



## Research paper

Beginning a teaching career: Contradictions and alienations<sup>☆</sup>

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## ABSTRACT

The teacher attrition at the beginning of the teaching career has aggravated the shortage of teachers in some countries. We carried out a case study of a novice physics teacher working in two Brazilian schools. Based on the Cultural-Historical Activity Theory, we analyzed the contradictions that emerged and how they transformed his teaching activity. The analysis indicates that the central contradiction, which emerged from how the capitalist modes of educational work are structured, determined an increasing teacher's work alienation, reinforcing his fear of losing his job.

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## 1. Introduction

One of the reasons for the lack of physics teachers with adequate training in Brazil is teacher attrition (Brazil, 2020). As in other countries, in Brazil many teachers leave the profession, especially at the beginning of their careers (Changying, 2007; Dupriez, Delvaux, & Lothaire, 2016; Hong, 2010; März, Kelchtermans, & Dumay, 2016; Struyven & Vanthournout, 2014).

It is in the first three years of the initial teaching career (Feiman-Nemser, 2001) that teachers experience what is usually called a period of "survival" and "reality shock" (Veenman, 1984). Becoming a teacher poses many challenges for novice teachers, such as adapting to working conditions; dealing with experienced colleagues adopting more traditional teaching methods; confronting classroom management difficulties, and carrying out the didactic transposition, among others (Avalos, 2016; Fry, 2007; McCormack,

Gore, & Thomas, 2006).

Consequently, novice teachers experience emotional tension, stress, and even psychological problems (Skaalvik & Skaalvik, 2016), which require much resilience (Beltman, Mansfield, & Price, 2011).

Therefore, the transition from undergraduate teacher to an in-service teacher can be seen as a crossing from one microculture (university) to another (school) (Aikenhead & Jegede, 1999; Chan, 2019; Kang, Bianchini, & Kelly, 2013; Luft, 1999; Mulholland & Wallace, 2003). Such cultural transitions could be so smooth that the boundaries may be unnoticed, e.g., when moving from home to work (Aikenhead & Jegede, 1999). Transitions become noticeable when "we begin to feel a degree of discomfort with another microculture" and the "border crossings become less smooth and need to be managed" (ibidem, p.272, original emphasis).

The novice teachers' difficulties become more accentuated in countries like Brazil, where working conditions can be uncertain and devaluation of the teaching profession occurs (Alves & Pinto, 2011; Ferreira, 2011; Hales, 2013; Libâneo, 2016). The advancement of neoliberal economic policies worsens labor relations in education by intensifying surveillance over teaching work and reducing their autonomy, remuneration, and labor rights (Hill, 2005). By establishing rigid curricula and assessments of teaching work, governments and educational institutions that defend

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neoliberal values have gained greater control over teachers' work, intensifying the teacher's alienation (Noonan & Coral, 2015).

This context of control over teaching work establishes the alienation process – understood as the loss of workers' production mastery and the expropriation of their work products (Marx, 1977) – could lead novice teachers to abandon the profession but generally indicates a loss of meaning concerning teaching itself. As a result, many teachers end up sick, stressed, and depressed.

Troman and Woods (2000), for example, showed how changes in the organization of productive activity have led to, at the beginning of the century, an increase in diseases related to stress in teaching work, leading many teachers to abandon the teaching profession or to adapt, decreasing the pace or dedication at work. In Brazil, Oliveira and Leite (2012), when surveying the health of more than 2600 teachers in Brazil, identified anxiety or panic disorder and depression as the main diagnosed diseases.

This environment of disease in teaching necessitates training to prepare novice teachers to face alienating processes early in their careers and stay in the profession without becoming ill. In order to support initial teacher education, it is necessary to understand these processes that alienate the teacher in his/her productive activity; being essential to understand the role of contradictions in human activity.

Engeström and Sannino (2010, p. 5) point out that “contradictions are the driving force of transformation” and are manifested in dilemmas, tensions, and conflicts that require subjects to adapt, reconcile or split their individual and collective interests. The contradictions, at the same time, can drive changes in the way human beings think and act but can also lead to adaptation processes to the socio-historical factors that alienate the worker in his productive activity (Engeström, 2001; Engeström & Sannino, 2010).

This paper presents a case study of a novice physics teacher (fictionally named Charles) in his first year and a half teaching at two private schools in São Paulo (Brazil). We based this study on Leontiev's (1981a; 1981b) and Engeström's (1987; 2001) perspectives of the Cultural-Historical Activity Theory (CHAT) to answer the following research problems: (i) what contradictions emerged at the beginning of Charles's carrier? (ii) how did these contradictions drive movements to overcome and/or alienate Charles in his teaching activity?

Thus, as a unit of analysis, we take the activity system related to the novice's teaching during his first year and a half at both schools. The unit of analysis here is understood within the scope of the CHAT - it does not an isolated whole or part but a totality that expresses the complexity of the phenomena analyzed in its relations with other totalities (Sannino & Engeström, 2018).

## 2. Theoretical-methodological framework

### 2.1. Cultural-Historical Activity Theory (CHAT)

The work of Soviet-Russian psychologists Lev Vygotsky, Alexander Luria, and Aleksei Leontiev laid the groundwork for Cultural-Historical Activity Theory (CHAT for short), which was further developed by scholars such as educational psychologist Vassily Davydov and philosopher Evald Ilyenkov (Sannino & Engeström, 2018). In this work, we have based our argument on Engeström's approach to CHAT (e.g., Engeström, 1987, 2001, 2015, 2020; Engeström, Miettinen & Punamäki, 1999; Engeström & Sannino, 2010, 2020), introducing further developments considering the complex mediation fields among elements of the activity (Mattos, 2019). From the beginning, Engeström (1987) worked on CHAT, proposing a model to analyze the development and transformation of human activity. The activity is a dialectic unit expressed by the Subject-Object-Community triad (Fig. 1).

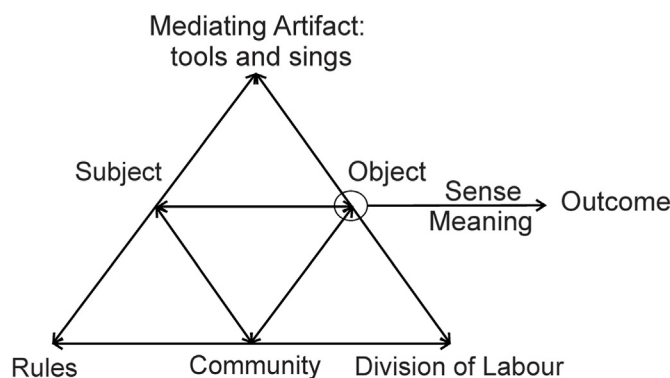


Fig. 1. Human activity structure model.

Engeström (1987) indicates that the *rules* (R) establish mediations between the *subject* (S) and *community* (C), for example, expressing prohibitions, duties, and concessions, that is, the norms that mediate the relationship between the subject of the activity and the community; the *division of labour* (LD) expresses the mediation between the *community* and the *object* (O) of the activity, where the attributions of each individual in the *division of labour* are determined. However, *mediating artifact* (MA) – *tools and signs*, expresses the mediations between subject and object, for example, the concepts, language, and material tools of work – the cultural instruments.

Engeström (2001) characterized activity as moved by contradiction, multivoiced, directed to an object, historical, and expansive. All those aspects should be considered when representing the activity in Fig. 1. Although not evident, the triangle expresses a dynamic activity system that could be more or less complex, such as the school or everyday life activities system (Engeström, 2020). Both systems are composed of other activity systems that relate to and interact at different hierarchical levels (Mattos, 2016, 2019).

The complexity of the system of activities demanded delimiting the research object producing a unit of analysis – an activity that comprehends the main contradictions that emerged at the beginning of a teacher's carrier and how they affect him/her. The unit of analysis is not an isolated whole or part but a totality that expresses the complexity of the phenomena analyzed in its relations with other totalities and other systems of activity (Sannino & Engeström, 2018).

Then, we looked at a case study to investigate the process of initiating a novice teacher into the teaching profession. The case consists of a novice teacher (Charles) who, in the first year and a half of teaching, taught at two private schools (S1 and S2) located in São Paulo city (Brazil). To determine the unit of analysis, we chose two hierarchical levels in the complex activity system experienced by Charles (Fig. 2).

The scheme (Fig. 2) shows an upper hierarchical level where there are five activity systems: (i) school S1; (ii) school S2; (iii) the families of S1 students; (iv) the families of S2 students; and (v) the novice teacher's family. On the level below is the system of activities for the classes of the various disciplines that make up each school's curricular frameworks, including the physics discipline activity. The diagram in Fig. 2 shows Engeström's triangular representation of the activity considered the Leontiev activity hierarchical structure (activity, action, and operation). For instance, considering the displacement of motives, we could take school S1 as an activity and the activities of the discipline as actions of this broader S1 activity. The dotted square (Fig. 2) indicates the unit of analysis of this research: each school's physics teaching-learning activities system.

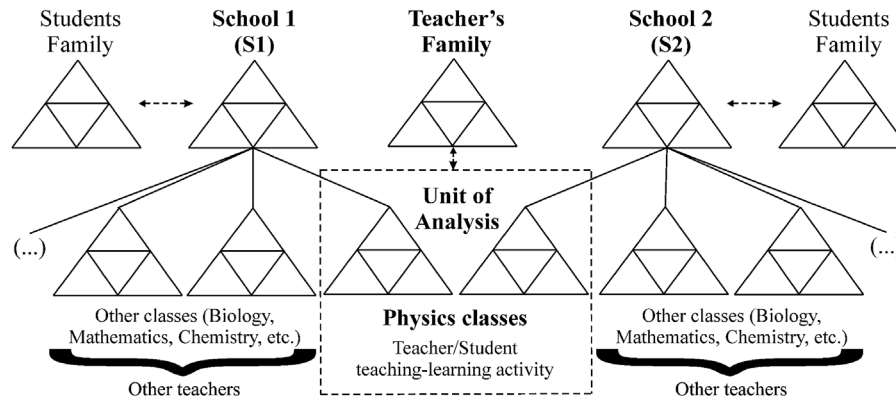


Fig. 2. Activity system, some of its hierarchical levels, and the identification of the unit of analysis.

Thus, to understand the transformation processes of teacher mediations at the start of a career, we consider that the smallest unit that expresses the totality of his work is his activity in physics classes at each school. Although he started his career in both schools, the contexts (rules, relationship with teachers, coordination, direction, parents of students, etc.) were important early in his teaching career. In this teaching-learning activities system (physics classes), the novice teacher and the students are the subjects, as they work towards the object of the activity – the teaching-learning of physics concepts. In addition to the novice teacher and the students, the other members of the school context (other teachers, coordination, parents of students, and other school staff) make up the community. The rules and division of labour established in each school and the mediating instruments (methodologies, didactic materials, and other teaching resources) used by the teacher make up the other mediating elements of the subject-community-object triad.

Engeström and Sannino (2010) point out that contradictions are manifested in dilemmas, tensions, and conflicts that require subjects to adapt, reconcile or split their individual and collective interests.

If, when enabling new meanings, contradictions can lead the subject to develop new motives, transforming or boosting his activity, they can also express losses of mediations and meanings about the object of the activity. Thus, if not overcome, the contradictions can lead to an alienation process of the subjects from their work. We, therefore, focused on the contradictions that emerged in the teaching-learning activity system when investigating the start of Charles's teaching career. Engeström's (1987) categories of contradictions (Table 1) were taken to identify the contradictions in which Charles was immersed.

## 2.2. Alienation from teaching work

The growing complexity of capitalism made the worker a commodity whose labor value was less than the products he created in the production processes (Marx, 1977). Thus, the reification of work deprived the worker of control of the means of production and the objects he produced. The work and the objects produced became foreign to the subjects of the activity; the more the human being creates, the more the objective world becomes complex and the less the human being belongs to himself.

The worker losing mediation with the object of his work loses conscious awareness of the productive process; consequently, the meaning and reason for his activity are dissociated, respectively, from the activity's social meaning and objective (Leontiev, 1981b). There is a dialectical process of humanization and alienation of human beings as they transform their activity. Simultaneously, they produce new cultural mediations and lose conscious awareness of the totality of their work and productive bonds with other human beings and nature. (Leontiev, 1978).

Considering the structure of human activity (Engeström, 2001, 2014), the alienation from work is an expression of the transformation of the mediations in the subject's activity system. Such transformations refer to changes in the quantity and quality of mediators, which express the transformation of the subject's conscious awareness of the object of the activity. Here, we propose a set of transformations in the mediations of the activity system, which express the process of alienation from work. Then, we will consider transformations in the mediating fields, according to Table 2.

Considering that the activity system (Fig. 1) represents a dialectical unit, these transformations of the mediating fields should

Table 1  
Levels of contradictions.

Levels of contradictions	Description
Primary	The main contradiction of the capitalist system arises from the internal conflict between the values of use and exchange, being present in each of the elements of the central activity system and which determines the tension between sense and meaning of the object of the activity
Secondary	It originates in the relationship between each of the elements that compose the central activity system; that is, it occurs in the mediations between subject-community-object
Tertiary	It arises when a new activity, representing a culture with different development, introduces a new object or motive into the central activity, which can cause tensions and resistance in the subjects involved <sup>a</sup>
Quaternary	It appears when neighboring activities (those essential to the central activity) influence the central activity, introducing new instruments, subjects, rules or objects.

<sup>a</sup> To exemplify this contradiction, Engeström (1987) uses the example of the school, where teachers try to make children study, while they just want to play with their peers. Source: Authors

**Table 2**  
Transformations of the mediating fields of the activity system.

Mediator field	Transformation
<i>subject-mediating artifact-object</i> (S-MA-O)	It occurs when the mediations established by means of <i>tools and/or signs</i> (MA) between <i>subject</i> (S) and <i>object</i> (O) are modified and express the transformation of the subject's conscious awareness about the object of the activity.
<i>subject-rules-community</i> (S-R-C)	It occurs when the mediations established by the <i>rules</i> (R) - laws, collective agreements, norms, etc. - between the <i>subject</i> (S) and the <i>community</i> (C) are modified and express the transformation of the subject's conscious awareness of the limits of the regulations of his actions in his relationship with the community.
<i>community-division of labour-object</i> (C-DL-O)	It occurs when the mediations established through the <i>division of labour</i> (DL) - subject's actions - between <i>community</i> (C) and <i>object</i> (O) are modified and express the transformation of the subject's conscious awareness of his role in the collective production of the object of the activity. This transformation may indicate the disarticulation of actions and their ends, and the need for new coordination of actions to achieve the objectives of the activity.
<i>subject-scommunity-object</i> (S-C-O)	This mediating field (S-C-O) expresses the totality of mediations, and its transformation reveals the movement of the activity itself. This transformation can mean an increase in the complexity of the subject's conscious awareness about the totality of the activity, but it can also mean the loss of mediation of the subjects, expressed by the loss of conscious awareness of the activity's unity. Here we take this loss of consciousness as an alienation process from the relationship between consumption and production of the object of the activity.

Source: Authors

not be interpreted as independent processes since they constitute a unit composed of several hierarchical levels in feedback. However, if we consider reducing the activity's mediating fields, the object's meaning, that is, the concretization of the motive, can detach itself from the communal stabilized meanings and the objectives of the activity. In this case, the work can become "foreign" to the subject, who is unmotivated and only works to maintain a basic level of subsistence.

In the case of the novice teacher, when carrying out the crossing institutional border between the university student activity and the teacher activity in a given school context, at the same time as he is establishing new mediations with the local school culture, he also faces tensions typical of collective relationships.

Such situations can lead the subjects to emancipate within or alienate from their work in a continuous movement of repurposing the activity. In the same way, the loss of mediations leads to a loss of conscious awareness of the coordination of actions when the subject "appropriates the mediating fields, expands his conscious awareness of the activity and its coordinations" (Mattos, 2016, p.9). This increase of conscious awareness does not imply greater precision in the meanings of the activity object because the conscious awareness of the activity's multivocality results in the awareness of the "attribution of multiple meanings to the object, which in this regard can be understood as a fuzzy object" (ibidem). This characteristic of the object expresses the complexity of human activity, which accepts the coexistence of several meanings.

### 3. Research context and procedures

In this work, we carry out a case study (Yin, 1994) about the beginning of teaching by a private teacher (Charles). The case study is due to considering that when analyzing the beginning of the teaching, a complex social phenomenon, we must consider the contextual conditions of its realization. The methodology allowed us to conduct a deeper longitudinal investigation of the process of beginning teaching in a specific context.

#### 3.1. The investigated subject

The case study was selected from a broader investigation in which we followed the supervised internship of a group of undergraduates throughout the last semester of their initial training as teachers. Among the undergraduates who started teaching, Charles was the one who showed interest and willingness to participate in the research.

Charles is a novice Physics teacher who started teaching immediately after completing his undergraduate course in 2017.

Before starting his Degree in Physics Teaching, he completed a Bachelor's Degree in Physics and started a Master's in Physics. However, he did not complete his master's degree training, choosing to become a basic education teacher. In addition to his interest in teaching, this choice was determined by changes in his personal life. A year before starting teaching, Charles became a father and started a family with his wife, who also works as a teacher. In this situation, Charles decided to enter the labor market, and the teaching profession was characterized as a faster way to get a job to guarantee the family's sustenance.

#### 3.2. Context to the start of teaching

When Charles completed his degree in physics teaching in early 2018, he began his teaching career. He was hired to teach at school S1 and, two months later, at school S2. S1 is a traditional institution, more than fifty years old, attended by students with great purchasing power and better infrastructure than S2. According to Charles:

(...) [at school A] the teachers there are good and have space to work (...) But because they pay more, I know that they expect more. (...) The pedagogical coordinator is more engaged, (...) she is very competent. All teachers are very competent. (...) It is a school that works, in a certain way, in the traditional way, but as it is very small, I have twenty students in each classroom, the relationship (...) is more refined, more effective, more focused (E1).

S2 was founded only twenty years ago and, according to Charles, serves students from families with lower purchasing power, has a precarious infrastructure, and the teachers have little teaching experience and receive lower salaries than those at S1.

It's cool that it's more money, but it [S2] pays much less per hour and has a slightly more complicated structure, (...) it is a private school on the periphery (...), but the structure, the size of the classroom, the training of teachers, are much more deficient, in my view, than the public school. (...) Now I am in a private backyard company (E1).

Unlike S1, in which "all [teachers] have ten or twenty years of school" (E1), at S2, there was a great exchange of teachers: "The oldest here at S2 has four years [of school] (...) Last year [in the discipline] of physics they had four [physics teachers]" (E1). At S2, Charles taught physics in high school, while at S1, he taught in the upper elementary final years.



### 3.3. Methodological procedures

We followed Charles' teaching initiation from his last semester on the teacher training course until the first year and a half following his graduation. This paper focuses on his professional life's first year and a half. To this end, we used the data transcripts of two interviews with Charles as the main source. These interviews lasted approximately 1 h and were conducted with the support of two semi-structured interview scripts to characterize the mediation fields Charles perceived and identify the contradiction he was immersed in.

The first interview (E1) was carried out six months after graduation and at the beginning of Charles' career, when he was a teacher at S1 and S2. This interview aimed to collect data about his initial experience on the physics teacher degree course and his first experiences of him as a teacher. We asked questions in five blocks: (i) general information about the teacher (the time and contexts of his performance); (ii) academic education (positive and negative aspects of his initial teacher education); (iii) relationship with the school community (relationships with the coordination, direction, other teachers, and parents of students); (iv) teaching-learning activity (relationship with students, organization of classes, desired objectives, and results achieved); and (v) significant situations at the beginning of his career (satisfactions and/or frustrations he experienced as a newly qualified teacher).

The second interview (E2) took place a year and a half later when he had already stopped working at S1 and S2. This interview aimed to collect complementary data about his entry into teaching. The script for this interview was composed of more general questions that referred to (i) his experiences as a teacher in his first year of teaching; (ii) his professional choices; and (iii) his future prospects in his teaching career; and other more specific questions (iv) how he resolved certain difficulties he had in his first year of teaching; (v) how he adapted (or not) to the demands of school contexts; and (vi) what teaching strategies he used in his classes.

Another complementary data source came from our contact with Charles during the investigated period. The contact occurred informally and sporadically when Charles returned to visit his professors and colleagues at the university. In addition, at Charles' initiative, another contact was made through audio conversations via WhatsApp (MMap), transcribed and archived.

The information obtained through these data sources was tabulated and analyzed using Textual Discursive Analysis (TDA) (Moraes, 2003; Moraes & Galiazzi, 2006). TDA is a qualitative research approach in which the analyses are built from a set of texts. Such textual materials can be pre-existing to the research (documents, reports, etc.) or be produced during the investigative process (transcription of interviews, questionnaires, etc.). In this methodological perspective, the analysis of textual discourse must consider the context of its production and analysis because "textual materials to which the analyst needs to attribute meanings are significant" (Moraes, 2003, p. 192). Depending on the researcher's objectives and theoretical frameworks, such a meaning can be interpreted differently. In this perspective, the TDA "is organized around three procedures: (i) disassembling of the texts into units of meaning; (ii) forming categories; (iii) producing new perspectives through meta-texts" (Martins, Lima, Amaral-Rosa, Moreira, & Ramos, 2020, p. 189).

According to TDA, we read the texts produced in the research (E1, E2, and MMap), gathering excerpts indicating the contradictions to which Charles would be subjected (units of meaning). From the excerpts, we established categories of contradictions (primary, secondary, tertiary, and quaternary), inspired by Engeström's (1987) categories, and we elaborated a descriptive and interpretive meta-text of how Charles's systems of activity were

transformed during his entry into the teaching career and what the implications were for alienation from his work as a teacher.

## 4. Analysis of results

The results are divided into two parts: 1) processes that characterized Charles's beginning as a teacher; e 2) the contradictions that mobilized changes in Charles's teaching-learning activity system.

### 4.1. Experiences at the start of teaching

To analyze Charles's first professional experiences, we chose to separate each mediating field's analysis to facilitate the presentation of the elements that characterize Charles's early career. However, it is essential to remember that they are mutually related, forming a dialectical unit (Fig. 1).

#### 4.1.1. Mediator field subject-cultural instruments-object (S-CI-O)

Working at different educational levels, Charles handled content differently in each school and teaching in elementary school was much more challenging because the "biggest difficulty is having a reference for what you are going to apply" (MMap). At this educational level, he is concerned with "trying to adjust the right level among methodologies, not focused on formalizing the content, more on engagement, also on the student's engagement, but without losing [content]" (MMap). In high school, with a better definition of the physics content in the curriculum, "(...) it is easier because in high school you already know more or less, you are ready, very defined and very structured. So I am not stressed" (MMap). The difficulty Charles experienced while teaching at the elementary level in S1 was greater than for the high school level at S2; partly, it can be explained by his initial teacher training being focused only on high school (IFUSP. Instituto de Física da Universidade de São Paulo, 2018).

In this way, it is possible to evidence the different mediations established by/with Charles in his activities in each school. His teaching training was focused on the secondary level, making him closer to the contents, didactic methodologies, and students in his teaching activity at S2 than at S1. On the one hand, Charles did not need to make many adjustments to the necessary mediating cultural instruments to contextualize teaching-learning activities in S2. However, on the other hand, he needed to make a great effort to adapt both the object (physics teaching-learning) and the form (cultural instruments) of the teaching-learning activity in S2.

Therefore, in this aspect, there were more considerable challenges in border crossing in S1 than in S2 because the novice science teachers have to deal with the challenge of enabling students to cross-cultural learning between everyday family life and school science microcultures (Aikenhead & Jegede, 1999). Thus, in addition to crossing the border "from non-science to science" and from "preservice to in-service," science teachers to succeed in teaching science need to carry out a third cultural transition: "from other school subjects to school science" (Mulholland & Wallace, 2003, p. 883). According to those authors, this third border crossing occurs because the "science classes seem to represent a particular sub-culture within the broader culture of teaching" (ibid., p. 893).

The most significant differences between the micro-cultural activities of S1 and Charles' initial teacher training activity at the university created greater challenges for crossing borders at the beginning of teaching. Charles's relationship with the other subjects (students) and the object (teaching-learning physics) of the activity at S1 seems to be more difficult. However, at S2, he seems to have more difficulty with the cultural instruments available; for example, the novice teacher had fewer resources, implying a

greater demand for a textbook. Charles reports the coordinator's speech at S2 during a teachers' meeting: "we need to use the book (...) for the father [of one of the students] to see what he is using" (E1). However, Charles thinks the textbook is terrible because "it is huge, it is very textual, out of context of their [students] reality" (E1), limiting the use of this instrument: "I use it occasionally to pick up exercises" (E1). Also, there was uncertainty due to the lack of printed material, making it difficult for the teachers to organize the work during classes. S2 resisted offering printed material, making Charles very uncomfortable: " (...) they did not give me a printed version. They say the material is on the (...) website, I said 'do you have a printed version to give me?'" (E1).

The lack of autonomy in choosing the textbook and the pressure felt to use particular teaching materials are conflict factors for many newly qualified teachers (Anthony, Haigh, & Kane, 2011; Bianchini & Solomon, 2003; Brickhouse & Bodner, 1992; McGinnis, Parker, & Graeber, 2004; Patchen & Smithenry, 2014). Charles expressed dissatisfaction with using the textbook only at S2, probably because he was trained to teach physics in high school (as in the case of S2). At S1, he taught science at the elementary level, and although he also used a textbook, he did not express any dissatisfaction. Charles felt more confident criticizing the mediating instruments (textbook) in S2 than in S1. This reflection corroborates studies that indicate that novice teachers depend more on textbooks to meet the demands of teaching-learning activities (Brickhouse & Bodner, 1992). This dependence increases when novice teachers teach in different areas they were trained in (Bullough & Knowles, 1990). Convergently, Nixon et al., (2017) show that novice teachers have greater autonomy and confidence in teaching the content they are trained in and rely less on textbooks.

Thus, at S2, tension was established due to the demand for the use of the textbook. In addition to not participating in the textbook selection process, which he considered deficient, he had difficulty accessing the printed material for his classes. These facts increase tension in S2, where the different meanings attributed by the novice (low-quality textbook) and the coordinator (instrument expected by students' parents) impact their entry into the teaching profession.

#### 4.1.2. Subject-community-object mediating field (S-C-O)

Beyond the different relationships with the students, Charles's relationship with the students' parents in S1 was more troublesome than in S2. In Brazil, it is common for schools such as S2 to have a clientele experiencing an economic crisis for some years. Such clients are accustomed to participating in their children's school life, so they usually interfere in the pedagogical actions of the school and, in particular, in the teachers' actions. In most private schools, the educational process is the object of a capitalist relationship that demands a correlation between student and parent satisfaction. The "relationship between parents-consumers and principals-owners-producers is direct, and mutual dependence is clear" (Carvalho, 2004, p. 44). Thus, many schools with low economic power treat their students more paternalistically to keep parents - their clients - more loyal to the institution (Li & Hung, 2009; Malik, Mushtaq, Jaswal, & Malik, 2015; Skallerud, 2011).

According to Charles, the "pressure that parents put on students to do well and this interference or intrusion in some things at S1 is greater [in relation to S2]" (E1). It is common for parents of S1 students to call at school: " (...) I did more investigative teaching, and several mothers called at school." (E1).

Despite the pressure put on by the parents in S1, Charles had the support of the coordinator to carry out his work: "the coordinator balances supporting me, with also pushing for a sense that minimally pleases the parents [who] understand that coordination is consistent (...) It shields me more" (E1).

To get the S1 coordinator's trust, Charles tried to do better marketing on the methodology he used; after all, "it is a private school (...) you have to dress them [methodologies] in a garment that the private education market sells" (MMap). He started to "sell" the methodologies he used: "I will talk about investigative teaching, I will not talk about autonomy, I will say: 'they are active methodologies, to assist the student, where we can make an open laboratory just like the one that a school such as this [renowned] has'" (MMap).

The strategy of adapting his discourse to present ideas and opinions was also used with the other teachers at S1. As a novice teacher, Charles did not reveal himself to more experienced colleagues, listening more than saying: "I listen a lot and do some interventions, (...) often, the feeling I have is that I try to look more ignorant and stupid than I think I am" (MMap). Charles feared that "this attitude, a very excited one for a new teacher, makes them [old teachers] anxious, jealous or worried that I want to take a leading role at school" (MMap), after all, "I am new, (...) I am afraid to make a strong impression. I am adjusting, balancing, how much importance I give to these proposals and how I place them" (MMap).

Charles's strategies reveal his quest to deal with the cultural border crossing. He tried adapting his speech to the socio-historical-cultural context, especially in S1. On the one hand, he sought to value himself by presenting didactic pedagogical knowledge for the coordination of S1; on the other hand, he sought to protect himself, exposing himself less to the experienced school teachers. Aikenhead and Jegede (1999, p.272) state that this behavior can occur in novice teachers because "when our self-esteem is in jeopardy, border crossing could easily be hazardous and we would tend to react in various ways to protect our egos."

Therefore, from the mediation between the subject (Charles and students) and object (teaching-learning of physics/sciences) established in the community (directors, parents, other teachers), it is possible to identify that the activities in each school required Charles to find different methods of dealing with tensions. This demand implied different transformations of the activities and their object, particularly due to the different meanings that Charles and the community attributed to the object of the activity and the teaching instruments used. Considering the importance of the subject-community-object mediating field, we will focus on the subsidiary mediating fields (S-R-C-O and S-C-LD-O) as follows.

#### 4.1.3. Mediating field subject-rule-community-object (S-R-C-O)

Among the rules established in the schools, the obligation to use the written test as an assessment tool is the one that caused the most tension in Charles' work. The tension emerged in the different meanings Charles and the schools attributed to the evaluation. For Charles, the test was an instrument that helped achieve his teaching and learning objectives, not a final moment of the assessment process: "the big question is when the test arrives there is an expectation of response, 'signal-response'. (...) So, the test makes my pedagogical process more difficult. If we had no test, my life would be pleased" (E2).

Although the assessment rule existed in both schools, the different relationships established with the school community (mediating field S-R-C-O) have different implications. In S2, Charles does not express any problems, but in S1, evaluation became one of the main tensions between Charles and students and their parents: "in the first test two girls cried and seven mothers called at school" (E1), an event that triggered the indiscipline of students in the form of resistance to the authority of the teacher.

The tensions with the community, established with the rule of using tests to evaluate students, resulted in changes in Charles' actions in S1. It could be evidenced by the transformation of the mediating field S-CI-O (Subject-Cultural Instrument-Object)

when Charles changed the pedagogical instruments. The situation is analyzed in the second part of this section.

The difficulties in dealing with the students' indiscipline and the parental demands corroborate some of Melnick & Meister's (2008) results. They compared experienced teachers with beginner teachers; the latter have big issues managing the classroom and interacting with students' parents.

The tensions that emerged between Charles, students, and their parents expose one of the main challenges of crossing borders for novice science teachers: reconciling the investigative methodologies learned in the initial teacher training at the university and the traditional teaching carried out in basic schools. (Kang et al., 2013). As in the case analyzed by Luft (1999), some of Charles' values, beliefs, and actions conflicted with school cultures, especially in S1, which created tensions between him, the other subjects (students), and the community (parents of the children). students) of their teaching-learning activity.

#### 4.1.4. Mediator field subject-community-division of labour-object (S-C-LD-O)

Charles' relationship with the community of S1, particularly with the other teachers, resulted in his efforts to validate his work. As the only novice teacher at S1, he was unsure about his job security and considered he had a lower status than his colleagues. Charles introduced the Moodle platform<sup>1</sup> as a new tool in school activities to minimize his insecurity.

I play a game of chess, (...) the idea of Moodle also has a political conception behind it. (...) Moodle works and its application for students is a guarantee I have that my work will be present and relevant in the school routine. So, the chance of losing my job decreases because I build up this side [Moodle management] and I have another relationship here on the other side [teaching inexperience]. It is a balance of forces. I have something that they will need, and I can get something that I want (E1).

Charles's strategy was to introduce a new hierarchically superior action in the teaching-learning activity in S1. This strategy reveals Charles' quest to make his border crossing smoother, in the sense of its valorization in the school context, through mobilizing his social capital within the social network of S1.

In the context of education, social capital is characterized as "resources available to teachers, including tangible tools like curriculum materials and intangible tools like knowledge and experience" (Sikma, 2019, p. 320). Access and sharing of available resources for the socialization of novice teachers depend on the quality of the novice teacher's interactions and relationships with the school community (Pogodzinski, 2012).

When implementing Moodle, he could assume a role that, in his view, meant that the value of his work for school would increase, guaranteeing his employment, regardless of the teaching activity tensions. Thus, the introduction of Moodle and the change in teaching and assessment methodology show an alteration in the coordination of Charles' teaching activities. The change reveals a transformation of the activity, whose motives now emphasize maintaining his employment in S1.

The analysis of the tensions in Charles' teaching activity indicates some contradictions that emerged during his entry into the teaching profession, which will be explored in more depth in the second part of the results, demonstrating the transformations that took place in the teaching-learning activity.

#### 4.2. Contradictions in activity systems

The conflicts that occurred from Charles's need to adjust to the necessary rule of using teaching material resulted in a tertiary contradiction at S2. This contradiction guides the activity in producing new mediating instruments for teaching and learning. However, Charles regarded the new instrument as ineffective in achieving the teaching-learning activity's objective, revealing a secondary contradiction between the tools (mandatory textbook) and the object of his teaching-learning activity (teaching physics).

In S1, at least four secondary contradictions emerged between elements of the teaching-learning activity system:

- (i) *Contradiction in cultural instruments*, based on the disagreement between Charles and the students regarding the meaning of the investigative activities and the evaluation format. The conflicts resulted from the different meanings he attributed to the teaching-learning processes and those students and the community expected. Such expectations are related to the family and economic contexts of part of the school community: " (...) I often see that the concept of education, rather than learning [of students and their parents], conflicts with the changes in methodology, more active, more engaged" (E1). For Charles, if he performed a more traditional practice, such as the transmission-reception kind, even though "bad, [the students] would be quiet, some would go to sleep, others would be moving about, but they would be quiet. But that student who is sleeping or moving about, he is not with me either." (E1).
- (ii) *Contradiction in the rules* is identified from the tensions established between the different meanings that Charles (subject) and the students' parents (community) attributed to evaluation. It is important to note that the obligation to evaluate students (rule) determined the mediating instrument of this action (evaluation) as an individual written test. If it depended on Charles, this instrument would not be used, as it understood evaluation as formative, a teaching-learning instrument, and a way to improve students' learning. Thus, the contradiction is between the mediating instruments (individual written test) and the object of the teaching-learning activity (learning physics), reflecting a contradiction in the division of labour.
- (iii) *Contradiction in the division of labour* can be identified in establishing responsibility for teaching in the school activity. S1's parents interfered in pedagogical activities previously assigned to teachers and school owners, indicating a contradiction in the division of labour in the teaching-learning activity. How Charles related to the other teachers in each school also indicated contradictions in the division of labour: in S2, all teachers were inexperienced, but in S1, Charles was the only novice and needed to assert himself in front of other experienced teachers; in S1, unlike in S2, Charles had a strong perception that he was undervalued, and because he is a novice, he changed the activity, as this determines the possibility of new actions in other areas of the school, even without payment: "then I spent the last three staff meetings giving a Moodle course to the teachers there. (...) I worked more hours than I earned" (E1).

Finally, we can say that there is (iv) *Contradiction in the community*, identified by the mediation Charles (subject) and science teaching-learning (the object of teaching-learning activity) made by the community. The tensions resulting from the difference in meanings of teaching-learning attributed by Charles and that attributed by the community, particularly the students' parents,

<sup>1</sup> Moodle (an acronym for "Modular Object-Oriented Dynamic Learning Environment") is a learning platform or course management system.

synthesize the contradictions in the rules and the division of labour and show the relationship between the community and cultural instruments.

All secondary contradictions, manifested in the teaching-learning activity systems of S1 and S2, were intensified by the primary (capitalist) contradiction between the use value and exchange value:

The big question is: my limit is how much I need the money to pay. (...) I have a financial reality, an evident social and economic reality. I have a family, I have a son. They depend on a large part of the money I have to pay for almost everything we have. So, it's another working relationship. (E1)

The tension experienced by Charles was reflected in his fear of losing his job, especially in S1, which paid better salaries and had a higher demand for good teachers. In S2, there was a higher turnover of teachers, but it was more difficult to find "another guy with a diploma, (...) with the willingness (...) to teach the class for the price they pay" (E1).

The fear of losing a job, especially in S1, was expressed in the teaching-learning activity. Charles faced the dilemma of adapting to school contexts or introducing methodologies that he believed were more efficient for students' learning, even though this encountered resistance from students and their parents. The financial reason, expressed by his fear, was important, but other reasons boosted his teaching-learning activity, such as making changes in schools to improve students' learning and development: "You arrive new, you want to revolutionize! You want to change [teaching]" (E1).

As a result, for Charles to stay in S1, he had to negotiate meanings and adapt his performance to the circumstances. This resulted in the transformation of Charles's activity in S1. The contradictions Charles experienced in S1 implicated his actions in attempting to overcome them. Thus, given his fear of losing his job, Charles adapted his actions to the school culture's expectations in S1.

I came up with an investigative proposal, do teaching by investigation, then after I had problems [with students and their parents], I started lecturing there is the science book, I ask the question, I show the question. But what I feel is that the more basic level you work, the more they will complain. (...) I went back to the lecturing and the [standardized] type question (E1).

Not only were the instruments that mediated this activity modified, but also the object of the activity. Thus, the relationship among the subjects of the activity (teacher and students) changes, and tensions that emerge in the mediations manifest as students' resistance and indiscipline in class. The teacher's motive is hybridized, and, consequently, the object itself becomes hybrid since, besides the activity being directed to the teaching-learning of scientific concepts, it also incorporates the need for Charles to keep his job in S1.

Charles faced the dilemma of implementing innovative strategies with better learning outcomes or giving in to traditional strategies to retain his employment. Despite having returned to the use of investigative activities, whenever he could, he carried out activities that met his teaching-learning ideals and expressed the reasons he entered the profession.

So (...) later on, throughout the year, I think (...) I never prepared investigative classes again, like those at the beginning (...) but, from time to time, we have a debate. (...) The attempt to do something, not different, but that made sense with the training I had, with what I had as a reference, was inevitable because I

wanted to do a good job, and a good job was to think about those things. So, this conflict continued to exist (E2).

Thus, throughout 2018, although some conflicts continued, Charles retained his job in the school. In S1, tensions decreased over time, making it possible for him to remain the following year; however, despite showing fewer difficulties in S2, he resigned due to the low salary and the school's distance from his home.

In 2019, already more stable in S1, Charles produced detailed planning, including investigative activities again and adding a historical approach to physics in these activities. Charles believed that he was beginning to consolidate his practice at school, feeling greater satisfaction with his work. However, problems with the students and their parents reappeared at the beginning of the year, resulting in his resignation.

## 5. Discussion of results

The contradictions that emerged in Charles's entry into the teaching profession had different severities and consequences in each school he worked. At S2, the contradictions were felt less intensely, as his practices suffered little resistance, and his relationship with students and the community was good, without significant conflicts or tensions. Also, at S2, Charles perceived his job to be more stable, not fearing losing it. However, at S1, there was less stability; the students' parents interfered in the teaching-learning activity more often, and he had more conflicts with the students and an unequal relationship with the other teachers with more experience and time at school. This resulted in a greater intensity of contradictions in Charles' teaching-learning activities at S1, transforming the mediating instruments that ultimately expressed a change in their activity system, according to Table 3.

The transformations led to a process of alienation from his work, expressed in the loss of Charles's autonomy and the initial meaning he attributed to the teaching-learning activity. The loss of autonomy is one of the main factors determining dissatisfaction in teaching since teachers with more autonomy have less stress at work and a greater sense of empowerment in the profession, which is fundamental for building a sense of professionalism (Pearson & Moomaw, 2005).

Cinamon and Rich (2005) indicate that teachers at the beginning of their careers are more vulnerable to experiencing family-work conflicts because, in addition to starting teaching, they may be experiencing another set of tensions related to the constitution of the family, such as inexperience in raising children, financial conditions are still unstable. In our case, Charles had just become a father, determining the need to keep his job at S1 to support his family. This result indicates the importance of reflecting on the conflicts related to crossing borders between life at work and in the family experienced by novice teachers. Even in this situation, Charles sought to overcome some contradictions at the border crossing at the beginning of teaching. Despite having adapted his practice to the school's conditions, he gradually resumed the teaching-learning strategies that he believed to be more appropriate.

This Charles' stance reveals the mobilization of his agency (Engeström & Sannino, 2016), that is, of his abilities to act autonomously and independently in the transformation of his activity, opposing the alienating factors of his teaching work. Even fearing losing his job, he did not stop carrying out the teaching-learning activity he believed was best for students, as opposed to the traditional teaching carried out at school.

In Charles' case, we had evidence that the novice teacher, particularly in the context of private schools, faces situations that



**Table 3**

Transformation of the teaching-learning activity system's mediating fields (MF) at S1.

Mediator field	Transformation
<i>subject-rules-community-object</i> (S-R-C-O)	The contradiction in the <i>rule</i> led Charles to circumvent some norms and collective agreements of S1. As he disagreed with the mandatory use of individual written tests as an assessment tool, he started to institute other means to evaluate students, in addition to applying the tests. This rule did not regulate his way of evaluating, but, at the same time, he lost mediations in his relationship with the community. This resulted in conflicts between <i>subjects</i> (Charles vs. students) and between <i>subject</i> and <i>community</i> (Charles vs. parents of students). A power struggle was established, demanding Charles' return to complying with the rule determined by the school and which culminated, later, in his dismissal.
<i>subject-community- division of labour-object</i> (S-C-LD-O)	The contradiction in the <i>division of labour</i> of the teaching-learning activity system indicates a transformation in the <i>subject's</i> and the <i>community's</i> mediation with the object. In a way, the interference of the students' parents in the teaching-learning processes resulted in a decrease in Charles's autonomy and authority concerning his assignments as a physics teacher. Although the teacher must be the school's specialist and responsible for evaluating the methodologies used in the teaching-learning activity, the school places itself as a service provider to the students' parents, who are consumers who may demand changes in the product they consume, in this case, the teaching-learning activities. Also, the difference in status between Charles ( <i>subject</i> ) and the other experienced teachers ( <i>community</i> ) established different values for work of the same nature (teaching). Unlike the other experienced and stable teachers at S1, Charles had to deal with more significant uncertainty considering if the school coordinators would let the teachers keep their jobs, thus weakening the autonomy of the teachers in relation to their teaching actions.
<i>subject-mediating artifact-object</i> (S-MA-O)	As an expression of the previous contradictions, especially the contradiction in <i>mediating artifact</i> and the primary contradiction, Charles's autonomy in choosing the mediating instruments for his teaching-learning activity was reduced. In this way, the teacher lost part of his responsibility for the teaching and assessment mediating instruments and, consequently, for the product of his activity ( <i>object-outcome</i> ), which was transformed by the changes in educational objectives, with the inclusion of the objective of maintaining his job at S1.
<i>subject-community-object</i> (S-C-O)	As the <i>rules</i> and the <i>division of labour</i> establish, respectively, the mediation of the <i>subject</i> and the <i>object</i> with the <i>community</i> , the contradictions in these elements determined Charles's dismissal from the school community. Charles felt he did not belong in the school, and this was expressed by the loss of Charles's mediation with the school community and the activity's objectives, since the community is also a mediator of the teaching and learning activity objectives. He realised that the feelings he attributed to teaching and learning were different and, often, conflicted with the meanings established in the school context. This implied the transformation of all mediating fields S-R-C-DT-O, synthetically the mediating field S-C-O, which shows the transformation of the totality of the activity as a unity.

Source: Authors.

require negotiation with the other subjects and the activity's community. The quality of these interactions with the school community influences the access and sharing of social capital, determining the socialization processes of novice teachers (Pogodzinski, 2012). In this process, "novice teachers may experience pressure to conform to the norms of their social network(s) within a school in order to access resources and support, which may limit their growth" (ibidem, p.328). In the case of Charles, the results of pressures from the school context can be identified by the transformation of the mediating fields, which may incur a process of alienation. Particularly in private educational institutions, the teacher does not determine the exchange value of the products of his work since labour relations (employee-employer) are mediated through the consumer public (school customers) who, with the power of capital, can determine some forms of the product, that is, school teaching-learning strategies. The situation is much more complex since school activity belongs to a sociocultural and economic activity system, determined by capitalist modes of production and consumption, supporting an alienation model of work and resulting in teachers' surplus value.

Such characteristics of Charles' teaching beginning reveal how the institutional border crossing between the university and the school of novice teachers can be determined by the school culture and the culture of the students' families. In particular, these results corroborate other research on the border crossing between university and school by novice science teachers (Luft, Roehrig, & Patterson, 2003; Mulholland & Wallace, 2003; Kang et al., 2013).

Novice teachers confront their meanings about the teaching-learning activity developed during the initial teacher training at the university, with the social meanings present in the socio-historical context of basic education schools, which are mediated by the demands of the students' families. As Charles, many novice science teachers need to reconcile inquiry-based teaching, learned at university, with traditional teaching in elementary schools and the demands of students' families.

## 6. Final considerations

The data analysis indicates that the central contradictions that emerged in the novice's teaching activity, were originated in his relationship: (i) with students who resisted the investigative teaching methodologies through their indiscipline and defamation of the teacher to his co-workers; (ii) with the students' parents who complained about teaching actions, interfering in his pedagogical activity; (iii) with the other, more experienced teachers, as Charles perceived himself to be devalued and to have less job security; (iv) with some rules in the school context, especially concerning the use of tests as the primary assessment tool and the mandatory use of textbooks as a mediating tool for teaching-learning activity. This result indicates that Charles's work activity was determined by his particular situation, i.e., by the multiple hierarchical mediations Charles has with different activity system levels that constitute the school context.

It is noteworthy that, (differently from Ritchie et al. (2013)), the resistance to applying investigative activities in one of the schools did not come from more experienced teacher colleagues but from the students and their parents. This shows how these emerging contradictions at Charles' career beginning are related to the modes of production and consumption of the educational product in the private school system, usually based on the idea of education as a business (Dniester, 2017; Li & Hung, 2009; Malik et al., 2015; Skallerud, 2011).

Charles's life circumstances intensified the contradictions he experienced as a novice teacher; for example, changing his role as a teacher (work) and as a father (family) had a big impact on the beginning of his teaching career. From the need to keep his job to maintain his family economically, Charles had to deal with the dilemma of using his more efficient teaching methodologies for students' learning or succumbing to students' and their parents' pressure to teach traditionally. Thus, these contradictions led him to adopt a more "traditional" lecturing practice aligned with the

school's needs. Charles's choice manifests the transformation of the teaching-learning activity mediating fields, resulting in the process that could be understood as the alienation from his work.

The tensions arising from the border crossing between the university student activity and the novice teacher activity indicate that Charles's meaning of teaching and learning differed from the social meanings accepted in S1. Thus, it is important to highlight the role of context in joining the teaching profession since each school has a different culture, requiring different cultural transitions for Charles. Such differences can be perceived by the distinct contradictions that emerge at the beginning of his teaching career. Even those contradictions of the same nature, such as students' indiscipline, had different meanings for Charles.

Several factors determined the way he perceived and acted concerning these contradictions. However, the salary to maintain his family can be considered the central contradiction of the teaching-learning activity because it prevented the object of his activity - the teaching and learning of physics - could be achieved by the instrument Charles thought was correct - inquiry-based learning. This corroborates with Rodriguez's (2015) result indicating that the context and the meanings attributed by novice teachers to the experiences of this career phase determine how the beginning of a career in teaching will be.

Thus, we can conclude that in the border crossing process, the novice teacher should deal with historically developed social meanings in the school context, expressed through customs, routines, and relationship patterns. The novice teacher, in turn, brings her/his senses about teaching and learning, the role of school, and school education, which were developed throughout his/her school and academic history. From the clash between those personal senses and social meanings, conflicts and incompatibilities can arise between the novice's way of being a teacher and how the school culture allows to materialize it. Depending on his/her senses and motives about the teaching profession, the novice teacher will deal differently with conflicts, adapting (or not) to the school culture. During the interactive processes, the teacher may change his/her motives and modify the activity in different contexts because of new needs arising from different interactions. As we observed, the result is an alienation process from his work, through the loss of mediations in his activity, transforming him into a mere means for his subsistence. As a typical situation in the capitalist economy, professional practice is not characterized, for this subject, as an activity but only a necessary action for his survival.

Such conclusions imply important questions about the role of future teachers' initial training and entry into teaching. Charles' initial teacher training was not enough to develop the mediating fields given the complex and concrete relationships in daily school life, especially in private institutions. Thus, it is important in teacher education courses to include activities that permit the future teacher to experiment with different school contexts in a more effective collaboration with experienced teachers (Roth, Tobin, Zimmermann, Bryant, & Davis, 2002). This will allow observing and experiencing different school cultural contexts, crossing borders before starting the teaching career. In addition, are needed teaching induction programs can help novice teachers to face the difficulties of starting teaching, providing support for them to seek to overcome the contradictions that permeate the teaching profession in a country like Brazil. In the case of science teachers, these initiatives must consider their specificity (Luft et al., 2011; Luft & Patterson, 2002; Luft et al., 2003; Roehrig & Luft, 2006).

Despite the limitations of the case study, our results show how the CHAT can be constituted as a theoretical instrument that allows us to identify and analyze the relationships and processes that characterize the border crossing between university student activity and teaching activity in basic education. In particular, the

concepts of contradiction and mediating fields make it possible to analyze the transformations in the teaching activity of novice teachers and the different aspects of academic and school culture that characterize the border crossing that novice teachers need to face.

In addition, some results presented can be found in other contexts, especially in countries where there is a devaluation of teaching work and a lack of support for novice teachers. Our research shows that reducing teacher attrition at the start of a career is not enough to retain teachers in the profession. Then, it is necessary to prepare future teachers to deal with the processes of alienation from the teaching activity and develop the capacity for resistance and agency to transform the specificities of their work situation and broader educational problems. We are convinced that increasing teachers' emancipatory conscious awareness will enable more qualified teaching-learning for basic education students.

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