



Corresponding to Author

<sup>1</sup> Thiago Santos Guimarães

E-mail: [thiago.s.guimaraes41@gmail.com](mailto:thiago.s.guimaraes41@gmail.com)

Universidade Estadual de Santa Cruz

Ilhéus, BA, Brasil

CV Lattes

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## Perceptions of Teacher Educators About Their Pedagogical Practices\*

Thiago Santos Guimarães<sup>1</sup>  <https://orcid.org/0000-0003-0709-5439>

Elisa Prestes Massena<sup>2</sup>  <https://orcid.org/0000-0002-7670-0201>

Maxwell Siqueira<sup>3</sup>  <https://orcid.org/0000-0002-2165-4244>

<sup>1,2,3</sup> Universidade Estadual de Santa Cruz

### ABSTRACT

Over the last few years, there have been significant changes regarding the scope of higher education institutions in the country, and this has provoked discussions about the search to meet the new training needs and the challenges presented at this level of education. Thus, it is important to underline the importance of understanding the role of university professors and the need they have to modify their teaching actions in times of constant social and technological advances. In this sense, the aim of this study was to analyze the perceptions of these teacher educators about their pedagogical practices. In this study, we will present the results of a semi-structured questionnaire with six questions, answered by fourteen teacher trainers of the undergraduate courses in Chemistry, Physics and Biology of a public university in the country. Data analysis was performed through Discursive Textual Analysis. The results indicate that teacher educators who can make a direct relationship between theory and pedagogical practices are committed to the teaching profession and seek new strategies to use in their classes, which aims to facilitate and encourage the process of teaching and learning of undergraduates. To this end, we believe that the efforts and commitments of both teacher educators and higher education institutions are necessary in order to improve university education.

### KEYWORDS

Higher education. University pedagogy. Teacher training. Pedagogical practice.

\*Texto traduzido por: Silvia Lacovacci. Graduada em: Secretariado Bilingue e tradução de Inglês Comercial – Instituto Schumann – Roma, Itália. E-mail: [siacovacci@gmail.com](mailto:siacovacci@gmail.com)

## Percepções de Formadores de Professores Sobre as Suas Práticas Pedagógicas

### RESUMO

Ao longo dos últimos anos, têm ocorrido mudanças significativas no que se refere ao âmbito das instituições de ensino superior no país, e isto tem provocado discussões acerca da busca por atender as novas necessidades formativas e os desafios apresentados neste nível de ensino. Assim, cabe ressaltar a importância da compreensão do papel do professor universitário e a necessidade que este possui de modificar suas ações docentes em tempos de constantes avanços sociais e tecnológicos. Nesse sentido, o objetivo deste estudo foi analisar as percepções desses formadores de professores acerca de suas práticas pedagógicas. Neste estudo, serão apresentados os resultados provenientes de um questionário semiestruturado com seis questões, respondido por quatorze formadores de professores dos cursos de licenciatura em Química, Física e Biologia de uma universidade pública do país, sendo a análise dos dados realizada através da Análise Textual Discursiva. Os resultados indicam que os formadores de professores que conseguem fazer relação direta entre a teoria e as práticas pedagógicas possuem comprometimento com a profissão docente e buscam novas estratégias para utilizar em suas aulas, o que visa facilitar e incentivar o processo de ensino e aprendizagem dos licenciandos. Para isso, acreditamos que são necessários os esforços e compromissos tanto dos formadores de professores quanto das instituições de ensino superior, numa integração em busca da melhoria do ensino universitário.

### PALAVRAS-CHAVE

Ensino superior. Pedagogia universitária. Formação docente. Prática pedagógica.

## Percepciones de los Formadores de Profesores Sobre sus Prácticas Pedagógicas

### RESUMEN

A lo largo de los últimos años, han ocurrido cambios significativos en el ámbito de las instituciones de educación superior en el país, y esto ha generado discusiones acerca de la búsqueda por satisfacer las nuevas necesidades y desafíos de formación presentados en este nivel de educación. Por lo tanto, es importante resaltar la importancia de comprender el papel de los profesores universitarios y la necesidad que tienen de modificar sus acciones docentes, en tiempos de constantes avances sociales y tecnológicos. En este sentido, el objetivo de este estudio fue analizar las percepciones de formadores de profesores sobre sus propias prácticas pedagógicas. En este trabajo presentamos los resultados provenientes de un cuestionario semiestruturado compuesto por seis preguntas, respondidas por catorce formadores de docentes de los cursos de licenciatura en química, física y biología de una universidad pública del país. El análisis de los datos se realizó por medio de análisis textual discursivo. Los resultados indican que los formadores de docentes que logran establecer una relación directa entre la teoría y las prácticas pedagógicas, se comprometen con la profesión y buscan nuevas estrategias para usar en sus clases, con el objetivo de facilitar y alentar el proceso de enseñanza y aprendizaje de los futuros profesores. Para tal, consideramos que los esfuerzos y compromisos, tanto de los formadores de docentes como de las instituciones de educación superior, de forma integrada, son necesarios para la mejoría de la educación universitaria.

### PALABRAS CLAVE

Educación superior. Pedagogía universitaria. Formación docente. Práctica docente.

## Introduction

Significant changes in the institutional sphere have provoked discussions about higher education in terms of the search to meet new formative needs and the challenges of this level of education (ZABALZA, 2004). Thus, the role of the university professor and the need he has to modify his teaching actions has already been the focus of many investigations in the last ten years (CUNHA, 2009; RAMOS, 2013; PEREIRA; ANJOS, 2014; CUNHA, 2018). Traditionally, a university professor has been seen as the one who is responsible for his education, so it is up to him to decide what type of education he intends to acquire, at what time and what his objective is, whether to meet institutional demands or to meet personal interests (ZABALZA, 2004).

For many years, the prestige of the university professor stood out for his various research activities, staying at a lower level than teaching. This shows that, according to Zabalza (2004, p.147), "the old idea that one learns to teach by teaching continues to prevail. This point of view is based on the idea of "those who know how to do, know how to teach", something that has been questioned and modified over the years (SHULMAN, 1986; CUNHA, 2009; ZANON; OLIVEIRA; QUEIROZ, 2009), because it is known that there are university professors who present skills and qualities both in teaching and research.

Given this scenario, it is important to investigate the innovations with regard to transformations and the reconceptualization of the role of university teachers in higher education, emphasizing that, within the teaching universe, pedagogical innovations are understood as actions that are considered distinct from traditional teaching and the incorporation of small changes in the teaching posture (CUNHA, 2009).

In this sense, studies have been developed over the last few years with a view to investigating the teaching practices of teacher trainers (SILVA; SCHNETZLER, 2001; CUNHA, 2018). Cunha (2016), in his work, presents indicators for the analysis of innovative teaching practices. Other papers present this discussion through case studies (QUADROS; MORTIMER, 2014; MÜLLER; ARAUJO; VEIT, 2018), bringing a reflection on innovation and how a teacher can become successful in his teaching actions. Still in this perspective, Quadros and Mortimer (2016) make an analysis of an innovative strategy that ends up making a teacher successful. Innovations arise as a consequence of the social contexts in which they are inserted, the way education is thought and also to respond to the needs that emerge, which the current paradigms can no longer meet (MASETTO, 2012).

Discussions on promoting the professional development of teacher trainers and the influence of their teaching actions on initial training have also been investigated (GONÇALVES; MARQUES; DELIZOICOV, 2007). One way of capturing the perceptions of these professionals about this subject has been the use of narratives (NOVAIS; GALVÃO; FERNANDEZ, 2016).

Another issue that has been investigated is the use of digital technologies in the classroom by science teacher trainers, bringing to light the aspect that it will be increasingly necessary to think and take into account these aspects, due to the great technological advance we are currently experiencing (JACON *et al.*, 2014; WANDENSKI; STRUCHNER; GIANNELLA, 2018). Recently, some researchers have sought to analyze the understandings of university professors regarding the Practice as a Curriculum Component (CALIXTO; KIOURANIS; VIEIRA, 2019).

We realize that, in different perspectives, university teaching has been investigated. In terms of commitment to their profession, and in the faculty's competence in teaching scientific content, there is also the idea of professionalism, which, for Cunha (2009, p. 175), "translates into the idea of being the profession in action, in process, in movement". For Zabalza (2004, p. 162) "the professionalization of the trainer allows to give more systemicity, stability and dedication to his work". For, by perceiving improvements in their working conditions, teachers would strengthen their teaching identity to the point of perceiving and feeling important within the formative process in which they are immersed (ZABALZA, 2004).

Bringing the discussion to the professional dimension of the teacher, in which it is not enough just to think about the specific discipline he teaches, but it becomes necessary to think about his function of forming individuals, we have that this formative function presents problems common to all teachers. Among them,

Aspects related to students' motivation, interpersonal relationships, the ability to transmit to them a vision of life and professional exercise in accordance with ethical principles and social responsibility, mastery of resources for curricular development of the discipline and the different processes that include its teaching (knowledge of the basic processes of learning and teaching, preparation of materials, ability to prepare presentations that are easy to understand, creation of activities, evaluation planning, etc.). ), mastery of the generic resources that condition the professional exercise (care with the voice, skills related to new technologies, skills in group management, etc.) (ZABALZA, 2004, p. 153).

All of this does not relate specifically or exclusively to any area of knowledge. These factors make up a territory common to all teacher trainers. Faced with this university teaching scenario, which constantly needs transformation, learning and the conditions for its optimization have become the objectives and challenges of these teachers, since the organization of content and how it is presented have become secondary objectives in the exercise of the teaching profession (ZABALZA, 2004).

Thus, the aim of this study is to analyze the perceptions of the teacher trainers of the undergraduate courses in Chemistry, Physics and Biology about their pedagogical practices, so that we can think about mechanisms to improve higher education, both in terms of the aspects addressed to university teachers and the improvement of initial training through an innovative teaching perspective.

## University Teaching in Contemporary

With the expansion and diversification of higher education supply in recent years, it is necessary to analyze some characteristics of the scenario in which higher level institutions are inserted (CUNHA, 2004; 2009; 2016; 2018). For many years, the vision of the university professor was exclusively linked to research, to the point that little value was placed on pedagogical training in his professional performance, i.e., a good university professor was only a good researcher (CUNHA, 2009).

According to Cunha (2009), paradigms that created a hegemony in higher education around the professional performance of university professors were influenced mainly by the areas of Exact Sciences and Nature, because they contributed to the epistemological conception, since they had a privileged position in the definitions of knowledge. What determined the teacher's competence to act in higher education was the researcher's trajectory, leaving as something secondary the training for teaching and his pedagogical experiences (CUNHA, 2009). Thus,

The prestige of the university professor in the academic field, although this condition may vary in intensity according to the origin of the area, is basically based on research activities, including publications and participation in qualified events. The professor is also valued for his dissertation and thesis orientation activities, as well as for his participation in post-graduation-related stands and processes. Consultancies and positions in university administration also constitute a professional value (CUNHA, 2006, p. 258).

Because of these factors mentioned above, it is essential to think about higher education issues that are related to the teaching and learning process. It is in this sense that the term university pedagogy has been proposed, which is defined by Cunha (2004, p. 351) as "a controversial field of production and application of pedagogical knowledge in higher education", which distinguishes itself from pedagogy in general because it seeks to understand the learning process of the professional training path of adults.

According to Cunha (2004), university teachers are only expected to have a knowledge of the scientific field, specific to their area, based on the rigors of science and, at the same time, a professional exercise that legitimizes this knowledge in practice. In this sense, "the current challenges of university teaching seem to be requiring knowledge that until now represents low academic prestige in the scenario of globalized policies because they go beyond the possibility of quantifying products" (CUNHA, 2004, p. 533). This makes one of the impasses that these teachers will face is that of having more and more relationship with the mastery of the content of their disciplines and pedagogical knowledge.

From this perspective, the investigation of the development of teaching practices differentiated from university teachers may enable reflection on current practices and training needs, which may establish knowledge about the didactic-pedagogical practice of teachers to be investigated, since we have a very complex educational scenario, in which

The understanding of teaching is exponentially rooted in the culture of the country. It is more than 300 years of positive science thinking, accompanying the condition of universal institutionalization of schooling at various levels. We still live with daily practices that confirm this reality: evaluations that require "memorized"; repetitions of tireless exercises to fix learning in a mechanical way; lectures with a single teaching methodology; use of power points - which succeeded the overhead projector blades and slides - with tacit content for students to copy and memorize; objective or symbolic punishment of all manifestations that disagree with the teacher's word; inhibition of sharing knowledge and so many other manifestations so common in the academic scenario (CUNHA, 2018, p. 7).

As Cunha (2018) points out, these are actions that continuously happen in the university space, situations that are sometimes seen as normal or without the need for discussions in an attempt to propose changes. The author also points out that:

Recently, in a conversation with a group of university professors, I learned that there are some colleagues who suspend classes when there is no light on campus, since they are prevented from using power points. In other words, they change the technologies, but little changes are made to the class ritual, still strongly based on the transmission of information. These practices are not merely individual decisions of teachers; they are in the cultures valued also in society and institutions (CUNHA, 2018, p. 7).

Thus, it is necessary to understand knowledge through an epistemological perspective, aiming at breaking with the traditional model of teaching and learning, bringing the problematization about the positivist principles of modern science impregnated in the way the university teaches (CUNHA, 2016). Allied to this there are attempts to think of innovative ways of breaking with this model, which aim, in fact, at a real and significant change in pedagogical practices, because, according to Masetto (2012, p. 15), innovations are called "the novelties of the era of technology and communication, [...], the interest in overcoming fragmentation in the various fields of knowledge, the search for interdisciplinary knowledge [...]", pointing out to us that there is a possibility of change in the understanding of knowledge (CUNHA, 2009), with caution not to interpret that only what is innovative will bring satisfactory results.

In this sense, Cunha (2016, p. 94) emphasizes "not only to trigger methodological changes or provide the inclusion of technological resources, we refer, mainly, to a new way of understanding knowledge and, therefore, a change in the epistemological bases of pedagogical practice", since there has been a growing use of digital technologies, implying the ways of teaching and learning in academic spaces. However, innovation has been understood only as the inclusion of these technological apparatuses, which, according to the aforementioned author, is a reductionist vision of innovation.

For Masetto (2012, p. 34) "it takes time and space to ensure that a new conception of being a teacher, which takes on new postures and a new action, is built. And in this time, it is important to emphasize that it is necessary to consider the personal and professional experiences of these teachers, because this innovative vision presupposes preparation for a new posture, which includes cooperation, collaboration and teamwork (MASETTO, 2012).

This brings the need for an involvement of senior management so that in addition to discussions about the organization of curriculum, as Masetto points out (2012, p.26) actions for a "professional training [...] with explicit educational objectives broader than just those relating to the acquisition and application of technological information". In the university's search for an institutional redefinition, the teacher trainer must be attentive to the professional conditions of his teaching (RAMOS, 2013).

## Methodological Path

In the broader context of the research<sup>1</sup>, it sought to identify and analyze differentiated teaching practices of teacher trainers of undergraduate courses in Chemistry, Physics and Biology of a public university in the northeast region of the country. To this end, from a contact made by the research professors of the Group for Research in Curriculum and Teacher Training in Science Teaching (GReTTST) of the State University of Santa Cruz who taught in each course, a semi-structured questionnaire was initially proposed to the undergraduates of the respective courses, who were attending the final semesters and had thus lived experiences with more teachers. However, it should be noted that not all accepted to participate in the research, in the Chemistry course only twelve (12) students answered the questionnaire, in the Physics course eleven (11) students and in the Biology course nineteen (19) students (PIMENTA *et al*, 2016a; PIMENTA; MASSENA; SIQUEIRA, 2016; PIMENTA *et al*, 2016b).

The semi-structured questionnaire contained questions related to the perspective of the licentiate as to the differentiated practices of the professors cited by them. According to Gil (2008, p. 121), the questionnaire is a "research technique composed of a set of questions that are submitted to people for the purpose of obtaining information [...]". In this sense, from the analysis of the questionnaires of the undergraduate students of the Chemistry degree course, we observe that out of thirty-two (32) teachers in the area, only ten (10) were cited as those who have different practices from the perspective of the students, eight (8) from specific disciplines and two (2) from integrating disciplines (PIMENTA *et al*, 2016a). In the graduation course in Physics, it was observed from the questionnaires that the number of cited teachers, both of the specific subjects and of the integrating subjects, grew slightly according to the longer time of each graduate in the course, being that of the thirty (30) teachers in the area seventeen (17), in which twelve (12) were of the specific subjects and five (5) of the integrating subjects (PIMENTA; MASSENA; SIQUEIRA, 2016).

Finally, in the graduation course in Biology, the students appointed twenty-eight (28) teachers, among the fifty-four (54) of the area, who have been adopting differentiated practices, being that twenty-two (22) ministered specific disciplines and six (6) integrating disciplines (PIMENTA *et al*, 2016b). We emphasize that specific disciplines are considered

<sup>1</sup> This research is part of a broader research project, and this study is a deepening of data from a work published in the Annals of the XI National Meeting of Research in Science Education (ENPEC).

to those that work the specific content from the perspective of Chemistry, Physics or Biology and the integrating disciplines those that work the specific content directed to teaching (PIMENTA *et al.*, 2016a; PIMENTA; MASSENA; SIQUEIRA, 2016; PIMENTA *et al.*, 2016b).

Based on the indications of the above-mentioned students, between the years 2016 and 2017, the cited teachers were invited to answer a semi-structured questionnaire. Initially, the researchers contacted about twenty (20) teachers through the institutional e-mail of each one and from the return of the respective e-mails, some requested the sending of the questionnaire by the e-mail itself, others marked a moment for the physical delivery of the questionnaire, and some did not answer. Thus, among the teachers cited by the students, only fourteen (14) teacher trainers returned the questionnaire, four (4) teachers from the Undergraduate Chemistry course, five (5) teachers from the Undergraduate Physics course and five (5) teachers from the Undergraduate Biology course.

The profile of each teacher trainer (Table 1) was prepared from the analysis of the answers to the first questions in the questionnaire. We observe that innovation and the search for differentiated practices take place regardless of the number of years of teaching, since we can perceive the heterogeneity in terms of the time in which the teaching profession is exercised. We emphasize that due to ethical issues<sup>2</sup>, teachers will have their identities protected, and will be named by means of a code in which we will identify the course in which they teach. Thus, teachers of the undergraduate chemistry will receive the FPQn code, those of the undergraduate physics FPFn and those of the undergraduate biology FPBn, in an alphanumeric system.

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<sup>2</sup> The research in question was approved by the Research Ethics Committee (CEP) of the University where the researchers are linked and the participants signed the Free and Informed Consent Term (TCLE). (CAAE 35281913.7.0000.5526).

**Table 1.** Profile of teacher trainers.

Performance Degree	Professor	Initial Training	Time at which practices teaching
Chemistry	FPQ1	Bachelor of Chemistry	22 years
	FPQ2	Bachelor of Chemistry	15 years
	FPQ3	Bachelor of Chemistry	34 years
	FPQ4	Bachelor of Chemistry	04 years
Physics	FPF1	Bachelor of Physics	13 years
	FPF2	Bachelor of Physics	15 years
	FPF3	Bachelor of Physics	16 years
	FPF4	Bachelor of Physics	10 years
	FPF5	Bachelor of Physics	15 years
Biology	FPB1	Degree in Science	20 years
	FPB2	Bachelor of Physics	21 years
	FPB3	Bachelor of Biology Degree in Pedagogy	22 years
	FPB4	Bachelor of Biology	10 years
	FPB5	Degree and Bachelor of Biology	18 years

Source: the authors, 2017.

The questionnaire presented six (6) questions, the first two (2) helping to profile teacher trainers as already mentioned, and the other questions were directly linked to the research focus (Table 2). There are some advantages to using the questionnaire as a tool for obtaining information, for example, ease of access and practicality, the guarantee of anonymity and the possibility of the researcher answering at the time he or she considers it convenient, without the direct influence of the researcher (GIL, 2008).

**Table 2.** Questionnaire questions.

Nº	Question
03	How do you prepare your classes?
04	How do you understand the teaching and learning relationship?
05	How does the theory and practice relationship work in the classroom?
06	What are your evaluation activities like?

Source: the authors, 2017.

Also, about the questionnaire, Gil (2008) highlights that it must have questions aligned with the objectives of the research, due to the fact that the answers are what will provide the data that will be properly analyzed. In this sense, as an instrument for analyzing the answers, we use the Discursive Textual Analysis (DTA) which, according to Moraes (2003), is based on three elements: unitarization, categorization and construction of metatexts.

In DTA, the text corpus of the analysis is called "data", which, in this work, refers to the answers of the teacher trainers' questionnaires. The text corpus will go through the process of unitarization, when there is a detailed analysis and fragmentation of the materials, seeking

to achieve units of meaning. Soon after, the aim is to gather these units into more complex sets, called categories of analysis, having here, the process of categorization. And, finally, we invest in communicating this new understanding through metatext, the last element of the analysis cycle (MORAES, 2003).

From DTA, we will present three categories, two of which are considered a priori categories, namely: a) relationship between teaching and learning and b) relationship between theory and pedagogical practices; and an emerging category: c) teaching professionalism. From them, we will see how the teaching exercise requires a consistent formation, not only of the scientific contents of the subjects, but also of the aspects related to its didactics, to the teaching and learning process, besides the several variables characteristic of the teaching profession.

## Results and Discussion

The results obtained will then be discussed, taking into account the categories that were previously established.

### a) *Relations Between Teaching and Learning*

This category is related to one of the debates in the field of university teaching which is the understanding of the relationship between teaching and learning by teacher trainers. This highlights the discussion that a good teacher needs to have double competence: the scientific one, where the teacher needs to know the scientific content that will be taught, and the pedagogical one, where the teacher needs to be committed to the learning and training of students (ZABALZA, 2004). This, in the following view of the teacher trainer, is indispensable, since he considers that teaching and learning

They are interdependent, and only this complementary duality brings success to the educational process. [...] (FPB3)

We thus have the idea of complementarity between teaching and learning, so that decoupling is avoided. Yet another teacher trainer says it would be contradictory to think of teaching without a direct connection to learning. Let's look at the speech below:

I understand that teaching and learning must go together for the success of all those involved in the relationship, because it is no use just the teacher worrying about passing the programmed content and not seeking application and learning by the student. (FPB4)

These fragments show us how clear these teacher trainers are about the relationship that must exist between teaching and learning if this process is to be truly productive in terms of ownership and knowledge construction. An understanding that can provide a differentiated pedagogical doing in the daily life of these trainers, especially if they have this awareness in the classes of the Degree in Biology.

In this way, it is understood that it is necessary to present, in the clearest possible way, the relationship between what is taught and what is learned (ZABALZA, 2004). And this relationship, according to Ramos (2013), is established from the interactions between those involved in this didactic-pedagogical context. However, the following speech shows the opposite of this argument, in which we clearly see the difficulty of understanding the issue of teaching and learning, which, in the second account, derives from the initial training of this teacher trainer:

I don't think I have a proper understanding. I'd say I'm not trained for this. Unfortunately, the bachelor's degree (I'm a physics major) doesn't give room for these discussions, much less content. I have never formally studied the issue of "teaching" or "learning". [...] (FPF2)

According to Zabalza (2004), it is a great challenge for teacher trainers to transform themselves and their teachers into learning professionals, who understand the task of learning not only as the sole obligation of the student. This can be made more difficult when there are cases, such as the one exposed by FPF2, in which there is minimal contact with the pedagogical aspects due to the fact that they have taken a bachelor's degree. FPQ1 is evidence that the teacher is open to learning together:

[...] It is necessary to stress that there is no teaching without learning and that in this context the teacher also becomes a pupil when he allows himself to learn by acquiring new means of teaching. (FPQ1)

According to this teacher trainer, it is also necessary for the teacher to allow himself to learn, becoming an effective participant in this teaching and learning relationship, understanding it as a constant and intense exchange, in order to improve the way he teaches. Zabalza (2004) still emphasizes that it is necessary that teacher trainers and teachers in training understand that they should be concerned with how the content is understood, organized and integrated, forming a significant set of knowledge and new skills. This can be seen from the following speech:

I believe that the teaching and learning relationship is inseparable from the practice of teaching, which includes variables such as teacher, student, content and educational structure. (FPQ4)

This connection between these different variables cited by FPQ4 shows the complexity surrounding the relationships established between teaching and learning. Thus, you speak as the teacher trainer below shows us that the idea that teaching and learning are interdependent processes is increasingly constituted. This, as Zabalza (2004) says, was misunderstood for many years when he thought that they were independent processes.

I start from the premise that there is no way to teach without learning and there is no way to learn without teaching. [...] (FPB2)

This can be a sign that a gradual change in the way teaching processes are thought is really taking place, based on a teaching focused on learning. According to Zabalza (2004), this new scenario has become one of the main challenges for teachers, as well as being a primary objective in their formative process.

Another point to be discussed is the fact that some teacher trainers have made a reflection about their methodologies and how they influence learning from students' expectations. This question can be seen in the following statements:

I prepare my classes considering the expectations of each class, using as resources: books, data show equipment, atomic models, among others. [...] (FPQ4)

The classes are based on the information contained in the course content associated with the daily activities, routines and coexistence of the students. [...] (FPB4)

As Zabalza (2004, p.169) states, the teaching commitment to his students is the "reason why he should serve as a facilitator, doing what he can so that students have intellectual access to the contents and practices of the discipline. This becomes more evident from the following speech; in which the teacher trainer is concerned about how he will contribute to the formation of his students:

I am concerned about the contribution of the contents of the subject to the formation of the student in the course, that is, I add or value a certain subject that adds knowledge to the student in formation. [...] (FPB2)

It is clear from the previous speeches that trainers take into consideration, when thinking about teaching strategies, what could contribute to the formation of the student, thinking about the best way to achieve this. In this sense, Zabalza (2004, p.170) points out that it is necessary "to reflect on our discipline not from its own perspective [...], but from the perspective of the students [...]". The teacher will have the possibility of committing himself to the search for a better way of approaching the contents, in addition to identifying possible difficulties that he may encounter throughout the formative process (ZABALZA, 2004).

Still according to the above-mentioned author, teachers will be able to worry about the way their students learn, not leaving them abandoned to their own ways of understanding in the learning process but looking for alternatives that favor this process (ZABALZA, 2004). This is presented by the following teacher trainer, who relies on student-to-student interaction to achieve learning objectives in his classes.

[...] So I value work and group activities such as reports and other activities in which students should study together and support each other in building knowledge. [...] (FPB2)

For Cunha (2009), differentiated methodologies are experiences that stand out, since the learning obtained by the students comes as a consequence of these, and it is necessary that the teacher trainer is concerned with the learning of his students. This issue was pointed out by FPQ3, which saw the proposition of problems and the generation of discussions about them as a strategy that contributes to student learning:

Always using one or more textbooks, I try to put the content to be approached in the easiest way so that the student understands the approach made. I then pose situations [...] to promote a better understanding of the knowledge and check whether or not there are difficulties on the part of the student. [...] (FPQ3)

Therefore, the transformation of the learning process, of the search for strategies that achieve the learning objectives, in a continuous way, in content and in teaching purpose, are part of the contributions that the teacher training needs to achieve in an effective way, so that there is really a learning-oriented education (ZABALZA, 2004).

### **b) Relationship Between Theory and Teaching Practices**

When teaching is initially through practice, a rupture occurs with traditional teaching, in which there is a break in the dichotomy of having to start this teaching from theory. Thus, the relationships between theory and practice derive from the individual and collective action of these teacher trainers as well as from their intentional praxis that needs to be constantly analyzed (CUNHA, 2009).

For Zabalza (2004, p. 166), this is part of "the idea of reflection on practice, or, as a result, the systematic review of the professional exercise itself through various systems of observation and evaluation and the link between theory and actual professional practice [...]". We can see from the following lines that teacher trainers are concerned about the way in which knowledge is mediated in their subjects.

The classes are planned aiming at the participation of the students, seeking to explore their knowledge, taking them and/or encouraging them to develop logical reasoning within the discipline. I usually encourage students to ask questions about the subject or report a fact or facts related to the subjects [...]. (FPQ2)

With care, so that students have a good product, in terms of accuracy and detail of information and in terms of contextualization of knowledge [...]. (FPB1)

This shows that the intentionality of the teacher trainer is an important factor for his action, for his pedagogical practice, which will consequently influence the quality of higher education. According to Zabalza (2004), it is from this moment on that teacher trainers realize that they need to develop their teaching practices in a more conscious way.

In the course of the analysis process, it was perceived that there was a divergence as to the researchers' intention and the teacher trainers' understanding of the research question, which sought to understand how these trainers work in the classroom, the relationship between theory and practice, within a pedagogical perspective.

It was observed that there were different understandings on this issue and one of them is the interpretation of the relationship between theory and practice as well as the relationships that are established between scientific content and the daily lives of students. This interpretation can be observed in the following teacher trainers' statements:

[...] For this, the class must be interesting and related to his life, the examples used must be remembered in his daily activities, so that he can see the specific teaching inserted in his reality. [...] (FPB5)

I make many analogies with what I assume students know, including sometimes everyday situations. I give many examples. And I always try to contextualize subjects in interaction with content, whether from other areas of knowledge or from the subject matter itself. [...] (FPB1)

These fragments show that, in the view of some of these teacher trainers, the relationships between theory and practice can open space for the contextualization and interdisciplinarity of disciplinary knowledge, making it meaningful for teachers in training. In other words, the use by these teacher trainers of the relationship between content and the real world is evident. In this way, Cunha (2009) states that, in the midst of experiences, there may be a direct articulation of theory with practice, thus differentiating their teaching.

Another understanding of the relationship between theory and practice is that some of these teacher trainers understand as practical the activities developed in the laboratory. This conception can be observed in the following lines:

Chemistry as an experimental science facilitates the relationship theory / practice in the classroom. In the disciplines that I minister, I try to perform practices that best exemplify what was seen in the classroom. (FPQ1)

I keep them integrated without fragmentation or valuing the one to the detriment of the other. I integrate them in order to use the physical spaces (classroom and laboratory) as unique, valuing the discussion and writing supported in the elaboration of reports of practical classes, reading and discussion of related scientific articles [...] (FPB3)

This fact is considerably accepted due to the context in which this research was developed, since they are teachers in the area of Nature Sciences, which is characteristically presented as an experimental area. Thus, it is believed that these different understandings start from the need to establish a reorganization of the relationship between theory and practice, which should be reflected in the pedagogical formation of these teacher trainers (CUNHA, 2009).

### **c) Teaching Professionalism**

Freire and Fernandes (2015) point out that research on the professional career of university teachers and their personal and professional development is still timid when compared to those involving other levels of education. However, this shows how much it is still necessary to explore the situation of the university professor and the aspects of his daily work, aiming at improving the formation of these subjects.

As far as university teaching is concerned, we understand that working with knowledge is one of the key points of discussion, this is due to the fact that for many years we have experienced a scenario in which the professor acted as a representative of the science produced, stored and communicated by the University. It was thought that, through the professor, students would acquire information, experiences, theories, concepts, principles (MASETTO, 2009). However, we know that the work of the higher education teacher has a range of other assignments, because

Working with knowledge in our society in higher education requires other teaching practices: researching new information, developing criticality in the face of the immense amount of information, comparing and analyzing the information seeking to elaborate their own thinking, their scientific collaboration, their position as an intellectual, presenting it to their students together with other authors. It requires mastering and using information and communication technologies as new paths and research resources, a new way of structuring and communicating thought (MASETTO, 2009, p. 6).

Because the teaching exercise is not static and immutable, but procedural, which involves changes and movements, being moved by new identities, new experiences, different contexts, time and new places, which involve new feelings and interactions, Cunha (2009) states that the conception of the term professionalism is more appropriate to the teaching work. For Ramos (2013),

Professionalism brings together two interdependent facets that are not reduced to the acquisition of a new knowledge, nor to the realization of an action, but implies considering that the sense of a new knowledge finds its expression in action. That is, in the case of the conception of teaching professionalism considered here, qualification and competence, although they are distinct, respect the same relational movement (RAMOS, 2013, p. 171).

In this sense, Zabalza (2004) states that it is important that the teacher trainer, besides explaining the content, knows how to explain it, enabling the meaning for the student, in an organized way, ensuring the understanding of knowledge in an integrated way. The following speech was highlighted considering the aspects mentioned throughout this initial discussion.

[...] the teacher [...], should make use of sensitivity, interpretation and integration of the sensations and perceptions of theoretical/practical knowledge in order to use methodologies that attract students to a personal and collective commitment to learning, initially, to propose teaching. (FPB3)

In this fragment, we can see that the teacher has a perception (or idea) that in order to teach it is necessary to go beyond content, thinking about approaches that motivate students to learn. In this way, the teacher has the need to be in constant evaluation of his teaching practice, trying to be always in movement and changing his teaching actions. For that, it is interesting that the teacher has a differentiated look at the pedagogical aspects that are tied to his work, which can be favored when he has had, throughout his professional career, a training also directed to these aspects.

Bolzan and Isaia (2006, p. 491) state that valuing the pedagogical aspects of teacher training enables "a path of qualification of the teaching work, implies the possibility of bringing the appropriate theories closer to the practice exercised, producing a new level of understanding that corresponds to a transformation of practice [...]". Still according to these authors, the possibility for teachers to continue learning and improving the didactic-pedagogical approaches used by them may also favor an optimistic view of the teaching profession, which may contribute to the construction of their teaching identity (BOLZAN; ISAIA, 2006).

Zabalza (2004) points out that university teaching is a very complex professional activity, which requires from the teacher a more specific training and a commitment to the development of student learning. This can be seen in the teacher trainers' speeches that we highlight below.

[...] one must be committed to the student and look at him with a humanizing gaze, of wanting transformation and, in fact, being an agent of transformation [...]. (FPB1)

The teacher has more information or knowledge about a particular subject and shares this information or knowledge with the student. (FPF1)

These lines point out to us the transforming perspective of the teaching action, so that a break with the ideas of transmission of knowledge is established, or a learning that consists only in a route that goes from the teacher to the student, showing us that it is inherent to the teaching profession the fact that there is a relationship of sharing knowledge, from mutual experiences. We see here that, although FPF1 is not a graduate, he has managed, throughout his professional career, to appropriate, in such a way, a teaching posture that he presented a pedagogical view of his role as a professional who can contribute to the formation of future education professionals.

One issue to be considered in this area of research linked to the professionalism of teaching is that it is necessary to learn how to work with the learning process in its complexity, since this is part of a current requirement of the pedagogical training of university teachers (MASETTO, 2009), since,

As a professional he will put himself in charge of seeking solutions to the problems that arise in his professional space, such as seeking the improvement of living conditions for society. His decisions and professional activities, besides being technologically competent, include ethical, social, cultural, anthropological and economic values that need to be explained, discussed and analyzed to guide these decisions. Students need to learn to work in this way with teachers who have this concern and know how to do it (MASETTO, 2009, p. 11).

Therefore, as well as Ramos (2013), we consider the construction of teaching professionalism complex, which requires the recognition of the relevance of didactic-pedagogical knowledge in the process of reconfiguration of university teaching. Freire and Fernandes (2015) still state that it is a process that needs time to strengthen the teaching identity, to get closer to innovations and assimilate the constant social changes that influence the university environment.

The exercise of the teaching profession and the mastery of the skills necessary for its teaching and learning action do not happen as a magic effect. We cannot assume that the university professor is completely prepared for university teaching. Although he is a competent researcher (ZABALZA, 2004), professional development is built throughout his career.

## Some Considerations

The training of university teachers in scientific and pedagogical qualification has become one of the primary factors for the quality of higher education, which has been evidenced by observing the overcoming of teaching inertia, the search for a way out of convenience and, at the same time, for innovations that enable greater efficiency in teaching work (ZABALZA, 2004). In this study, we aim to analyze the perceptions of some teacher trainers of the undergraduate courses in Chemistry, Physics and Biology of a public university in the country, about their pedagogical practices, aiming at possibilities to think about mechanisms to improve higher education, both with regard to aspects aimed at university teachers and for improving the initial training of graduates of the areas of operation of these trainers, through the different perspectives of innovative teaching.

The results indicate that, among the perceptions of teacher trainers about their practices, the teaching of content based on the direct relationship between pedagogical practices and their intentionality with theory stands out, as well as the commitment to the teaching profession, and the search for new classroom strategies that facilitate and encourage the relationship between teaching and learning.

With these results, we were able to observe that differentiated teaching practices and from the perspective of innovation directly affect the learning of students, in order to bring positive contributions to the training of future teachers of Chemistry, Physics and Biology. This makes teacher trainers understand the importance of these practices in the way the content is understood, organized and integrated, so that it generates a significant set of knowledge and new skills, which benefit the performance of both university teachers and future teachers.

Something that needs to be mentioned is the fact that when university teachers engage in the search for innovative and differentiated strategies, there is often no support in universities for confronting the difficulties and conflicts that may emerge, which ends up leading them, based on negative experiences, to a discontinuity in the use of innovations in the classroom.

In this sense, it is necessary to think about the establishment of institutional policies that favor the implementation of networks for the exchange of experiences, in which there is room for support for teachers who strive to innovate in their classes, and that this is a possibility of making this movement of innovation feasible in the process of teaching and learning in universities. We believe, therefore, that the necessary knowledge for the teaching activity can be further developed through collective work, in which teaching and learning issues can be problematized, allowing a better integration between theory and pedagogical practice.

Thus, the discussion about this relationship within higher education institutions has provided different research related to teachers' innovative postures in the university context. This also requires from the university changes in terms of openness and dialogue, partnerships with new sources of knowledge, reorganization of curricula, which will provide the emergence of even more significant innovations (MASETTO, 2012). Greater engagement of teacher trainers in a process that seeks to leverage these innovative actions, such as courses and workshops in which there is a real discussion on how to make undergraduate students experience training spaces for innovation and dialogue within higher education institutions. And from the limitations and potentialities of the resources and tools of pedagogical innovations look for ways to discuss these aspects by going through teaching, research and extension including issues related to university administration.

This study makes it possible to think about issues related to the work of university teachers and their direct and indirect influences on the teaching and learning process of future teachers, in an integrative perspective between theory and practice, aiming at breaking with

traditional teaching. An analysis of innovative teaching practices by means of video recordings of teacher trainers' classes may be a way to improve research on this subject, since it could bring complementary elements to the discussions that underpin this study.

Finally, it is worth pointing out that the reflection on the formation of undergraduate students is not a matter for them alone but requires the efforts and commitments of higher education institutions and their professionals who act as trainers of these future teachers. Without this integration it is unlikely that the formative initiatives will advance.

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