



Corresponding to Author  
 1 Franciele Siqueira Radetzke  
 E-mail: [francielesradetzke@gmail.com](mailto:francielesradetzke@gmail.com)  
 Universidade Federal da Fronteira do Sul  
 Chapecó, SC, Brasil  
 CV Lattes  
<http://lattes.cnpq.br/6007927453058608>

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## The Researches on Higher Teaching Education in the Brazilian Context: Challenges to Think About the Formation in Sciences

Franciele Siqueira Radetzke<sup>1</sup>  <https://orcid.org/0000-0002-3222-7977>

Roque Ismael da Costa Gullich<sup>2</sup>  <http://orcid.org/0000-0002-8597-4909>

<sup>1,2</sup>Universidade Federal da Fronteira do Sul

### ABSTRACT

Teaching in Higher Education (ES) is the central theme of the present study, which aims to present a panorama about the conceptions of university teaching as well as to establish a dialogue with the main themes investigated in Brazilian theses and dissertations, circumscribed to the area of Natural Sciences and its Technologies (CNT). For that, qualitative research of the bibliographic type was developed, based on the data search of the Brazilian Institute of Information and Technology (IBICT), highlighting academic works on ES. Recurring conceptions were highlighted as Experience (12:14), Research (5:14) and Naturalized (2:14) and among the most researched topics are Teaching Practice (7:14), Professional Identity (6:14), Processes Formative (2:14), Conceptions of Teaching (2:14) and Teaching Knowledge (1:14). It was also possible to perceive that the themes and conceptions investigated are related in the context of the ES in the attempt to obtain understandings about the process of teaching and learning. From research, the main challenge is the need for continuous training processes in order to qualify the teaching action: conceptions and practices.

### KEYWORDS

Higher education. Teacher training. University pedagogy. First word.

## As Pesquisas sobre a Docência no Ensino Superior em Contexto Brasileiro: Desafios Para Pensar a Formação em Ciências

### RESUMO

A docência no Ensino Superior (ES) é a temática central do presente estudo, o qual visa a apresentar um panorama acerca das concepções de docência universitária, bem como estabelecer diálogo com as principais temáticas investigadas em dissertações e teses brasileiras, circunscritas à área de Ciências da Natureza e suas Tecnologias (CNT). Para tanto, foi desenvolvida uma pesquisa de abordagem qualitativa do tipo bibliográfica, com base na busca de dados do Instituto Brasileiro de Informação e Tecnologia (IBICT), destacando-se trabalhos acadêmicos sobre ES. As concepções recorrentes foram destacadas como Experiência (12:14), Pesquisa (5:14) e Naturalizada (2:14) e, dentre as temáticas mais investigadas, estão Prática Docente (7:14), Identidade Profissional (6:14), Processos Formativos (2:14), Concepções de Docência (2:14) e Saberes Docentes (1:14). Foi possível perceber também que as temáticas e concepções investigadas relacionam-se em contexto do ES na tentativa de lograr entendimentos acerca do processo de ensinar e aprender. Da investigação emana como principal desafio a necessidade de processos de formação continuada no intuito de qualificar a ação docente: concepções e práticas.

### PALAVRAS-CHAVE

Ensino superior. Formação docente. Pedagogia universitária. Primeira palavra.

## Las Investigaciones sobre la Docencia Superior en el Contexto Brasileño: Desafíos Para Pensar la Formación en Ciencias

### RESUMEN

La docencia en la Enseñanza Superior (ES) es la temática central del presente estudio, el cual pretende presentar un panorama acerca de las concepciones de docencia universitaria así como establecer diálogo con las principales temáticas investigadas en disertaciones y tesis brasileñas, circunscritas al área de Ciencias de la Naturaleza y sus Tecnologías (CNT). Para ello, se desarrolló una investigación de abordaje cualitativo del tipo bibliográfica, con base en la búsqueda de datos del Instituto Brasileño de Información y Tecnología (IBICT) destacándose trabajos académicos sobre ES. Las concepciones recurrentes fueron destacadas como Experiencia (12:14), Investigación (5:14) y Naturalizada (2:14) y entre las temáticas más investigadas están Práctica Docente (7:14), Identidad Profesional (6:14), Procesos Formativos (2:14), Concepciones de Docencia (2:14) y Saberes Docentes (1:14). Es posible percibir también que las temáticas y concepciones investigadas se relacionan en contexto del ES en el intento de lograr entendimientos acerca del proceso de enseñanza y aprendizaje. De la investigación emana como principal desafío la necesidad de procesos de formación continuada con el fin de calificar la acción docente: concepciones y prácticas.

### PALABRAS CLAVE

Enseñanza superior. Formación docente. Pedagogía universitaria. Primera palabra.

## Initial Considerations

Teaching in Higher Education (ES) is the theme that covers this writing, since it is found and intersects the conditioning foundations of training and performance for different professional areas. However, we have directed attention to the formation of teachers (undergraduate), in view of the approximation with the area, as well as the understanding that there is a lack of understanding of the need for specific preparation for teaching in this teaching space (ISAIA, 2006). We are dedicated to studying the area of Nature Sciences and its Technologies (CNT), as we approach the area through our research experiences and teacher education. And, therefore, in the study / text in which we refer the teacher education at higher level, whose teachers in the area of undergraduate degrees in CNT, are charged with the training of teachers for basic education in the same area (CNT).

Even starting from the understanding that the teachers are responsible for the formation of future professionals and, more specifically, that in undergraduate courses are responsible for the preparation of new teachers for the Basic Education, we have observed that, for the most part, the simplistic idea remains. that teaching is the propagation / transmission of historically produced knowledge (CARVALHO; GIL-PÈREZ, 2001). For Isaia (2006), teachers usually define themselves based on their areas of knowledge (physics, engineering, medicine, geography, etc.), addressing their specialties and disregarding the teaching function, which is clearly linked to formative mission of higher education

In opposition to this conception, Krahe (2007, p.30), when discussing the difficult change in rationality of university pedagogy, highlights that: “Today we seek to train teachers within a practical / reflexive rationality, in which the work of teaching it is seen as the space of an autonomous, reflective, creative professional”. We note that the defense that teaching activities in the ES do not end in the technical dimension has been discussed for more than five decades (CUNHA, 1989, 2005, NÓVOA, 1992, ISAIA, 2006), a period in which more than one could be trained. five generations of undergraduate teachers (RICHTER et.al, 2017). However, in terms of change, we have made little progress in the Brazilian context.

Thus, it is necessary to discuss with this space / level of education, to which are assigned extremely important functions to be performed, such as: training future teachers for Basic Education, generating knowledge in their specific domains, as well as own knowledge of being a teacher (ISAIA, 2006). Given such complexity that is accentuated on the formation of new teaching professionals in the scope of the social function that needs to be developed, we aim to discuss the main issues that beckon to higher education in recent years, facing them as challenges of education. According to Imbernón (2001, p.57):

The teacher's professional socialization begins in the initial formation. It is necessary to thoroughly analyze the initial formation received by the future teacher, since the construction of schemes, images and metaphors about education begin at the beginning of the studies that will enable them to the profession.

We believe that the challenges to be recognized / discussed / investigated in the ES will only emerge after becoming aware of the aspects already addressed and the understanding of what still needs to be worked / discussed. In this sense, for the present study - which is characterized as a review of the state of knowledge already researched - we invested in the main themes and conceptions of teaching that run through the ES in the last two decades (1996 to 2018), in order to favor a panoramic reading. of the research developed on the ES, at *strictu sensu* level, limited to the area of CNT, space and time of formation in which our main concerns lie.

Such direction meets the discussions of Razuck and Rotta (2014), which discuss the high dropout rate in science courses and the unsatisfactory performance in several disciplines that make up the area. Faced with this situation, the authors affirm that: “it should be given priority to the formation of teachers in order to reduce this distance between students and schools, thus modifying this exclusionary situation” (RAZUCK, ROTTA, 2014, p. 740). In this direction, science education faces the challenge of training professionals aware of their social function of providing an opportunity for education that promotes the formation of critical citizens, based on what they know in terms of school scientific knowledge. Silva (2016) highlights the need for discussion about the formation of trainers in a process of awareness about their roles as agents of transformation,

it is therefore a matter of addressing the following challenges: discussing the training of trainers not only in what they are willing and / or willing to discuss with university graduates and teachers in schools, but also what is possible. be done with and for themselves in a process of awareness of their role as transformation agent (SILVA, 2016, p.30).

Thus, treating the last two decades as a cut / study time is a short period in terms of historical context for education, but of great repercussion in terms of social changes in the Brazilian context. During this period, a scenario of uncertainties and complexities arising from the so-called knowledge society was being rebuilt and changed, impacting the expansion of schooling levels, as well as presupposing changes in conceptions in the teaching context (SOARES, CUNHA, 2017). Among some changes, the following stand out, according to Isaia (2006, p. 64):

from a cultural good, the university became an economic good; from a place reserved for a few, it has become a place for as many people as possible; from a good directed to the improvement of individuals, it has become a good whose benefit is society as a whole; It has also become another resource for the social and economic development of countries, submitting to the same political and economic laws. It is part of social dynamics and is subject to the same processes and uncertainties in the political, economic or cultural sphere that affect all social institutions.

Thus, in the context of university pedagogy: “the training process should provide teachers with knowledge, skills and attitudes to develop reflective professionals or researchers” (IMBERNÓN, 2001, p 41). These professionals who necessarily need to be involved in the production of knowledge as responsible, critical and autonomous in the social context. Such statements support the challenge of understanding the dimensions of teaching

in higher education, in which the term teaching approaches social practice, because, in theory, teaching also learns, in collaboration with students and teachers.

Thus, when we seek conceptions of teaching that permeate the ES of the CNT area, we are involved in understanding its consequences for teaching work, its assumptions and the way they are constituted throughout the processes and formative paths investigated. Thus, the reach with the main themes that have been the subject of discussion in the ES of this area, enables the understanding of the main approaches of the research developed and the challenges of the area still to be reached and problematized. In this bias, both research situations (teaching conceptions and themes investigated) circumscribe perceptions about teaching in higher education and point challenges to be discussed, in perspective, in check.

### The Method and the Means

Such investigation constitutes as a research of qualitative approach of the bibliographic type (LÜDKE, ANDRÉ, 2001). To search for data, the Database of Theses and Dissertations (BDTD) of the Brazilian Institute of Information and Technology (IBICT) was investigated, highlighting academic works: Theses and Dissertations, on the perspective of the main research approaches, the to know: Teaching / Education / Higher Education; University Pedagogy; Higher Didactics and University Teaching. In this search were initially found 276 Dissertations and 240 Theses and, of this amount, cut 8 Theses and 6 Dissertations, which referred specifically to the ES in the area of CNT, with the following descriptors: CNT; Science / Natural / Nature / Biological; Biology; Physics and chemistry. We conducted the thematic content analysis of the academic works found in the respective repository, as advocated by Lüdke and André (2001), being developed in three stages: pre-analysis, material exploration and the treatment of results and interpretation (LUDKE; ANDRÉ, 2001). In the pre-analysis as an initial step, we performed the preliminary reading of the abstracts of the works in order to demarcate theses and dissertations focusing on higher education and the area of CNT. Soon after, in order to explore the material, we performed the demarcation of excerpts and selected excerpts that best correspond to the objectives of the research objectives to, in the end delimit the thematic categories and treat the results providing the interpretation / production of them with collation of the theory in. study. The thematic categorization made it possible to undertake research efforts on two flanks that comprise two central categories for discussion: I) the conceptions of higher education and II) the investigated themes.

To subcategorize the conceptions of teaching, we adopted as a base, conceptions of teaching of higher education already established by Cunha (2005) that identifies them as: (i) Teaching as Experience; (ii) Teaching as Research and; (iii) Naturalized Teaching. Such conceptions are explained in Chart 1.

Chart 1. Teaching Conceptions

Category	Definition
Teaching as a notion of experience	“Knowledge derived from teachers' life histories, professional education [...] from their practice as teachers, incorporating work as a learning space and territory. [...] It is also strongly exposed to regulatory processes that come from state policies” (CUNHA, 2005, p. 57). “Teachers are unanimous about understanding teaching as a process. We have in the words of two interviewees an illustration of this statement. They say: [...] my craft is built on my relationship with my students and colleagues, I feel in a process of construction [...] I am still graduating at 50 years old; it was in-service training that helped carve out my way of being in the classroom; this formation was done throughout my life as I worked [...]” (CUNHA, 2005, p. 137).
Teaching as a notion of research	“It represents the conception that the professor is especially a producer of knowledge and that the university, to cope with its academic profile, needs to be based on a strong investigative tradition” (CUNHA, 2005, p. 77). It is important to highlight that: “[...] In its interior there is a structuring that carries greater importance than the other and refers to pure and applied research, which takes the specific area of knowledge as its object. [...] This dimension assumes greater prestige than the investigation of the pedagogical processes that the teacher, also professionally, develops at the university” (CUNHA, 2005, p. 77).
Naturalized Teaching	“The naturalization of teaching refers to the maintenance of cultural reproduction processes as the basis of teaching, that is, the teacher teaches based on his experience as a student, inspired by his former teachers [...] From this perspective, it is possible to identify in teaching the profile of a cultural action, present in the trajectory of most people, in the contemporary world (CUNHA, 2005, p. 94). As an example, highlighted by the author “I am from a family of teachers [...] I knew the Pedagogy course, I fell in love with it [...]” [CUNHA, 2005, p. 138).

**Source:** Authors, 2019. **Note:** Frame constructed based on Cunha (2005).

The themes investigated comprise subcategories that emerged from the empirical field (here taken as documents - dissertations and theses). For the discussion of the themes presented in the works, we use questions already discussed by authors in the area (NÓVOA, 1992; CUNHA, 1998; 2005; IMBERNÓN, 2001; 2010, ISAIA, 2006; PIMENTA; ANASTASIOU, 2014), besides frameworks that discuss each theme in its specificity.

The academic papers analyzed were identified and classified by organizing them in summary form: Chart 2, which presents the selected works according to the following subcategories: 1- Year of publication; 2- Identification of papers for further discussion; 3- Titles of the works; 4- Institution and place from which the work proceeds; 5- Type of research, i) Thesis or ii) Dissertation; 7- Guiding theme of the works, organized in; i) teaching practice, ii) teaching conceptions, iii) professional identity, iv) teaching knowledge and v) teacher training; 8- Teaching Conceptions, grouped into: i) experience, ii) research and iii) naturalized.

In addition to the information in Table 2, the original works were highlighted, emphasizing the analysis of the abstracts and their discussions, guided by the search in relation

to the themes and conceptions of teaching and the literature of the area. Following, we highlight the discussions based on the investigated themes and teaching conceptions arising from the analysis process. For this, the works will be named as D1, D2, D3 ... for Dissertations and T1, T2 ... for Theses, followed by the year of its publication in IBICT. Thus, we also safeguard ethical research issues, since selected academic papers on a public domain Web 2.0<sup>1</sup> site were analyzed.

**Chart 2.** Brazilian research on teaching in ES restricted to the area of CNT

Year	N.	Title	IES <sup>1</sup>	T <sup>2</sup>	Teaching Conception	Thematic investigated
1996	<u>1</u>	The teaching practice of the physics teacher in the third grade.	USP	T	Experience	Teaching practice
2008	<u>2</u>	The conception of teaching at the chemistry institute of the University of São Paulo: teacher or researcher?	UNIMEP	D	Experience	Teaching Conceptions
2009	<u>3</u>	The problematization of experimental activities in the professional development and teaching of chemistry teacher trainers	UFSC	T	Research	Teaching Practice and Professional Identity
2012	<u>4</u>	Professional identity of the Biological Sciences degree teacher at UFS: unveiling the meanings of being a teacher.	UFS	D	Experience	Professional Identity
	<u>5</u>	The university teaching in biology and its relations with the reality of the Amazonian metropolises.	UFSC	T	Experience	Teaching practice
2013	<u>6</u>	Trajectories of knowledge: the training and practice of teachers of distance learning courses in natural sciences and mathematics at the Federal Institutes of Education, Science and Technology in Brazil.	UFRGS	T	Research	Teaching knowledge
2014	<u>7</u>	Epistemological and formative hybridism in the Biological Sciences Degree: how teachers of specific disciplines are involved in the articulation of initial education with professional practice.	UFBA	T	Experience and Naturalized	Teacher Education and Professional Identity
	<u>8</u>	Factors that influence teacher education for higher education in chemistry.	UNIFESP	T	Experience and	Teacher training

<sup>1</sup> <http://bdtd.ibict.br/vufind/>



					Research	
2015	<u>9</u>	Teaching in higher education: thematic approach in nature science degrees.	UFSC	T	Experience and Research	Teaching practice
2016	<u>10</u>	Social representations of university teaching by professors of the exact sciences and nature of UFPE.	UFPE	D	Experience and Naturalized	Professional Identity and Teaching Practice
	<u>13</u>	Quantum physics teaching-learning: conceptions and practices of higher education teachers from the perspective of reflective practice.	UFABC	D	Experience	Teaching Concepts and Practices
	<u>11</u>	Constitution of the teaching professional identity of biology teacher trainers: potentialities of interconnectivity.	UFSC	T	Experience	Professional Identity
	<u>12</u>	Between conceptions and challenges: the pedagogical practice as a curricular component in the perspective of university professors of biological sciences.	UFSC	D	Experience	Teaching practice
2018	<u>13</u>	Teaching in higher education: aspects about the beginning of the career of teacher trainers in the area of Natural Sciences and Mathematics.	UNESP	D	Experience and Research	Professional Identity

**Source:** Authors, 2019. Notes: 1. IES- Higher Education Institutions; 2. Type of academic work: D - Dissertation, T - Thesis.

## What do Brazilian Research on Higher Education in the Area of Natural Sciences and Their Technologies Say?

Our research intentions about the current Brazilian scenario, with regard to higher education, led us to understand the main discussion themes that permeate and move this space / level of teaching and learning. Such restlessness challenges us to understand the meanings attributed to higher education and from these understand the main investigated themes and teaching conceptions emerging from investigations.

In the Brazilian context, our investigation has shown that studies on higher education in the area of CNT have been developed with greater intensity in the Southern (6:14), Southeast (5:14) and Northeast (3:14) regions of Brazil. In the South, five works belong to the state of Santa Catarina and only one from Rio Grande do Sul. In the Southeast, all are part of the state of São Paulo, and in the Northeast one in each state: Bahia, Sergipe and Pernambuco. Thus, we observed that the topic of discussion about aspects of teaching in higher education in sciences has still been little discussed, restricting concerns in only three Brazilian regions. The



number of postgraduate programs in Education and Teaching in these regions should be highlighted as they indicate the offer of specialization in certain regions, as can be seen from the Sucupira Platform<sup>2</sup>. The Southeast (1999), South (984) and Northeast (946) graduate programs are concentrated, with only 384 in the Midwest and 273 in the North.

Given this information, we observe the southern region with more prominence in number of studies that emphasize higher education in the area of CNT, especially in the state of Santa Catarina, despite the low number of courses offered. Unlike the state of São Paulo, region with the largest number of courses and only five papers discussing ES in CNT. Thus, it is clear that research on higher education is still incipient in the Brazilian context, especially in the context of CNT, which requires greater research efforts in terms of research.

Thus, we understand the importance of observing the main lines that guide the discussions in the academic papers already discussed. In order to broaden these aspects in the midst of challenges that seek to qualify teaching and learning in higher education, especially limited to the area of CNT. Starting the analysis, we discuss the category of higher education conceptions.

### Teaching Concepts in ES

In dealing with the theme Teaching Conceptions, it leads us to think about the understanding of its consequences for teaching practices and perspectives, from their assumptions and the way they were constituted throughout the formative processes. In view of the understandings of Isaia (2006, p.63), we understand the professional teacher as a unitary subject: “interwoven by the personal path (life cycle), the professional (the various paths built by the profession) and the institutional (the various contexts in which he acts or acted)”.

Given these assumptions, which imply the constitution of the teacher throughout his professional performance, it is also necessary to take into account the transformations that the university context has gone through and has gone through, due to changes in social order (ZABALZA, 2004). , since the pedagogical practice tends to reflect situations embedded in the social context in which it is inserted (MARTINS, MORAES, SANTOS, 2014); Thus, the teaching profession is understood as: “an educational practice, that is: like so many others, it is a way of intervening in social reality; in this case through education. Therefore, it is a social practice” (PEPPER, ANASTASIOU, 2014, p.178).

Through these aspects, Cunha (2005, p. 14) highlights the idea that there is one: “desired teacher’, is always configured based on a project of society and education”. In this direction, by breaking paradigms and submitting to evaluation processes, the teacher starts to resize, according to the circumstances, the meaning of his professionalism (CUNHA, 2005).

<sup>2</sup> <https://sucupira.capes.gov.br/sucupira/>. Data obtained on May 27, 2019.

In an effort to systematize reflections on the knowledge that permeates the practice of university professors, Cunha (2005, p. 57.58 [emphasis added]) points out: the “teaching component” and the “research component”. The first comes from the teachers' life story and their practices, and the second is mainly permeated by postgraduate education and investigative activities, verticalizing the contents of certain fields of knowledge.

According to these components, Cunha (2005) highlights three conceptions of teaching: Teaching as Experience; Teaching as Research and Teaching as Naturalized condition. Intertwined in these conceptions, we seek to dialogue them with assumptions presented in the analyzed works.

**Teaching as a notion of Experience** (12:14) has as its field of constitution the experience acquired by the Teacher resulting from his professional performance, produced both in knowledge, in doing and in the relationship between them (BOLZAN, ISAIA, 2006). Cunha's (2005) experience is based on Larrosa's (1994, p.48) ideas, when he states that “the meaning of who we are depends on the stories we tell and the ones we tell ourselves, in particular on the constructions narratives in which each of us is at once the author, the narrator and the main character.” What we want to think about in this conception is that teachers are graduating and changing along the teaching path, bearing in mind the demands of life and profession (Bolzan and Isaia, 2006).

In the works, the authors sought to understand the way teachers themselves conceive their pedagogical practices, as highlighted in T1 (1996, p. 12), emphasizing that: “*it supposes, on the one hand, to know what the person conceives about the that makes the meaning she gives to her performance as a teacher and how she understands the execution of her teaching*”.

These aspects are highlighted in D10 (2016, p.170), by understanding the representations of teaching with a group of teachers in the area of CNT: “*the representations present in the universe of this group of teachers are historically constituted and socially confirmed. They come from the experiences of these teachers, their life and education trajectories, which influence the identification of their actions and discourses and, at the same time, identify their members at the moment they confirm and share these actions*”. In studies developed by Isaia (2003, 2005) about the education of higher education teachers, it is argued that the formation path is constituted by the intrinsic relationship between personal, professional and formative path. What is called in D10 (2016, p.50) as internal and external aspects: “*the interns refer to the experiences lived by the subjects during the personal and professional formation and socialized by the teachers. The external ones refer to the policies aimed at the exercise of this teaching in the social, political and economic reality that influence, in a certain way, these processes of construction and effectiveness of the teaching practice*”.

The formative and, therefore, constitutive trajectory of the conceptions defended by the teachers is a continuous process, as emphasized in D4 (2012, p. 8): “*that begins with the*

*pre-professional experience, going through the choice of the profession, strengthening in the initial formation and in the first years of work and extending to the different spaces of professional performance throughout the teaching career, where each individual continues to produce his or her way of being a teacher* ". For Junges and Behrens (2015), university teaching, in addition to specific knowledge of the area of training, also requires that the teacher combined with the knowledge of his experience and scientific production act on pedagogical foundations of the teaching-learning process.

Along these lines, Tardif (2002, p. 54), when seeking to understand teachers' knowledge, emphasizes that teaching knowledge is: "plural knowledge, formed from diverse knowledge coming from training institutions, vocational training, curricula and daily practice". The latter, called knowledge of experience, occupies a prominent position, given the relationship of externality that teachers maintain with other knowledge, as they do not control their production and circulation. In this direction, Isaia and Bolzan (2006) also draw attention to the sharing of experiences in the sense of producing shared pedagogical knowledge, dialogue with references and with themselves. Given this purpose, it is stated in T8 (2014, p. 6) that: "*the teacher is being trained throughout his professional performance, based on his reflection on his practice. In addition, we believe in the need to rethink and reorganize the Graduate Facing the real and pressing need for higher education teacher training through activities that make it possible to problematize, experience, reflect and research on the professional activity in teaching*".

Thus, we bet on continuing education processes as space and time for discussion of training needs of this nature, in which teachers can gain awareness about their processes of formation and thus their conceptions of teaching, reflecting on them, dialoguing with their peers. and with references, constituting a triple dialogue, as emphasized by Alarcão (2010), as well as a mutual construction about the meanings produced by being a teacher.

**Teaching as a notion of research** (5:14) takes the question of teaching research based on a strong investigative tradition as a reference, in which (specific) area research assumes greater prestige than pedagogical research (CUNHA, 2005). This aspect is evidenced in the works by pointing out that the Graduate courses are focused on the training of researchers and not on the formation of new teachers for higher education, i.e.: "*[...] for acting in Higher Education, we do not have any legal requirement for specific training for professional practice; There is only one recommendation that these professionals should be prepared in postgraduate courses. However, these courses are aimed at training researchers in specific fields and do not aim at teacher education*" (T8, 2014, p.8).

For Bolzan (2008, p. 105), the pedagogical knowledge: "refers to a broad knowledge built by the teacher in his formative process, implying the mastery of the know-how, as well as the theoretical and conceptual knowledge and its relations". In this bias, the teachers' discussions need to be grounded in the relations between the scientific knowledge of the content and the domain of knowing how to do it, however in a university context there is a distancing between these dimensions, that is: "*professionals are created from 'strong' areas,*

*those that deal purely with their sciences, and the 'weak' areas where practitioners are beginning to think of science that they should teach as something to be built and not just transmitted”*(T6, 2013, p.244).

We observed a gap between the terms / practices, between teaching and research, which would need to be intrinsically related, as pointed out in T2 (2015, p. 8): *“In addition, the importance of greater appreciation of teaching within Higher Education Institutions is indicated, so that the three spheres that make up the teaching-research-extension tripod are treated and valued equally”*.

In terms of teaching in higher education, the academic career is generally valued much more for publications and scientific performance than for acting in the classroom, with pedagogical skills in the background (CUNHA, 1998, 2005; BOLZAN, ISAIA, 2006; PEPPER, ANASTASIOU, 2014). This situation assumes that the teacher devotes more time and attention to research activities than to activities inherent to the process of teaching and learning in the classroom (JUNGES; BEHRENS, 2015). These aspects are conditioned by what Cunha (2005, p.73) points out by stating that:

the university career is established in the perspective that teacher education requires efforts only in the scientific dimension of the teacher, materialized by the stricto-sensu postgraduate degree, at the masters and doctorate levels. It explains a revealing value that, to be a university professor, the important thing is to master the knowledge of his specialty and the academic forms of his production.

When dealing with research and teaching as if they seemed to be two very distant extremes, comes the question of the end activities of the Universities, that is, the tripod: teaching-research-extension, established as an obligation for the Universities, in article 207 of the Federal Constitution. 1988 (BRAZIL, 1988). Aragão *et al* (1999) provide guidance on these three implications, namely: teaching is the starting point for the apprehension of knowledge; In research, the unknown is defined or redefined in social terms, starting from existing knowledge; and extension is translated by the importance of knowledge learned and expanded, increasing its scope, characterized as intervention in the social context.

In terms of **Teaching as a Naturalized Condition** (2:14), it is emphasized that the factors that interfere with the choice of teaching as a profession, through which subjects organize, consciously or not, are their cognitive and affective schemes (CUNHA, 2005; 2006). For Cunha (2005, p.94): *“being teaching a human action, it is also historical and cultural, that is, it is embedded in a web of meanings that constitute the subjects”*. They all have a marked history of events and records that helped them choose a particular course. These are influences from family, school, childhood and even from employment that stimulated professional qualification. In D10 (2016, p. 39) it is emphasized that the: *“university teaching identity is built from experiences lived during the life trajectory, often marked by the family influence that aroused the taste for the profession”*.

Cunha (2005), when discussing the conception of naturalized teaching, points out that all teachers were students of other teachers and experienced mediations of values and pedagogical practices. Given the context they produced worldviews, epistemological conceptions, political positions and methodological experiences. Thus, consciously or not, they were organizing their ways of being a teacher, also supporting future teaching. This aspect is also highlighted in T7 (2014, p. 72), in understanding the formative and identity aspects of teachers: *“more or less explicitly, all teachers stressed that the way they experienced their initial formation has had an influence on identity construction and the way they perform their teaching and training work, especially in terms of references with their formators”*. Thus, in the study by T7 (2014), the choice for a degree is emphasized either by affinity with the course, due to school or childhood experiences, or by the possibility of professional performance in the technical area or research, even in courses with qualifications. in the undergraduate degree exclusively, as highlighted by a teacher investigated in T7 (2014, p. 74): *“some teachers had a negative predisposition to become a teacher, especially in basic education. This position was maintained by Professor Augusto even after the initial formation, in the baccalaureate qualification. Throughout the course, as well as other teachers, he associated his professional choice for research with the need to enter the public university and this was what led him to teaching”*.

In this sense, Cunha (2005, p. 94) infers that: *“intervening in this process of professional naturalization requires a systematic energy of reflection, based on the deconstruction of experience. Teaching subjects only change their practices when they are able to reflect on themselves and their education”*. Hence the need for continuing teacher education and perhaps this is the main meaning of teacher education: the dialogue between conceptions.

Thus, teaching experiences are branded, which most often lead to teaching work. However, in the context of acting in the exercise of university teaching, in the ES, in continuous with respect to the activities of teaching, research and extension, the teacher produces his professional development as he needs to improve his experiences in the context of the scope of the program. be a teacher, taking here the idea of teaching as a process to be built. It is in the midst of these dialogues that we are interested in bringing the discussion of the conceptions / teaching practices of higher education closer to the main themes that have been a means of investigation in higher education within the area of CNT, which we present below.

### A look at the themes investigated

We understand that the factors that interfere in university institutions in terms of changes and teaching conceptions are varied, among them the lived institutional climate, politics, society, level of student engagement, forms of knowledge control, among many others (CUNHA, 1998), which make possible / substantiate the articulation of certain behaviors/actions. In this sense, regarding the investigated themes that emerged from the

thematic analysis: Teaching Practice, Professional Identity, Formative Processes, Teaching Conceptions and Teaching Knowledge, we observe that they are directed to the practice of being a Teacher, confirming Cunha's statement (1998). , p.33), emphasizing the teacher: “as a fundamental element, it can favor change, due to its condition of giving direction to the pedagogical practice that it develops, even recognizing in it the historical, social and cultural conditions”.

Based on the framework of the area, we recognize that from the expansion of access to higher education in view of professional qualification in the midst of new configurations of work, information and knowledge, coupled with the pursuit of democratization of access to all (CUNHA, 1989; ISAIA, 2006; PIMENTA, ANASTASIOU, 2014), there are needs / challenges to rethink ES education and knowledge production in which the university class may no longer be a space for the mechanical and fragmented transmission of scientific and professional knowledge, but rather as a place that allows students to have a genuine understanding of their field of activity, being able to apply this knowledge to unpredictable situations. (ISAIA, BOLZAN, 2007, p.6).

Thus, in an attempt to systematize the current scenario of the Brazilian higher education, we invested in the discussion of the emerging themes of the analysis undertaken in this investigation. **Teaching Practice**, found in 7 of the 14 papers selected in the area of CNT, was the most recurring theme among discussions in the area. The study approaches were characterized in the analysis of the development of curricular components, such as: Experimentation, Quantum Physics, Microbiology and Parasitology, besides the investigation about the emerging conceptions of the analyzed studies, which point to the necessity of the reflexive practice and the continuous formation with direction for pedagogical situations.

A dimension emphasized in D<sub>12</sub> (2016) discusses the objectives that Biological Science teachers seek to develop in the Practice as Curriculum Component (CCP) activities of the subjects they teach. Since this component, with mandatory 400 hours, must be inserted from the beginning to the end of the undergraduate courses in order to expand the space for teaching practice in teacher training (BRASIL, 2001). However, D<sub>12</sub> (2016, p. 28) points out that *“it is observed, for example, from the students' speech, a lack of consensus among university lecturers about what it is, what its objectives are and how it can be CCP students [...] also mention the limited time available in the classroom to develop this activity, overloading them too much, [...] there is too much elaboration of teaching materials and resources, such as games and models, that seems to imply a merely activist doing, distanced from theories of the sciences of education and the school context ”*.

Thus, even providing space for linking more practical and pedagogical teaching strategies with regard to the training of new teachers (undergraduate), the lack of understanding about the pedagogical principles in ES still remains in the university context. Such understandings, in the view of D<sub>12</sub> (2016), are related to the professional career and teacher training for the exercise in this curricular component (CCP). Thus, when thinking about challenges experienced by the teacher trainers, we dialogue with the results of T<sub>9</sub>



(2015, p.9), which, by investigating the aspects that influence the trainers' practices, organizes them into two axes, which are: *Axis 1: Influences on the teaching practice of higher education. In this axis are the categories: i) dialogue; ii) curriculum; iii) time; Axis 2: On possibilities and needs: i) in approaching themes; ii) continuing education for higher education teachers*". In this direction, as highlighted by T<sub>9</sub> (2015), there is a lack of communication between teachers regarding the conduct of pedagogical practices, which often by the curricular organization is far from the reality of teacher education. Also noteworthy is the lack of time for planning on thematic approaches aimed at interdisciplinarity and participation in training meetings, placed as bias of necessity. In counterpoint to this, we understand the importance of the institution providing time and discussion in face of the needs pointed out by the teachers, that is, "the educational institution, as a set of elements that intervene in the contextualized educational practice, must be the engine of innovation and teacher professionalization" (IMBERNÓN, 2011, p. 23), by providing opportunities and problematizing the importance of socialization spaces on teaching practice.

Moreover, when investigating works that deal with the study of teaching practice in the curriculum components, previously highlighted, the importance of reflective practice and the need for pedagogical training is stressed, as underlined in T<sub>1</sub> (1996, p.175): "*teachers need socialize, among peers who share the same pleasure in teaching, experiences and reflections so that they can gain confidence in what they do, promote self-training, guide their continuing education without insecurities and without remaining anonymous in their own classroom as if good experiences were the work of chance*". Thus, education will be based on reflection on the teaching practice itself, allowing the teacher to examine their implicit theories, their working schemes, their attitudes, performing a constant self-assessment process that guides their work (IMBERNÓN, 2001), and may provide opportunities for teacher to reorient and understand aspects about his own professional identity, focus on the next topic of discussion.

Understanding about how to be a teacher meets the theme **Professional Identity**, dialogued in 6 of 14 articles reviewed as the main theme. We believe that the professional identity in teaching in the ES is understood as a process that extends to the teacher's career, integrating experiences, practices, ideas and values acquired throughout the career and initial education, because for Isaia (2006, p. 72):

The teachers' professional identity is formed by a continuum that goes from the phase of choosing the profession, through the initial formation, to the different institutional and generational spaces in which the profession unfolds, comprising the space / time in which each one continues to produce. your way of being a teacher.

In terms of meaning, identity is what is proper, a set of characters that identify a particular individual (FARIA, SOUZA, 2011). Thus, when directed to the teaching profession, we focus on the processes that structure the ways in which teachers assume and dialogue about their performance according to their knowledge, attitudes and principles that guide their practice. As expressed by T<sub>11</sub> (2016, p. 14), stressing that: "*professional identity is not something that can be transmitted and absorbed, since it is an unfinished process of*



*socially constructed reality, triggering changes in personal and professional histories. from the teacher”.*

In the same direction, Pimenta and Anastasiou (2014) point out that “university teaching has been configured as a continuous process of an *epistemological* identity arising from their scientific knowledge and teaching skills” (PIMENTA, ANASTASIOU, 2014, p. 88 [author’s emphasis added]. This conception is highlighted in D9 (2018, p. 43), emphasizing that: “*the mobilization of the knowledge of experience, in the context in which its research is inserted, is the main point for mediation in the construction of a professional identity. teacher*”. Thus, it is necessary for the teacher to dialogue about the knowledge of his experience with the references of his studies / research and it is also necessary that he can socialize with the other teachers, since: “*because there is no collective teaching identity of the which is to be a university professor, each interviewee built their professional identity [...]. Thus, higher education institutions, as an environment of professional socialization, should provide conditions that assist the teacher in the construction of his teaching professional identity*” (D4, 2012, p. 8).

Aware that in ES there is little or nothing to do with the theme of training, we understand that such spaces for discussion / socialization would foster the concept of *professional development of higher education teachers* (PIMENTA, ANASTASIOU, 2014), would be more appropriate than education, given that teaching is a specific field of professional intervention in social practice. In agreement with the understandings of Isaia (2006), that teaching in higher education is built along its trajectory involving personal, professional and institutional dimensions, each in its specificity, fostering the teaching identity in terms of professional development. This statement is directed to the idea that professional development and, consequently, the constitution of a professional identity, will be based on the reflection of the subjects about their practices and knowledge as a means of problematizing their conceptions, implicit theories, functioning schemes, their attitudes, among other important positions for teaching practice (IMBERNÓN, 2011).

Such concerns lead to another emerging theme of the analysis undertaken, which is ***Formative Processes***, highlighted in 2 of 14 works, which problematize continuing education interventions in teaching in ES. According to Imbernón (2010), the teacher is considered the main piece of any intervention that seeks a true innovation of the teaching process. Thus, the justification that the formative processes need to be linked especially to the teachers, the subjects of the process. However, in terms of legislation, university teaching has not been conceived as a training *process*, but as a *preparation* for teaching, which will preferably be done in *scritto sensu* postgraduate courses (PIMENTA, ANASTASIOU, 2014 [emphasis added of the authors]).

Such defenses are expressed in the Law of Guidelines and Bases of National Education (LDBEN No. 9.394 / 96, art.66), when determining the pedagogical preparation for the exercise of teaching at higher level according to which:

the preparation for the exercise of higher teaching will be done at postgraduate level, mainly in master's and doctoral programs. Single paragraph. The notorious knowledge, recognized by a university with a doctoral degree in related field, may meet the requirement of academic title (BRASIL, 1996, p. 21).

Given the context described above, we observe the certain consensus that was established in the field of higher education, that teaching in higher education does not require training in the field of teaching, that is, the domain of specific knowledge would be sufficient, as this identifies the ability to teaching in question is the research it conducts. According to T8 (2014, p.34), referring to master's and doctoral programs: *“such programs are aimed at training researchers in specific fields and do not aim at teacher training. [...] the vast majority of teachers are researchers and lack training for teaching ”*.

Such training, according to Imbernón (2010), needs to foster the personal, professional and institutional development of teachers as a fundamental requirement, since continuing education must prioritize collaborative work to transform practice. This view of training is underlined in T7 (2014, p. 116 [emphasis added]), highlighting: *“the lack of institutional policies for continuing education that can favor **professional development** based on a reflection on practice”*.

It is seen that such situations are due to the fact that there is still a strong belief that to be a teacher just a volume of accumulated knowledge and the exercise of the profession, a preponderant factor of the dominant paradigm of science (SANTOS, 2008). The belief that the content knowledge that university professors carry with them is sufficient and easily able to plan their classes is the factor that also distances them from continuing education groups, often understood as mere content updates. For Imbernón (2010, p.94), the change in educational practice will only be possible “when training ceases to be a space for ‘updating’ to be a space for reflection, training and innovation, with the aim of teachers learning. Thus, teachers' learning is emphasized more than their teaching ”.

Thus, it is necessary to discuss during the training meetings relevant pedagogical factors to the qualification of teaching and learning in a university school context not to incur the misunderstanding pointed out in T8 (2014, p. 159), emphasizing about the formative processes of the teachers interviewed: *“declare no interest in continuing education courses; They say that they do not believe in the contribution of this type of activity to the improvement of their teaching action and see them as a waste of time ”*. Therefore, it is not enough to provide continuing education meetings; Rather, it is necessary to strengthen its assumptions towards a reflective dialogue about teaching practice and performance, so a welcoming and institutional training policy would be indispensable.

Concerning ***Teaching Conceptions***, treated here as a research theme, we realize that these are produced from implications related to the reality of teaching, their consequences for the teachers' work and the way they are constituted over time (ISAIA, 2006). The theme Teaching Conceptions was a discussion medium in 2 of the 14 works, under different approaches: in D2 (2008), the author seeks understandings about the institutional implications

in teachers' conception of teaching and its reflexes in daily practice; Already in D13 (2016, p.8) the objective of the dissertation was to understand the emerging teaching conceptions of the experience of pedagogical practices and teacher education, from the perspective of reflection.

In terms of conceptions, it is important to realize that these are made within the dimensions of the teacher's professional career, whether personal, professional or institutional. For Isaia (2006, p.73): “In terms of attribution, teaching encompasses all activities developed by teachers that are oriented towards the formation of their students and themselves”. In a relationship coated with changing conceptions, the teacher produces new knowledge about his way of teaching, students also experience new constructive processes of their own knowledge.

For other authors, the teaching conceptions are based on the educational panorama (CUNHA, 2005) and on the paradigm transition (SANTOS, 2008), in which the teaching practice in a university context has mostly been based on the domains of technical rationality. addressing what really matters: “the existence of a contemporary literature that seeks to resize teaching professionalism towards autonomy and reflection” (CUNHA, 2005, p. 5). Such conception is indicated in D2 (2008, p. 113), considering that: *“some factors in conjunction, in the trajectory of teacher education of these IQ-USP professionals, underlie a conception of teaching focused predominantly on research, in the objective of train researchers of high scientific level, an intellectual elite of the area. Certainly, one of these influencing factors in teacher education is in the academic, research-oriented culture.”*

In this context, the analyzed work infers on the favoring of rationality for the search for a greater intellectuality as one of the organizational principles of the institution. Factor that leads the author of the paper to question: *“In XX-YYY do we have fundamentally researchers, or teachers?”* (D2, 2008, p.114). Such a view is placed as an impasse in thinking about the exercise of teaching, given that certain teachers with high academic productivity (researchers) do not recognize themselves in the role of teachers.

For Isaia (2006), the conceptions about teaching involve mental creation, understanding and dynamics in which reflexive processes and effective practices are articulated, in a permanent constructive movement throughout the teaching career. Such conceptions are crossed by orientations, be they implication with teaching, centering on the specific area of knowledge and personal dimension. According to Isaia (2006), the meaning of such conceptions is accompanied by invariables that accompany the teaching trajectory, making teaching not only constituted by the technical dimension, but also by interpersonal and ethical conceptions that will guide the way of being a Teacher.

In D13 (2016), looking for higher level teaching conceptions in the context of the Quantum Physics curriculum component, about the learning process, the author highlights the following conceptions: Teaching requires technical training; Teaching requires personal aptitude; Teaching-learning is transmission-reception; and Teaching-learning is interaction.

With such, it is possible to emphasize certain conceptions based on the real situations in which the ES is, corroborating Cunha's defenses (2005) that we are still walking in the midst of paradigm rupture, which strengthens the defense / challenge that it is necessary to better investigate the higher education, especially the area of CNT, as well as to strengthen the dialogue about the teaching conceptions for a professional development articulated to reflection processes and autonomy in formation processes.

In the midst of this dialogue, we think about the knowledge that guides teaching in line with the *Teaching Knowledge* theme, problematized in only 1 of the 14 works analyzed. The fact that it is the subject of discussion in only one paper indicates the need for us to think about them in the ES regarding the knowledge / discussion of the knowledge inherent to the university professor's own education. In T6, the study sought to understand the knowledge mobilized by a group of teachers and at the end highlights that: *“the teaching profession is not neutral and needs to be equipped with concepts and practices aimed at the formation of a subject capable of interacting and transforming the world. . Respondents show that they need academic training and also the development of knowledge inherent in vocational training”*(T6, 2013, p. 8).

Given the above in T6 and the main function of teaching in ES in undergraduate, be it to train future teachers for basic education, Isaia (2006, p. 69) stresses that teachers do not have a specific function inciting a fragility of teaching activity in ES. That is,

usually teachers define themselves from their areas of knowledge (physics, engineering, medicine, geography, etc.), focusing more on their specialties; Thus, disregarding the teaching function that is clearly linked to the formative mission of higher education.

In view of this, the importance of research or scientific knowledge of the contents is not denied, but it expands to the articulation between scientific knowledge and pedagogical knowledge. Thus, it is necessary that teachers “have mastery in their area of knowledge, how their students learn and how they can be assisted in this process” (ISAIA, 2006, p. 69). This statement also brings us to the knowledge needed for teaching, in which the teachings postulated by Shulman (2005, p. 11 [our translation]) can make it easier to think of their expansion, to:

- Knowledge of the content;
- General didactic knowledge, especially taking into account the general principles and strategies for managing and organizing the class that transcends the scope of the subject;
- Knowledge of the curriculum, with special mastery of the materials and programs that serve as the teacher's "tools for commerce";
- Didactic knowledge of content: that special fusion between subject and pedagogy that constitutes an exclusive sphere of teachers, their own special form of professional understanding;
- Knowledge of students and their characteristics;
- Knowledge of educational contexts, ranging from group or class functioning, management and financing of school districts, to the character of communities and cultures; and

- Knowledge of educational goals, objectives and values, and their philosophical and historical foundations.

In this sense, much more than mastering scientific content with the intention of simply transferring ready-made content, it is necessary to study and plan / organize in the face of knowledge, knowledge understood with formative bias, since it is pertinent to mediate knowledge towards the production of a teaching able to assist the student in the production of knowledge towards their formative autonomy, in the sense that the knowledge is translated into teaching.

Pimenta and Anastasiou (2014), dedicated to the university context, describe teaching knowledge as intrinsically related to the identity of the teaching profession, which is built from the knowledge of experience, the understanding of knowledge and pedagogical understanding, seen as a process of construction. of the contextualized and historically situated professional. In this sense, as exposed in T6 (2013, p. 282) *“the teaching knowledge is not ready and finished, is in constant movement and always needs to be mobilized [...], because each group, each time and each room space requires a different intervention of this knowledge”*.

The research of T6 (2013), searching for the teaching knowledge mobilized by CNT teachers in the Federal Institutes of Education, Science and Technology in the distance learning modality, indicated certain knowledge in two categories, namely: Didactic-Pedagogical Knowledge and Knowledge Curricula, the first characterized by the knowledge transmitted by the institutions, incorporated into the teaching practice, those produced in the practice of the profession; and the second as the contents and methods determined by the institutions for teaching performance. In T6 (2013, p. 282), the author also points out that: *“the teacher needs academic training Lato and Stricto Sensu, but also needs to develop the knowledge of vocational training, the disciplinary knowledge, the knowledge curriculum and experiential knowledge”*. Thus, it is in the midst of teaching knowledge, which the ES teacher needs to develop (SHULMAN, 2005), that we can move to more problematized contexts and where teachers guide their classes to the learning process and better education of future professionals of higher education. in this case in particular the CNT.

The discussion topics in higher education limited to the area of CNT, as we can see in the discussion, are not exclusive, but each in its role seeks understandings about a more qualified teaching and learning. It is worth noting that from the analysis that emerges from the themes that underlines professional development as a product of personal, professional and institutional processes and the relationship between them. Thus, in search of teaching performance in terms of values articulated to the contemporary world, we want ES teachers not to be professionals to develop prescribed classes, but to participate actively and critically in a true process of innovation and changes for the transformation of practices, perhaps social ones. (IMBERNÓN, 2001), so that the collectives, in their contexts, can, through dynamic and flexible processes, reflect on their teaching practices.

## Final Thoughts: A Challenging Agenda

Teaching in ES was the central theme of the present study, which sought to establish a dialogue between the conceptions of university teaching and the themes that have been the subject of discussion of the analyzed works. For that, we took as data for the discussion the Brazilian researches of *Stricto Sensu* level (theses and dissertations) that were sent to the ES, limited to the area of CNT, clipping that also made possible a look at the degrees of the area. The production of results, collated with the theoretical references of the area, implies considering challenges to be discussed in the context of higher education, in view of the enrichment of the processes of formation and teaching of / in the sciences. Such challenges make us base an agenda of considerations that include:

- create spaces for discussion / socialization of teaching practices by fostering the concept of professional development of teachers of higher education, characterizing a training process based on learning;

- stimulate continuing education processes as spaces and times for discussion, in which teachers can acquire awareness about their education processes and thus their conceptions of teaching, reflecting on them, dialoguing with their peers and with references;

- foster the idea of teaching as a process to be built within the scope of work in the ES, with regard to teaching, research and extension activities, because the teacher is producing their professional development as they need to improve their experiences to build up /be a teacher;

- strengthen the dialogue about teaching conceptions for a professional development articulated to reflection processes and autonomy in formation processes (here considered the notion of systematization and experience reports, as research of the practice itself), (re) visiting constantly the means that constitute the professional identity of the teacher;

- Recognize / constitute and explain teaching knowledge, in order to be intended by teachers of higher education, leading to the appropriation of individual professorship of each subject: teaching and professionalism;

- develop institutional reception policies for new teachers as a crucial and indispensable task for the beginning of the teaching career, including them in a training system.

Finally, we understand that it is necessary to better investigate the ES and especially the CNT area due to the scarce number of dissertations and theses found, as well as the need to make new efforts in continuing education actions already carried out and others to be developed that enhance the reflection and socialization of practices and experiences in the context of university pedagogy.



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