a matrix of multiple learning and knowledge on teaching. It is in the school context that undergraduates will learn to be teachers. According to Canário (2001), school is the place where one learns to be a teacher and the pre-service training "consists in learning to learn with the experience" (p. 156). Mizukami (2013) affirms that "... school is, *per excellence*, a place of learning and professional teaching development" (p. 23). Pimenta and Lima

⁶ The interviews were fully transcribed, thus reflecting oral language.

(2017) highlight that in their school placements undergraduates establish a network of relationships, knowledge, and learning in the movement between HEI and school.

In this training perspective, the intersection of *Estágio Curricular Supervisionado* (ECS-School Placement) with PCC, together with the immersion of undergraduates in the school routine, since the beginning of training, is translated into deeper teacher learning. Despite being different moments in the training process, PCC and ECS can articulate the activities of the course with school practices or other non-formal spaces that promote a socialization experience of teaching and the construction of teacher identity. We understand that ECS and PCC are spaces that promote dialogue between the training institution and the approximation of undergraduates with their future work space. For these moments to be effective to teaching initiation, there needs to be a joint definition among IF professors, basic school teachers, and the undergraduates, as well as the systematic and reflexive follow-up of the whole process.

In the teacher training scenario in the scope of IF, we have not found studies that deal with PCC and ECS, what can be justified by the recent experience of these institutions, which completed a decade in 2018. In the set of works on teacher training in IF, we highlight Lamb, Welter and Marchezan (2014), Arantes (2013), Lima (2014), Machado (2008), and Moura (2008). We have not found any specific work on PCC, therefore, this research will significantly contribute in this direction.

Among these, the research of Lamb, Welter and Marchezan (2014), with 63 pedagogical projects of Teaching degrees (20 of Chemistry, 20 of Mathematics, 13 of Physics, and 10 of Biology) in IFs in Brazil, is the one who more directly focuses on PCC, when trying to identify the characteristics of PCC and the relation between specific subject contents and pedagogical ones.

Arantes (2013) analyzes, in general, the process of teacher training in the Teaching degrees in the institution; Lima (2014) analyzes the political proposals for teacher training in IFs, focusing on the obligation of offering 20% of places to teacher training degrees. On her turn, Machado (2008) presents the result of the discussion among the participants of the Work Group (WG) *Formação de Professores para a Educação Profissional e Tecnológica* (Teacher training for professional and technological education) established by the Secretary of Professional and Technological Education contributing to the debate on the national policy of teacher training to professional and technological education, not focusing on PCC in the context of degrees for

pre-service teacher training. Similarly, Moura (2008) discusses teacher training in the professional and technological education without talking about the PCC.

Faced by the lack of references that deal with the pertinent studies to PCC and ECS in the IF, we searched in the legal documents of CNE explanations on the training dimension of pre-service teacher training, such as: *Parecer CNE/CP n° 2/2015*, *Parecer CNE/CP n° 9/2001*, *Parecer CNE/CP n° 28/2001*, *Parecer CNE/CES n° 15/2005*.

According to the *Resolução CNE/CP n° 2/2015*, the PCC translates into a set of activities that give rise to types of learning inherent to the professional teaching. On its turn *Parecer CNE/CP n° 28/2001* clarifies that PCC, in articulation with ECS and the other activities in the course, "...work, together, to the formation of teachers' identity as educators" (p. 9). *Parecer CNE/CP n° 9/2001* warns on the type of work and meaning of PCC:

Practice in the curricular matrices of teacher training courses cannot be reduced to an isolated space...In this perspective, the planning of training courses should foresee didactic situations in which future teachers use the knowledge they have learnt, while mobilizing others, of different natures and grounded on different experiences, times, and curriculum spaces.... (*Parecer CNE/CP n° 9/2001*, p. 57)

Therefore, it is clear that PCC cannot be restricted to HEI spaces; on the contrary, it should go towards basic education and foresee situations of learning how to teach. On its turn, *Parecer n° 2/2015* and *Parecer n° 28/2001* warn that PCC aims to overcome the dichotomy between theory and practice. *Parecer n° 15/2005* describes that the activities of PCC can be held as a nucleus or as "...part of subjects of practical nature, related to pedagogical formation, therefore, excluding those related to the technical-scientific fundamentals related to a certain area of knowledge" (*Parecer CNE/CES n° 15/2005*).

Furthermore, PCC can be one of the key moments to allow the approximation of the Teaching undergraduate students with school life and the learning of teaching. As Pimenta and Lima (2017), we understand that pre-service training does not answer all the training needs of future teachers. However, we hope they can build a matrix of types of knowledge, as proposed in a previous study, based on the readings of Lee Shulman (1987), Tardif (2013), Pimenta and Lima (2017):

- 1) the content of the subject area, a key condition for teaching;
- 2) the pedagogy of the content;
- 3) the curriculum of and about the Sciences of Education;
- 4) on students and how one learns;
- 5) the educational context and community;
- 6) practices of reflection and investigation;
- 7) on inter and transdisciplinary (Paniago, 2017, p. 80)

Moreover, we consider that, beyond mastering the specific content of their area, teachers need to know how to use strategies that favor students' learning, implying knowing theoretical and epistemological references of the sciences of education, aiming to understand the several aspects that influence learning, being, and socializing. We understand that the insertion of this matrix of knowledge in the pre-service training translates itself into significant practices⁷.

In this perspective, PCC and ECS can establish themselves as spaces of concrete integration between training and pedagogical practice, thus an initiation to teaching in which undergraduates can face themselves, under supervision, since the beginning of the course, with diverse and concrete teaching-learning situations, as well as the dynamic of school environment and professional socialization.

4. The current work model with the PCC in the teaching degrees of IF Goiano

The information collected was organized into the following categories: (i) aspects indicating training for teaching in the analyzed documents; (ii) the PCC through undergraduates' narratives; (iii) possibilities of (re)signifying PCC articulated to the ECS practices.

4.1 Aspects indicating training for teaching in the documents

We have tried to identify elements that indicated the pedagogical dimension for teaching in the *objectives* of the pedagogical projects of the course (PPC) and analyzed how PCCs are presented in the matrices and syllabuses in the specific subjects that offer them, in the documents until 2017.

⁷ We consider significant practices of teacher induction those that articulate the set of knowledge defended by Paniago (2017), articulated among themselves and with basic school; i.e., besides the theoretical knowledge of teaching, developed in the higher education institution responsible for the training, its practical materialization since the beginning of the course is fundamental, through a constant movement of action, reflection, and search for didactic strategies, for different content pedagogies so that teaching-learning can be meaningful.

It is important to highlight that the PPCs of Chemistry (CT) and Biology (BT) teaching degrees were adjusted in 2017 to adapt to *Resolução CNE n° 2/2015*. Though we focus on the documents until 2017, we highlight aspects of the new proposals operative since 2018.

In the teaching degrees PPC enforced until 2017 the general objectives are:

... to train biologists, educators, and/or researchers committed to the reality of their time, to act in favor of a conscious, fair, and democratic society, through a body of knowledge of the phenomena that guide a living being, as well as their relation with the environment (Instituto Federal de Educação, Ciência e Tecnologia Goiano, 2013, p. 6).

... to form chemists, educators, and researchers committed to the reality of their time, to act in favor of a conscious, fair, and democratic society (Instituto Federal de Educação, Ciência e Tecnologia Goiano, 2010, p. 10).

As can be seen, despite the similarities of the general objectives of the two degrees, pointing out the formation of educators and researchers, and the importance of graduates committed to social justice and the care of the environment, the questions inherent to the types of knowledge they will have, as future basic school teachers, are not explained. When analyzing the objectives to the teaching degrees in the new proposal of PPC, such finding is also evident, indicating that the alterations done might have been punctual, aiming to attend the rules, without a fruitful debate with the educational community.

On the professional profile intended by BT, the PCC in action until 2017 affirms that the course "...will provide a solid formation in the area of Biology..." (IF Goiano, 2013, p. 8). When continuing to the areas of work and competences, we could see that they are also guided towards the formation of biologist and not of a teacher, with knowledge pertinent to teaching, going beyond the contents of the specific area and incorporating knowledge on the sciences of education – so as to perceive the elements that influence the teaching-learning process in the classroom and the knowledge on the content pedagogy - to mobilize the elements that ease the learning of contents, the context of students, among others, as highlighted by Lee Shulman (1987), Tardif (2013), Paniago (2017).

The same situation takes place in CT, thus, we can say that the intentions foreseen in the PPC of CT and BT are more guided towards a Bachelor degree than a pre-service Teaching degree.

Regarding the matrices, tables 1 and 2 below highlight the specific subjects that offer PCC, with their respective academic load (measured in hours).

Table 1 – Matrix of chemistry and biology teaching degree until 2017

Biology Teaching degree				Chemistry teaching degree			
Subject	AL T	ALP	PP	Subject	AL T	AL P	PP
Histology	40	20	20	Experimental General Chemistry		20	20
Invertebrate Zoology I	20	40	20	Experimental Physics I		20	20
Plant anatomy	40	20	20	Scientific methodology	20		20
Basic biochemistry	60	20	20	Didactics	20		20
Embryology	40	20	20	Experimental Organic Chemistry		40	20
Invertebrate Zoology II	40	40	20	Experimental Physics II		20	20
Plant physiology	50	30	20	Experimental Physical-Chemistry I		20	20
Vertebrate Zoology	40	40	20	Experimental Organic Analysis		20	20
Genetics	60	20	20	Experimental Analytical qualitative chemistry		20	20
Teaching practice I			40	Teaching practice applied to Chemistry			40
Comparative Physiology of Vertebrates	60	20	20	Experimental Analytical quantitative chemistry		20	20
Geology and Paleontology	40	20	20	Experimental biochemistry		20	20
Plant systematics	40	40	20	Experimental inorganic chemistry		40	40
General microbiology	40	20	20	Experimental Physical-Chemistry II		20	20
Evolution	60		20	Environmental Chemistry	40		20
Brazilian sign language	20		20	Experimental Physical-Chemistry III		20	20
Teaching Practice II			40	Public policies in Brazilian education	40		20
Immunology	40	20	20	Brazilian sign language	20		20
Total:			400	Total:			400

Table 1: Analysis of the Curriculum matrices of 2013 (Bio) and 2010 (Chem.).

*Names following the table of curriculum matrix of PPC. Theoretical academic load: ALT; Pedagogical Academic Load: ALP; Pedagogical practices: PP.

Table 2 – Matrix of Chemistry Teaching and Biology Teaching degrees in action since 2018

Biology teaching degree				Chemistry teaching degree			
Subject	*ALT	ALP	PCC	Subject	**CHT	CHP/PCC	Semi in-person
Plant anatomy	40	30	20	Experimental General Chemistry		72	
Histology	40	15	20	Experimental Physical-Chemistry I		36	
Invertebrate Zoology I	40	30	20	Academic practices of General Chemistry		36	36
Biochemistry	55	15	20	Experimental Physical-Chemistry II		36	
Embryology	40		20	Academic practices of Physical-Chemistry		36	36
Invertebrate Zoology II	40	30	20	Academic practices of analytical qualitative chemistry		36	36
Plant physiology	55	15	20	Academic practices of analytical quantitative chemistry		36	36
Invertebrate Zoology	40	30	20	Experimental inorganic chemistry		72	
Genetics	55	15	20	Academic practices of inorganic chemistry		36	36
Plant morphology and organography	40	15	20	Academic practices of organic practices		36	36
Research and intervention practice in Education I	30	0	30	Organic analysis	36	36	
Comparative Anatomy of Vertebrates	40	30	20	Interdisciplinary academic practices		36	18
Management and organization of teachers' pedagogical work	40	0	20				
General microbiology	40	15	20				
Environmental education	40	0	20				
Evolution	40	0	20				
Immunology	40	15	20				
Research and intervention practice in Education II	30	0	30				
Comparative Physiology of Vertebrates	40	15	20				
Total:			400	Total:		504	234

Table 2: Analysis of the Curriculum matrices approved in 2018.

*Names following the table of curriculum matrix of PPC. Theoretical academic load: ALT; Pedagogical Academic Load: ALP; Pedagogical practices: PP.

** Names following the table of curriculum matrix of PPC. Theoretical academic load: ALT; academic load including the practices as a pedagogical curriculum component ALP; Semi in-person to online education.

When analyzing the curricular matrices of teaching degrees enacted until 2017, we could see that PCC were offered in CT and BT in the pedagogical and specific subjects that compose the curriculum matrices, fulfilling the 400 hours demanded by *Resolução* CNE nº 1/2002, with

an average academic load of 20 hours entitled “pedagogical practices”. This is similar to other IFs, as seen by Lamb, Welter and Marchezan (2014), in the courses they analyzed “74% distribute the academic load in subjects related to the specific formation and in those of pedagogical training. 23% created a subject for PCC...” (p. 11).

We have also identified a strong value given to the specific subjects, at the expense of pedagogical ones, considering that the pedagogical subjects represent 20.7% of hours of the total academic load of the course – meaning 3,200 hours, thus fulfilling the minimum load established by legal documents.

In the proposal implemented since 2018, the PCC presented in the matrices of the two teaching degrees also fulfill the 400 hours demanded by the current *Resolução* CNE nº 2/2015. However, there were some substantial changes. The first refers is that PCC cannot be offered as a part of pedagogical subjects. In BT, they are only part of the specific subjects; in CT specific subjects were created to PCC. Another difference is that the load of pedagogical subjects represent, at least, 1/5 of the academic load, fulfilling *Resolução* CNE nº 2/2015.

Another changed aspect is that, in the case of BT matrix, the PCC alter the name of the pedagogical practice and receive the title of PCC. In the CT matrix, they are named “academic practices”, though it is not clear what type of practice they are and what dimensions of teaching will be approached.

In the syllabus of the subjects offering PCC until 2017, we have not seen elements that incited the induction to teaching; on the contrary, in general, the syllabuses of both degrees point out only the contents of the specific areas, as presented in the syllabus of “Plant Anatomy”, with a load of 80 hours, with 20 hours of pedagogical practices (IF Goiano, 2013, p. 33). On its turn, in one of the CT subjects – Experimental General Chemistry –, in a total of 40 hours, 20 are to PCC, as highlighted by the syllabus:

Characterization of nature and the role of experimental investigations in chemistry. Study of measurements and meaningful algorithm. Development of abilities to deal with volumetric devices, filtration systems, distillation systems, and chemical processes (IF Goiano, 2010, p. 23)

Thus, in general, the teaching subjects in BT and CT, that have a PPC load, do not clearly present how these would be worked in class, except the subjects in the educational area.

Gatti (2010), based on the research on curriculum issues in Teaching degrees and Pedagogy point out that:

The issue of practices demanded by the curriculum guidelines in these courses is problematic, as sometimes it is ingrained in several subjects, with no clear specification, other times they are separated, with very vague syllabuses. In most analyzed syllabuses we did not find an articulation between the subjects of specific formation (contents of the subject area) and the pedagogical training (contents to teaching) (pp. 1373-1374)

Regarding the syllabus of the new BT proposal, when analyzing the subjects that have a load to PCC, it is not clear how they will be enacted. This is the case of the biochemistry syllabus, which only proposes specific contents:

Water and buffers, Amino acids, Enzymes, Carbohydrates, Lipids, Nucleic Acids, Vitamins, Principles of Bioenergetics and Thermodynamics, Introduction to Metabolism, Glycolysis, Citric Acid Cycle, Respiratory Chain and Oxidative Phosphorylation, Fatty Acid Metabolism, Amino Acid and Protein Metabolism, Photosynthesis, Pedagogical Practice Tools (IF Goiano, Ementas LCB, 2018, p.6)

At CT we also could not perceive advancements, as in all the syllabus analyzed of the subjects created as PCC only the specific area contents are presented, silencing the pedagogical ones. Thus, we question: what elements indicate that the induction of teaching will take place in these subjects?

In fact, in the scope of PPC restructure, we expected to be advancements. However, we have seen setbacks, as in CT even the word pedagogy was removed and substituted by academic that does not aptly translate its pedagogical dimension. In this sense, Lamb, Welter and Marchezan (2014) affirm that:

When analyzing the academic load of teaching degrees in the *Institutos Federais*, we perceived that there is a clear load predominance in subjects related to the specific area knowledge, at the expense of those related to education fundamentals and teacher training. (p. 7)

Finally, it is possible to affirm that PPCs (those until 2017 and the ones implemented since 2018) have weaknesses in teacher training aspects in the scope of PCC. The analysis of the new PPCs does not show that the proposal was built together with the educational community of the institution.

This situation points out the need for changes in the pre-service teacher training degrees in the institution, aiming, through the (re)formulation of the PPCs of the Teaching degrees, a better articulation of the syllabus that foresee PCCs to undergraduates' learning of teaching, as well as promoting the participation of professors, undergraduates and, maybe even basic education teachers, who are co-trainers.

4.2 PCC and ECS through the narrative of undergraduates

The data collected through narratives were organized into the following subcategories: (i) learning to teach in subjects offering PCC; (ii) articulation between among subjects, PCC, ECS, and school everyday life.

4.2.1 Learning to teach in subjects offering PCC

In this discussion, we will bring evidences of learning to teach and how they take place in the scope of PCC. The narratives show how the subjects that offer PCC are developed; *“in the pedagogical practice, I participated on the creation of a folder about the research in the institution and its presentation to high school students (Plant Physiology) and gave a class for the students on the technical course about genetic biotechnology”* (BB, 2018). Another undergraduate says: *“We worked on the construction of an insectary, in genetics, whose theme was the methods of cellular transcription and plant physiology, in which we demonstrated how plant cell walls work”* (AB, 2018). In the same sense, other narratives point out that:

During the 2nd term, there were pedagogical practices in two subjects, both in groups. In the first, we did a musical parody on the theme and a game, the proposal of both was to help memorize the content. (CB, 2018)

The professor proposed the construction of ludic models to help explain very abstract contents, which are difficult for basic education students to learn; the contents worked were chemical reactions, bonds, and atomic models. After creating the didactic materials, we presented them to our classmates (MC, 2018)

The proposal was for us to teach a class on the theme of the subject. My theme was Hooke's law, so we did a simple experience to explain the content to the class. The experiment consisted on using weights to deform springs and rubbers and show through calculations how Hooke's Law work. (AC, 2018)

In general, the narratives reveal the initiatives of teaching induction practices taking place in the PCC, such as the use of several strategies and didactic resources, as building an insectary, work with games and music, the use of didactic board, the construction of ludic models and experiences, meaning that professors are using different activities to raise on students the type of learning needed to become a teacher. The undergraduates recognize the value of these practices in their training; “*the professor of oficina de prática pedagógica*⁸ (OPP-pedagogical practice workshop) *showed the difficulties that teachers face when trying to teach the content to students, gave tips, and helped us to prepare for the profession ...*” (MC, 2018). Another one, when talking about a project done in a PCC, says that “*the project was done in groups. Ours was ‘crisis in science teaching’, a theme that helped us think and reflect as future teachers*” (AC, 2018).

In fact, a professor used a didactic strategy that incited students to reflect on the activity: “*the professor of the subject did not ask a class on the theme of our work, as in the first practice, but gave us the time to talk about how the material presented were made, the expenses, and how they would be used in the classroom*”. (AB, 2018). Another undergraduate highlights:

... there was a class on mechanisms; this content had not been explored by the professor, thus we had to learn by ourselves and look for a way to teach the rest of the class. Among all the subjects with pedagogical practices, this was the one that made me think and reflect the most as a future teacher, because I felt how hard it is to find a way to explain a content to a class that doesn't know the subject. We taught with the aid of slides and a board. (AC, 2018)

AC's narrative points out that professor are inciting undergraduates to learn about and how to teach, what to do in the classroom as future teachers, that is, they are raising learning on content knowledge and content pedagogy, as announced by Paniago (2017) and Lee Shulman (1987).

Though the activities developed in the subjects could contribute to the learning of teaching knowledge, they seem fragile, as they are limited to a work with models, techniques, strategies, and didactic resources. The making of pedagogical models on a specific content is relevant, as students will have an idea on the didactic resources they can use in the classroom. However, we have to consider the situations involved in the school socio-educational context,

⁸ *Oficinas de práticas pedagógicas* was the name given to the subjects focused on the development of practices of specific knowledge contents in the Chemistry and Biology Teaching degrees in the campus.

in micro situations, as in the classroom, or macro, are heterogeneous and imply several demands that go beyond the use of different didactic resources (Paniago, 2017).

It is key that undergraduates have an opportunity to experience different situations to immerse themselves in teaching, that these should happen beyond higher education institutions, and are not restricted to create a class plan and apply it in the classroom with their colleagues, as affirmed by BB: “normally, the OPP are worked in...or are structured as seminars, or building models” (BB, 2018). Another student states that “...most seem more like a seminar than a class”. (MB, 2018). Nor as studies targeting the specific content of the subject,

In three subjects, the pedagogical practice was worked in a way that they proposed studies on the themes of the subjects, so we research theorists and experimental tests needed to identify the components in samples (FQ, 2018)

I am currently in the 5th term, in which there are two subjects that offer pedagogical practices. Until then we have started to work pedagogical practices in only one, but, the pedagogical practice proposed by the professor in this subject, I think, does not fit in a pedagogical practice. She proposed us to determine cations in food samples, we also have to write a scientific article to explain the practice. (AQ, 2018)

It is clear through undergraduates’ narratives that the pedagogical practices were directed to the specific contents of the subjects. The student, in fact, recognizes that the practice proposed by the professor cannot be classified as a pedagogical practice. Thus, we can understand that the student considers that it is a purely conceptual and academic work, lacking a reflection on the issues of teaching-learning in basic education. According to Souza and Silva (2014),

.... the 400 hours of curriculum practice that were added to the curricula of teacher training degrees cannot be seen as a strategy to find balance in the theory-practice relationship in the subjects, but need to be thought under an interdisciplinary perspective, aiming for a practice that produces something in the teaching scope and help the formation of an identity of the teacher as an educator. (p. 898)

Based on their research, the authors state that “...it became ‘common’ to find PCC pulverized in the undergraduate subjects, they can be specific, pedagogical, or an intervention, and they are often confined in the “mission” to improve the theory-practice relation of the subject itself” (p. 898).

Furthermore, it is clear in the narratives the fragmentation between theory and practice in the subjects offering PCC, as they are dealt with in two parts, “The first refers to the experimental

part that is correlated to the corresponding theoretical subjects and, in a second phase, we have the pedagogical practice of the subject". (FQ, 2018)

This situation leads us to defend the dissolution of the dichotomy between the theoretical conceptual part of the subject and the one in which undergraduates will create a practical class to teach their colleagues, a class that, sometimes, is built with no connection to the specific contents of basic education and no knowledge of the didactic field, whose study object is the teaching-learning process and the multiple relations it involves (Paniago, 2017). Actually, students recognize this theory-practice dichotomy, *"It would be more fruitful to have a subject that was completely in the OPP format, contrary to the current model in our course, in which it is divided in two moments"*. (FC, 2018). Another students highlights:

Considering the proposals of the professor in these practices, it is very clear that the knowledge and theories on didactics are, often, left behind, mainly regarding the effectiveness of the teaching-learning process, both of the students who are creating the workshops and also of the ones who will watch the classes. (BB, 2018).

Furthermore, the students with no theoretical and methodological knowledge will often face dilemmas when trying to teach their colleagues, *"we created a class plan but we didn't know how to do it, because we hadn't done didactics yet"* (CB, 2018). In this sense, another narrative points out that *"the problem of these practices is that most of them take place before we have any idea on how to do a class plan or how to develop projects, as the subject that could help us do that is normally in the terms ahead"* (MB, 2018). That is, it is explicit that the learning on school and class planning will happen in the pedagogical subjects. Likewise, the narratives and the documents show fragilities on the PCC in the Teaching degrees. We reaffirm that teaching is no simple task. This understanding forces us to move away from the idea that anyone can be a teacher and that there is no preparation needed to teach. The narratives reveal the lack and/or fragility on the necessary needs for everyday pedagogical actions. From them, we can perceive that the training received in IF has not been sustained, reinforcing our perception that there is no process of continuous training in the institution focused on the field of sciences of education and the relations that encompass teaching-learning in basic education, ultimately, on the professional knowledge of teaching that students will need to learn in their training to use in their future work as teachers. On higher education teaching, Pimenta and Anastasiou (2014) state that:

In most higher education institutions, including universities, though professors have a significant experience and years of study in their specific areas, there is a lack of preparation and even a scientific unfamiliarity on what is a teaching and learning process, to which they are responsible from the moment they enter in the classroom (p. 37)

In this study, we have seen that many professors working in the Teaching degrees also teach in the master's degrees in their specific areas, with publications and research experience in their fields, however, we cannot say the same on the education field.

If professors-trainers do not know the teaching questions, how will they work the PCC to encompass the many types of learning needs to be a teacher? Besides this, the investigated campus does not have a culture of in-service teacher training, as the moments entitled as 'pedagogical' are in fact restricted to administrative and technical information. In this scenario long-time professors and new ones do not take part in an in-service training to discuss and reflect on the complex issues related to teaching-learning. The information is limited to models of class plans, deadlines, and others. In this respect, Pimenta and Anastasiou (2014) claim that, in general, professors do not take part in the organization of the syllabus they will teach, but receive a ready-made syllabus and plan, individually, their classes, "they receive no guidance on the planning, methodological, and evaluation processes, nor have any accountability, nor have to write reports, as it normally happens in the research processes" (p. 37)

4.2.2 Articulation between among subjects, PCC, ECS, and school everyday life.

In the narratives the articulation between the subjects of the course are not explicit, as, in general, they do not point out substantial elements about the relation of the activities of PCC with the subjects in the course matrix and the school: "*the OPP offered work a lot on the contents that are not in the basic education*" (PC, 2018); followed by: "*Some subjects don't have topics to teach in high or elementary school, so we had to use contents of the subject and teach our classmates*" (NB, 2018); or even the experience in school situations, except in a subject of Biology Teaching.

There was only one subject in which we researched in schools. So, our OPP was to create a type of report on school diagnostics. Then, we had to know what students understood about the subject, what lab material students had to the subject, if the work on basic education followed the National Curriculum Parameters, the guidelines. (MB, 2018)

These evidences contradict the proposals of *Parecer* n° 2/2015, as well as *Parecer* n° 28/2001, when warning on the need for PCC to overcome the dichotomy theory-practice, knowing-doing, aiming the integration needed between general and specific knowledge, between high school and professional education. As narrated by NB, “*we did an educational booklet, but it was very hard to think a way to use it in school. So, it is not only about thinking a different practice but not knowing how to use it*” (NB, 2018). This excerpt shows a gap between theory and practice, portraying the concern of PCCs disconnected from basic school reality, the practice field of future teachers.

Amidst the narratives, we could perceive that undergraduates suggest a relation of the themes with basic education as possibilities to improve the work with PCC.

To have improvements in the PCC, all professors that have these classes have to really do something connected with the students, so that teacher training is complete and is not only in the theory. Besides this, these pedagogical practices apply themes and contents related to basic education, as among all the subjects with PCC, the content worked was related to higher education. (MC, 2018)

It would be important that OPP professors try to relate more the contents we see with those that will be used in elementary, middle, and high school. (PC, 2018)

The pedagogical practices developed in the subjects in the course are often not developed correctly and its academic load is not completely used. (AC, 2018)

In my opinion, there should be more subjects with pedagogical practices using different ways to present and give us more contact with reality. (AB, 2018)

What helps most is when the professor proposes students to present a class as if it were a real school. (NB, 2018)

Professors that teach them should invest in more pedagogical knowledge to help us and provide us a moment to know school reality and also of self-knowledge as professionals. (BB, 2018)

Also on the relation with ECS practices, the narratives do not point out substantial elements beyond indicating that they have learned some didactic strategies and models that could be used in ECS. The identified elements go against *Parecer* CNE/CP n° 28/2001, which says that PCC can be articulated with ECS and with the other activities of the course.

Thus, we insist that PCC is a practice that focuses on the preparation for teaching, therefore, it is important to be held in different educational spaces and incite in future teachers the analysis, problematization, and investigation of situations related to the future work field –

basic education school. After all, as affirmed by Canário (2001), school experiences are key on learning how to teach, as they allow pre-service teachers to learn the times, the ways, and what and how to mobilize contents and organize them, thus building their own ways of professional development.

Similarly, other theoreticians alert to the need and importance of a training connected to school (Mizukami, 2013; Tardif, 2013), among others. That is, experiences lived in school, when reflected upon together with basic school teachers and the support of IF faculty, can be key opportunities to create a professional knowledge that will ground the future teacher.

4.3 Possibilities to (re)signify PCC articulated to ECS practices

When analyzing the syllabus of the subjects offering PCC, we have seen some correlation possibilities between the contents proposed in the Teaching degree and the contents of basic education. There are many possibilities in the later years of high school, however we will focus on some evidences for the first year of high school and middle school, as we cannot present all data here. The table below shows some possible correlations.

Table 3 – List of subjects that offer PCC

Teaching degree in Chemistry			
Term	Subject	PCC time load	Basic education content
1st term	Experimental Chemistry	20 hours	Grade 9- high school – the establishment and properties of the matter; atoms, chemical elements, and periodic classification; substances and chemical transformation; chemical bonds, mixtures, chemical functions, and chemical reactions.
2nd term	Experimental Physics	20 hours	Grade 9- high school – movements force and energy; gravitational attraction, work, energy, and simple machines, among others.
4th term	Experimental Organic Chemistry	20 hours	Grade 8 middle school – the role of nutrition, carbohydrates, proteins, and vitamins.
Teaching degree in Biology			
1st term	Histology	20 hours	Grade 8 middle school – cell, cell organization in tissues.
2nd term	Invertebrate Zoology I	20 hours	Grade 7 middle school – animal kingdom, invertebrate— sponges and cnidarian.
4th term	Plant Physiology	20 hours	Grade 7 middle school –Plants with seeds: gymnosperms and angiosperms

There are many possibilities of correlation between the several PCC matrices and the contents of basic education. Beyond these relations, several didactic strategies can be used in the teaching-learning process of PCC, such as; games, conceptual maps, use of digital information and communications technology (DICT), practical and experimental classes, work with projects, analysis of didactic material, music, theater (Paniago, 2017) – as well as work with didactic situations that favor the immersion of undergraduates in the universe of school for research, analysis of different situation in the classroom and educational context.

We emphasize the need of trainers-professors to open their perspectives on the work possibilities with PCC and the importance to connect it with ECS, as, according to *Parecer CNE/CP n° 2/2015*, the activities developed in the PCC should, necessarily, be connected to the learning of teaching.

Finally, based on what was we found and considering its training profile, highlighted on *Parecer CNE/CP n° 2/2015*, we present some suggestions to the PCCs, involving different characteristics and dimensions for teacher induction, among which, we highlight: development, execution, follow-up, and evaluation of interdisciplinary projects involving different resources and didactic-pedagogic strategies, such as the use of technologies; analysis of didactic books; case studies based on problems in the school context related to sociocultural aspects; teaching-learning processes; projects; family-school relationship; teacher training; study and analysis of the curriculum guidelines for basic education focusing on the specific formation and professional area; case study, life story; building of narratives; portfolios, among others. Neto Souza and Silva (2014) suggest that “...PCCs could be organized under the format of Integrating Projects, implementing integration seminars and practical experiences” (p. 905).

By bringing to light the many possibilities of pedagogical actions to be enacted by PCCs, we reaffirm our understanding that these are not necessarily restricted to the methodological application, involving only the specific contents of PCC or those of basic school. Notwithstanding, it does not need to be established as a subject, on the contrary, it can be organized transversally and worked by a group of professors interdisciplinary. This perspective to work with PCC implies advancing the insulated process of PCC reformulation, restricted to the course coordinator and the *núcleo docente estruturante* (NDE- structuring faculty nucleus), towards a debate and a collective dialogue in the school community.

5. Final remarks

In general, the initial results sign that PCCs are offered in specific and pedagogical subjects that compose the curriculum matrices of these teaching degrees and follow the rules of Brazilian legislation regarding the academic load. However, we saw that the initiatives of practices to induce teaching are held in specific subjects that offer PCC – the study focus of this research – using several didactic strategies for the undergraduates, to give classes to their colleagues. However, these practices are mainly guided towards the practical part of the subjects and the building of models, experiments, and the enactment of practical classes to their colleagues, with not contextualization with basic education.

We also have not identified an articulation between the teaching practices of PCC in the scope of specific subjects and pedagogical subjects, as well as practices of ECS. Another aspect is that in the syllabus of the subjects offering PCCs there is a supremacy of specific questions at the expense of pedagogical ones, as, in general, the syllabus point out only the specific areas contents, suppressing teaching aspects.

Furthermore, the ways of distribution and development of PCC do not show a significant advancement in the theoretical-practical training of teachers' learning in CT and BT. We believe that the implementation of PCC in the pre-service teachers' training can happen through the integration of subjects that promote the participation of trainers-professors, undergraduates, and basic school, with discussions and reflections based on the understanding of learning of teaching, which goes beyond the specific contents of the different knowledge areas.

We insist that PCC is a practice that focuses on the preparation for teaching. Therefore, it is important to be enlarged beyond the classrooms of the institution and be held in different educational spaces, that incite in future teachers, the analysis, the problematization, and the investigation of situations to connected to their future work field, the basic education school, and which involves other activities of teachers' induction, including actions with different didactic strategies, the work with projects, the analysis of didactic books, the study of different situations of the educational context, among others.

Nevertheless, we advocate for the implementation of an in-service training in the campus, aiming the collective reflection on the various factors involved in teaching-learning in

higher education and basic education. We certainly recognize and highlight the initiatives that are taking place in the institution aiming to improve the process of teacher training, such as events and the creation of curriculum guidelines in the teaching degrees of IF, inciting the improvement of the work in PCC and ECS. However, these initiatives are still not effective in as a whole in the researched campus. Based on these assumptions, we are developing a second phase of the research to search collaboratively, among professors, new training possibilities that articulate the training process of PCC and ECS with basic school.

In the context of the research, we must say that the DCN/2015 emphasize the importance of making the practice and the school placements more consistent and realistic, to integrate in the everyday life of undergraduates the knowledge needed to reflect on their teaching work. Certainly, this research, besides going in this direction, will contribute to the debate on teachers' pre-service training in the scope in IF and advance on the practices with ECS and PCC in the pre-service teacher training in IF, as they are basically no studies on this issue.

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