

Co-teaching *praxis* as an interdisciplinary experience in Natural Sciences teaching

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ABSTRACT. Although education in rural areas is already robust, especially in relation to basic education, the graduation courses regarding to teacher formation to this specific area are still young in the Brazilian educational scenario. This aspect is being the scene of epistemological, didactic and many other discussions that imply the teaching action. We teach natural sciences in a degree course in education in rural areas in the Northern University Center of Espírito Santo, Federal University of Espírito Santo and we discuss these and other issues, such as the teaching training by knowledge area, overlapping and incorporating the debates in our teaching practice. Therefore, we present in this article our co-teaching experience and we discuss its challenges and overcoming during teaching a discipline composed by contents of biology and chemistry. The discipline, called “Introduction to cell biology and life chemistry” was created by two teachers and had 60 hours of theory, taught during one semester. The discipline and its evaluation activities were elaborated to integrate biology and chemistry contents, to turn interdisciplinarity as possible to realize. We report here the whole process of co-teaching, which began with the collaborative conception and creation of the discipline, moving forward to its execution, the elaboration of evaluative activities and finalizing with the reflection and the writing of this paper. Our experience reveals the importance of interdisciplinarity and co-teaching as a possibility of breaking the fragmented formation in higher education.

Keywords: Education in Rural Areas, Co-teaching, Training by knowledge Area.

A *práxis* codocente como experiência interdisciplinar em ensino de Ciências da Natureza

RESUMO. Ainda que a Educação do Campo já se apresente robusta, sobretudo na educação básica, os cursos de Licenciatura em Educação do Campo (Ledoc) ainda são jovens no cenário educacional brasileiro, sendo palco de discussões epistemológicas, didáticas e outras tantas que se apresentam e que implicam na ação docente. Como professoras do curso de Licenciatura em Educação do Campo, habilitação em Ciências Naturais, existente no Centro Universitário Norte do Espírito Santo, Universidade Federal do Espírito Santo, debatemos essas e outras questões, como a formação por área de conhecimento, sobrepondo e incorporando os debates em nossa ação docente. Neste sentido, apresentamos no presente artigo um relato de experiência de codocência de uma disciplina que dialogou conteúdos de química e biologia, discutindo seus desafios e superações frente à necessidade de uma formação por área de conhecimento em ciências da natureza numa Ledoc. A disciplina em questão, chamada de “Introdução à biologia celular e química da vida”, teve carga horária de 60 horas teóricas, e foi lecionada durante um período letivo a partir de aulas dialógicas, contando com atividades avaliativas, com objetivos conceituais e analíticos, pautadas na relação interdisciplinar entre os conteúdos de biologia e química abordados. Esta disciplina foi concebida e estruturada conjuntamente por duas professoras, objetivando a abordagem de conteúdos introdutórios organizados de forma a promover a interdisciplinaridade. Relatamos aqui todo o processo de codocência, que se iniciou com a concepção e criação conjunta da disciplina, passou pela sua execução, elaboração de atividades avaliativas e culminou com reflexão e escrita deste trabalho. Nossa experiência aponta a importância da interdisciplinaridade e a codocência como uma possibilidade de rompimento da formação fragmentada no ensino superior.

Palavras-chave: Educação do Campo, Codocência, Formação por área de Conhecimento.

La praxis codocente como experiencia interdisciplinaria en la enseñanza de Ciencias de la Naturaleza

RESUMEN. Aunque la Educación del Campo ya se presenta robusta, especialmente en la educación básica, los cursos de Licenciatura en Educación del Campo (Ledoc) todavía son jóvenes en el escenario educativo brasileño, siendo escenario de debates epistemológicos, didácticos y de otros tantos tipos que se presentan e implican en la acción docente. Como profesoras del Curso de Licenciatura en Educación del Campo, habilitación en Ciencias Naturales, existente en el Centro Universitario Norte de Espírito Santo, Universidad Federal de Espírito Santo, debatimos estas y otras cuestiones, como la formación por área de conocimiento, sobreponiendo e incorporando los debates en nuestra acción docente. En este sentido, presentamos en este artículo un relato de la experiencia de la codocência de una disciplina que discutió los contenidos de química y biología, discutiendo sus desafíos y la superación ante la necesidad de una formación por área del conocimiento en ciencias de la naturaleza en una Ledoc. La disciplina "Introducción a la biología celular y la química de la vida", tuvo una carga de trabajo teórica de 60 horas, y se enseñó durante un período académico, con actividades de evaluación, con objetivos conceptuales y analíticos, basados en la relación interdisciplinaria entre los contenidos de biología y química cubiertos. Ella fue concebida y estructurada conjuntamente por dos maestros, con el objetivo de abordar el contenido introductorio, organizado para promover la interdisciplinariedad. Aquí relatamos todo el proceso de codocencia, que empezó con la concepción y creación conjunta de la disciplina, pasó por su ejecución, elaboración de actividades de evaluación y culminó con la reflexión y la escrita de este trabajo. Señalamos para la importancia de la interdisciplinariedad y la codocencia como una posibilidad de rompimiento de la formación fragmentada en la enseñanza superior.

Palabras clave: Educación del Campo, Codocencia, Formación por Área de Conocimiento.

Introduction

The initial training courses for Degree in Rural Education are still recent, most of them having been created since the MEC 2010 public notice (Molina & Hage, 2015). In this sense, even though several pedagogical practices and epistemological debates take place within the scope of these courses, there is a need to disseminate these experiences to disseminate, expand and improve them. In response to this need, we present this article.

We are new teachers of the teaching staff of the Degree in Rural Education (Ledoc/São Mateus), qualification in Natural Sciences, existing in the North University Center of Espírito Santo, Federal University of Espírito Santo. One of us has a degree in Biological Sciences and a PhD in Entomology from the Federal University of Viçosa, and the other has a degree in Chemistry and a PhD in Sciences, with emphasis on Chemistry, from the Federal University of São Carlos. At Ledoc/São Mateus, we work in the teaching of nature sciences although we teach, more specifically, disciplines connected to biology and chemistry.

In the curricular matrix present in the 2012 version of the Pedagogical Course Project (PPC) of Ledoc/São Mateus, the specific disciplines of the Natural Sciences habilitation, linked to the contents of biology, physics and chemistry, are only located after the fifth period. This organization, considering that our course has eight periods, has always caused us a certain strangeness and concern, because we understood that the contact of the students with the specific contents of their habilitation was delayed. Also, in this version of the PPC, the organization of the subjects in the curricular matrix does not present, at least in an intentional and evident way, connections between the contents approached in the same period, and we consider that this implies a certain restriction to interdisciplinary approaches or specific pedagogical practices that relate distinct disciplines.

Faced with these issues and from discussions and exchanges of experiences fostered by the challenges posed to us by the teaching, we began to analyze ways to foster interdisciplinarity in the teaching-learning process existing in our course, especially that linked to the contents of

our disciplines. This analysis resulted in the elaboration and joint offer of a discipline approaching, in an integrated way, the contents of chemistry and biology. We also defined that this discipline would be taught concomitantly by both of us, through co-teaching, a didactic methodology unprecedented in our course and which reveals itself as a potential promoter of interdisciplinarity in the classroom, in order to materialize the formation by area of knowledge.

In this sense, the context experienced by our students, the process of elaboration, planning and teaching, as well as the challenges, difficulties and overcoming relevant to this discipline will be discussed in this article. Thus, our goal is to collaborate, in a positive and concrete way, for the improvement of the teaching practice present in the Degree courses in Rural Education.

History: The creation of the Degree Course in Rural Education at CEUNES/UFES

The advance of the economic/political/ideological developmentalist project that arrived in the state of Espírito Santo in the 1960s and 1970s led to a great exodus of

peasant populations expropriated from their lands/territories and, simultaneously and as a consequence, the emergence of the current peasant organization existing in the state, articulated to trade union and religious organizations.

What can be observed in the rural scenario, from these decades to the present day, is that due to the policies of encouraging a form of agriculture focused on the external market based on the monoculture model of agribusiness, the countryside has been increasingly characterized by latifundia. As a result, the rural exodus and the growth of the urban population have intensified greatly, causing less than 20%, out of a total of approximately 3.5 million inhabitants of the state, to live in the countryside (Jones dos Santos Neves Institute, 2011). The analysis of the average schooling of the rural population, currently registered in only 8.3 years, according to studies by the IBGE/Pnad, made one of the goals of the PNE to raise this number, since the average schooling of the urban population is 10.3 years.

According to data from the 2014 School Census, the Espírito Santo

State Public Network has 115 schools located in the rural perimeter, which corresponds to 23% of the schools in the entire public network, being: 63 multi-teachers Elementary Schools; 3 State Centers for Rural Comprehensive Education; 9 High Schools; 18 Elementary and Secondary Schools and 22 Elementary Schools. These numbers include schools located in areas of Agrarian Reform Settlements and Camps; State Centers for Rural Comprehensive Education - CEIERS; schools organized through Pedagogy of alternation - CEFFAS and schools organized through multiservice/multiple entities.

It is in this context that Ledoc/São Mateus is inserted, with the priority objective of forming educators who act, or intend to act, in the countryside schools and other formation spaces, both in schools and social movements. As a higher education course, Rural Education has its roots in pilot experiences carried out in four Brazilian universities (UFMG, UnB, UFBA and UFS) in mid-2007 (Antunes-Rocha & Martins, 2009; Molina & Hage, 2015). Driven by these experiences and by social movements, in 2008 the Ministry of

Education launched edicts for the creation and implementation of initial training courses in Degree in Rural Education. One of the institutions selected was the Federal University of Espírito Santo, which offers the Degree in Rural Education in two campuses: Goiabeiras and São Mateus. In São Mateus, Ledoc is part of the courses present in the North University Center of Espírito Santo (CEUNES). CEUNES, founded in 1990, comprises approximately 2000 undergraduate and graduate students from the states of Bahia and Minas Gerais, in addition to Espírito Santo, and is the main public education institution in the north of the state of Espírito Santo (PPC of the Degree Course in Rural Education - CEUNES/UFES, version 2019).

Ledoc/São Mateus has two degrees, Natural Sciences and Human and Social Sciences, and had its first class admitted in 2014. Our course aims to meet, as a priority, the strong social demand of peasant communities (family farmers, settlers, and agrarian reform campers, quilombola, fishermen) in the northern regions of Espírito Santo, southern Bahia and eastern Minas Gerais.

Teacher training by knowledge area

Thinking about the degree course in Rural Education requires analyzing the tense encounter between the different formats and specificities of two contexts: that of the Master's Degree and that of Degree in Rural Education. Thus, we risk saying that as in any other Degree in Rural Education course, our course also had and has its challenges. One of them is to conceive training by knowledge area as one of the political-pedagogical advances that require a deep analysis of the previous conceptions that teachers bring from their initial training, and that demand changes, above all, in their teaching practice (Britto, 2015).

We understand that training by knowledge area needs, among other aspects, the overcoming of barriers inherent in the creation of a pedagogical project, both in the initial training of educators at the university, and in basic education in the countryside schools (Caldart, 2011). One of these barriers is, for example, the difficulty in creating an interdisciplinary dynamic among the proposed disciplines, materialized both in their menus and in their teaching

methodology (Britto, 2015; Britto & Silva, 2015; Caldart, 2011).

The purpose of a curriculum organized by areas of knowledge is to overcome the fragmented training based on the disciplinary concept, so well-known in the Brazilian basic education model, and to train, in addition to a critical educator capable of collaborating in the political and social transformation of the reality of the countryside in Brazil, educators prepared for interdisciplinary teaching (Molina, 2017). In this way, one of the challenges of the Ledoc is that the teachers of the course, understand that, starting from their initial fragmented training courses, they need to provide training disciplines by area of knowledge, so that our educators and educators are in fact prepared to exercise teaching by area in the countryside schools (Britto, 2017; Molina, 2015).

In this sense, these pedagogical challenges are reflected in components such as the curriculum, the contents worked and the teaching methodology (Britto, 2017; Caldart, 2011).

Historically, the proposition by area of knowledge existing at Ledoc was made considering the example of

Pedagogy, which enables the teacher to work with early childhood education and the initial years of elementary school in all areas of knowledge. However, even though there were good reports of experiences with "Pedagogy of the Land" courses, other alternatives in other areas started to be discussed, still with the concern for a broad education, which besides teaching, also considered the reality of the countryside. At the same time, the existing models for disciplinary courses were also discarded, due to Ledoc's specificities and for the reason that many schools in the countryside do not have teachers of different subjects available (Caldart, 2009; Caldart, 2011).

The debate to arrive at the qualification by area of knowledge is still maturing and taking shape. What is happening is the attempt to work on the relationship between areas and disciplines in the most appropriate way for the reality of the countryside, thinking about the organization of the curriculum of basic education schools, the initial training course for educators, and how pedagogical practices could work on disciplinary curricula and

overcome existing barriers (Molina, 2017; Rodrigues, 2010).

In this context, interdisciplinarity and transdisciplinarity represent the ultimate goal of training by area of knowledge, since they are in line with the training goals present at Ledoc (Frigotto, 2008). Although interdisciplinarity does not necessarily eliminate disciplines, it concretely proposes an articulation and dialogue between them, a response to the fragmentation built with time (Gadotti, 1999). Interdisciplinarity and, beyond that, transdisciplinarity are approaches that make possible the realization of pedagogical actions that are in accordance with a search that substitutes compartmentalization for integration, connection, and dialogue (Morin, 2007; Santos, 2001). As its name indicates, interdisciplinarity refers to the action through which an effort is made to correlate disciplines, discover what can be common among them, and thus promote the connection of knowledge. Transdisciplinarity, on the other hand, indicates that which is at the same time between, through and beyond the disciplines, and which can even produce new disciplines (Santomé, 1998).

Several pedagogical experiences in Basic Rural Education propose the use of interdisciplinarity as a way to defragment curricular contents from the collective construction of disciplines, providing the transposition of barriers through different pedagogical actions in the classroom (Molina, 2017). Such experiences demonstrate that interdisciplinarity is a possible reality, and its presence is also necessary in the initial training courses for educators, in order to realize the commitment of Ledocs assumed, since its conception, with the demands of peasants (Britto & Silva, 2015; Molina, 2015).

The great challenge of interdisciplinarity is not only to guarantee moments of contextualization of contents, but also to dialogue and build, together, the concepts of the different areas of knowledge, uniting theory and practice, integrated in the same totality of pedagogical work. In this way, these factors consolidate the training per area of knowledge as one of the main challenges experienced by the Graduates in Rural Education (Molina, 2015). Thus, we understand co-teaching as a potential didactic

methodology to overcome this challenge, promoting interdisciplinary teaching and learning at Ledoc.

The creation of the subjects

In the specific cut of the qualification in Natural Sciences of Ledoc/São Mateus, the Pedagogical Course Project (PPC) in force until the year 2018 provided only one discipline in the area of chemistry and two disciplines in the area of biology, both taught in different semesters/periods. In addition to the compulsory subjects, the students necessarily needed (and still need) to take optional subjects so that the credits are paid at the end. Motivated by the mentioned context, allied to the desire to initiate the practice of co-teaching as a strategy to materialize the training per area of knowledge, we opted to create two optional subjects, which would be taught simultaneously at the same hour and same place, related to the areas of chemistry and biology.

Creating two disciplines instead of one was a decision made since the university system did not understand that we would both spend the same time in the preparation, development and execution of classes, and

evaluation activities. On the contrary, if only one subject was created for two teachers to teach, the workload would be divided in half.

The first challenge when creating the disciplines was to think about the menus so that they could dialogue with each other, as much as possible, to give concreteness and meaning to the proposed interdisciplinary co-teaching. Additionally, since they were educators who had not yet had any discipline from these two areas, we were concerned with starting the construction of the concepts through a solid basis, that is, we had the assumption of starting the discussion based on basic contents. Thinking about this aspect, the most basic content that could be approached, and that dialogues chemistry and biology, is the emergence of the universe and life. At the appearance of the universe the first chemical elements formed by atomic particles appear, and the combination of these elements with the existence of water, an essential condition for life, made possible the appearance of life in its simplest form. It is interesting to point out that in biology textbooks, commonly, the first topic to be addressed is the "chemistry

of life". In this topic the contents worked are about atoms, chemical elements and molecules that constitute cells and organisms. This intrinsic relationship between these two sciences resurfaces in other specific biology contents, such as genetics and physiology, reaffirming the integration and interconnectivity of knowledge. However, because they are abstract contents, there is usually a great difficulty in understanding on the part of the students, especially because they do not perceive the intrinsic relationship between the two areas of knowledge dealt with disciplinarily in basic education, and they do not perceive a direct relationship between these contents and their daily lives. From this, the disciplines "Introduction to Cell Biology" and "Introduction to the Chemistry of Life" were thought and created, with a workload of 60 theoretical hours each.

In the menu of the discipline "Introduction to Cell Biology" we planned to address the origin of the universe, the earth and life; the first elements and the first forms of life; the fundamental characteristics of the cell; the biomolecules, bio membrane, organelles and cell metabolism; the

cell types and their representations; cell division and the transfer of genetic information; some biological processes present in everyday peasant life. To dialogue with these concepts, the menu of the discipline "Introduction to the Chemistry of Life" proposed the origin of life and the universe: the emergence of chemical elements, their abundance and properties; atoms, ions and molecules: forms and structures; the biomolecules: amino acids, peptides and proteins, nucleotides and nucleic acids, carbohydrates, lipids, enzymes and the organic functions present in these biomolecules; the types of bonds and chemical reactions involved in cellular metabolism; the molecules and chemical reactions present in daily peasant life. The preparation of the classes, as well as the elaboration of the menus, was also a collective construction, something much more challenging and that demands much more time than the individual planning. Since the classes were held once a month, all the classes, tasks, and activities of University Time (UT) and Community Time (CT) were thought and developed together and, therefore, at least three days were available for such activities. For each

stage of the class at least one activity for UT and one activity for TC were prepared. Everything duly analyzed and corrected by both teachers.

At the time these two optional subjects were being created for the PPC in force until 2018, we were also forwarding the reformulation and creation of a new Pedagogical Project, which was still going through the elaboration of curricular subjects and organizations. At the end of the creation of "Introduction to Cell Biology" and "Introduction to the Chemistry of Life" it was realized how important it was to organize the disciplines in the same semesters, in order to propitiate the dialogue between the contents of different areas, not being limited, of course, to the disciplines of biology and chemistry. From this experience, the new PPC of the course, which began to take effect in the first semester of 2019, counts with the presence of these two disciplines as mandatory disciplines, created until then as optional, which will be taught for the third period of the qualification in Natural Sciences.

Our co-teaching experiences

To present our co-teaching experiences, we will consider the discipline as unique since, even though we have two menus, all aspects related to the subjects have been treated in an integrated way, with the classes being taught by both teachers at the same time. To better guide the students, we have even named the discipline "Introduction to cellular biology and chemistry of life". Thus, in this chapter we have chosen to debate, in one topic, the classes and activities proposed to the students and, in another topic, the reflections and challenges regarding the planning and accomplishment of the classes and activities of the discipline.

The classes

The whole discipline was built together. This construction, obviously, is more challenging than a solitary, individual elaboration, and this will also reverberate in the elaboration of the classes themselves. The contents, methods, resources, and other strategies are systematically discussed and debated beforehand, which demands more preparation time and an elaborate vision on the importance, pertinence and understanding of what

is essential. During the construction of the menus, as well as in the preparation and administration of the classes, there was always the concern of starting the contents from macroscopic aspects, finishing in microscopic and symbolic aspects, more abstract in the eyes of our students. We consider the different contents and the way they relate to the classes, and from them we choose the best methodologies and didactic resources. We always include the peasant reality in the classes, which were planned one by one. Here we will present the classes offered in two UTs experienced by the educators, pointing out the way of elaboration, teaching and evaluation of the classes and contents. Our proposal, in terms of class preparation, was to include at least one evaluation activity to be carried out at the UT and one to be carried out at the CT.

The first UT had the objective of presenting and discussing the theories of the emergence of chemical elements and life, in addition to presenting the atoms, ions, chemical elements, molecules and periodic table, as well as animal, plant and microbial cells, and the basic differences between unicellular and multicellular

organisms. Our proposal was that educators and students would perceive the universal constitution of living beings: formed by the same chemical elements from the beginning. To this end, we elaborated two moments of class.

For the first moment of class we planned, from the previous evaluation, the use of two videos available on YouTube that address, in a concatenated and subsequent way, the theories of the emergence of chemical elements, the Earth and the first forms of life. During the previous evaluation we observed that it was not necessary to use the videos in their entirety and we determined the parts to be worked on, as well as the interventions to be carried out, at specific times, in order to stimulate the debate of the information presented. After choosing, analyzing and planning the use of the videos, we elaborated a diagnosis, to be applied before and right after the videos, whose objective was to know, from the students, their previous conception about the existence of chemistry, if there was chemistry when the universe appeared, when life appeared, where and in what way.

For the second moment of class, to be carried out after the videos and the diagnosis, we elaborated a dialogical theoretical class, whose objective was to present the organisms and the way they are organized (in cells, tissues, systems) to connect to the different existing cellular types and advance the knowledge towards ions, atoms and molecules. We added to this theoretical part a brief video about the atom and the projection of images to exemplify the contents to be debated and give more concreteness. For being a more abstract content, we chose to plan this theoretical part starting from the scale observable with the naked eye and moving forward to the smallest scale (atoms and ions), in order to provide students with the perception that these contents were related.

Finally, we elaborated an evaluative activity to be applied at the end of the class, with the objective of fixing the content discussed in class and relate it to the peasant reality. We asked, for example: how to explain the similarity in the chemical composition of living organisms? Where are the chemical elements present in your community? Explain the emergence of

the chemical elements. Some questions, with the same purpose of fixing the learning, were elaborated for the realization by the students in the TC.

Thus, in class, we presented the content that would be approached and, briefly, we held a small debate. After this introductory moment, we started the first moment of the class applying the diagnosis. We informed the students that the diagnosis did not have an evaluative nature, but that it would be important for us to analyze the results of our teaching actions. In the sequence, we carried out the lesson with the videos and asked them to answer the diagnosis again after the end of the debates. In the second moment, we presented the theoretical contents with the use of multimedia projector and, although not planned, in this part of the class we also performed some group dynamics.

During the first application of the diagnosis the students felt uncomfortable and insecure with their own answers. The diagnosis caused a stir in the class, which showed great interest in the content from the contact with the questions. A change in the answers of the diagnosis is noticeable

when we compare the initial and final application. Notably, the answers that initially were more evasive were replaced by placements that were more coherent with the current scientific knowledge and, in this way, we considered that the use of the videos was positive for learning. In addition, some diagnostic questions were taken up by the students during our interventions in the presentation of the videos, stimulating the debate and favoring the amplification and fixing of the contents.

However, in the second moment of class, during the theoretical presentation of the contents, we observed that the subjects were less interconnected than in the first moment and we had less chances to carry out interventions in each other's speeches. In addition, the students had some difficulty in understanding some of the contents, such as the arrangement of particles in an atom (protons, neutrons, and electrons), for example. Faced with this difficulty, although not previously planned, we used a dynamic in which students represented protons, neutrons, and electrons, and were disposed in the classroom space and oriented to move in order to imitate the

atomic organization. Despite the limitations of the dynamics, for example the impossibility of representing the three spatial dimensions, it allowed the students to reach the understanding of the content from the concreteness given by the representation of the atomic organization with their own bodies. Other similar interventions, although simpler, were performed whenever we observed difficulties in understanding the content. The understanding of abstract contents is a challenge for the students, and we consider that the dynamics are good alternatives for this knowledge to be built in a more concrete way, so that it can make sense to the students.

The second UT aimed to work the content of "chemistry of life". The proposal was to approach the macromolecules essential to all living beings (or biomolecules) as well as their functions in organisms and the organic functions found in the structure of these macromolecules (alcohol, ketone, ester, etc.). Our goal was that educators could recognize that they are present in specific macromolecules living organisms, and that they also compose various materials present in

our daily lives, such as agrochemicals. Furthermore, we aimed to present genetic information as a set of molecules, atoms, ions, so that they could perceive the possibility of interference (such as transgene), to be addressed in the future. For this UT we prepared two moments of class between which we divided the content to be approached.

For the first moment of class, we planned an evaluation activity to be applied before starting the new content, to rescue the knowledge previously approached and necessary to understand what would be treated. In addition, we previously asked the students to bring packaging with labels of different products to be used in this moment of the class. We elaborated a dialogic theoretical class to be realized with the use of a multimedia projector, whose content was centered on the macromolecules, their functions in the organisms and organic functions found in the structure of these macromolecules (alcohol, ketone, ester, etc.).

For the second moment of class, we planned a dialogical theoretical class addressing the molecular structure of nucleic acids,

demonstrating the existence of atoms and ions in these molecules. In addition, we have elaborated an evaluative activity to be carried out at the end of this moment of class as well as an activity to be carried out at the TC.

Thus, in the classroom, we initially applied the evaluative activity that caused a stir in the class. We had already informed in the previous UT that this activity would be applied at the beginning of the next UT, and that the objective would be to rescue contents. We made a brief debate from the questions present in the activity and we started the class with the use of the labels. Each student read aloud the label they had brought, and we listed some molecules present on the board. From these molecules we started the relative content, relating the label molecule to a macromolecule to be studied, for instance corn starch and carbohydrate. We used many molecules images to facilitate the comprehension of the content and we intensified the dialogic approach to get a wide involvement. During the class, we perceived high integration of content, mutual interventions among us teachers were constant and dialogue

and debate with students strengthened interaction and interdisciplinarity.

The debates were intense, and we observed the need to give more emphasis to the content on macromolecules, especially due to the presentation of pesticide labels brought by the students. Thus, we opted to finish the class with the application of the evaluation activity linked to the content of macromolecules and work the nucleic acids in the next UT.

We are guided not only in the enlargement, but also in the connection between the knowledge treated in the subject, so we intend in our activities, whenever possible, the use of the knowledge previously discussed in the classes for their realization.

As an example, we present here one of the integrating activities that the students have done on macromolecules (figures 1 and 2). Our objective with this activity was the recognition of macromolecules (carbohydrate, protein, lipid and nucleic acid) as well as the identification of the organic functions discussed in class (of which alcohol, aldehydes and ketones, ester, ether, carboxylic acids and derivatives, amines, etc. are part) and to verify that these functions are also present in

other molecules besides the macromolecules. It is valid to emphasize that for the elaboration of this and all the activities proposed to the students we carry out, together, the reflection on the objectives of the activity in relation to the contents approached.

The Sciences of Nature have been the subject of debate in the Rural Education, especially regarding the challenges related to epistemology, understanding and teaching of scientific knowledge in this area of knowledge (Souza, 2012), a great challenge to be overcome. In view of this, we understand that the scientific language cannot be stolen from the graduate student in Rural Education, since this language should guide his/her future teaching action. Thus, in our classes and activities, although we deal with the peasant reality, we dialogue with our students in the scientific language, both oral and written, helping them to familiarize

themselves, internalize and also to consciously reproduce this language in their speeches.

Reflecting on our co-teacher praxis

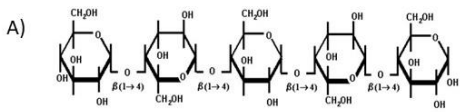
Offering a discipline in co-teaching is an unprecedented experience for us teachers, both in our course and in our teaching experiences and, as such, has brought us numerous challenges. We will deal here with some of the main aspects that involved the planning of the classes, from the determination of the content to be worked on to the choice of methodology and didactic material and resources.

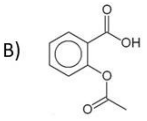
During the collaborative class planning process, we reflect and dialogue about our conceptions, biased by our specific training, about content and methods, and of course, the implications of this for learning.

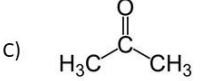
Figure 1- Extract of the fixation activity performed by Ledoc/São Mateus 7th period students.

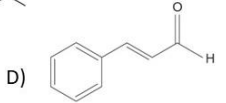
Analisar a estrutura de cada uma das moléculas a seguir, respondendo:

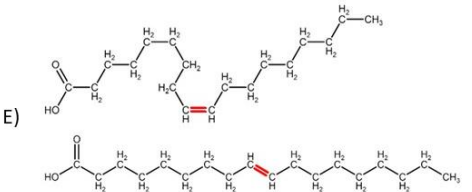
- 1) É uma biomolécula?
- 2) Em caso afirmativo, de qual biomolécula se trata?
- 3) Qual(is) a(s) função(ões) orgânica(s) presente(s)?

A) 

B) 

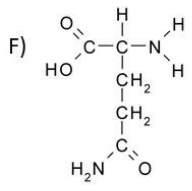
C) 

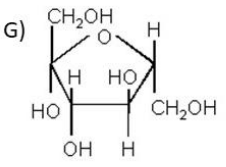
D) 

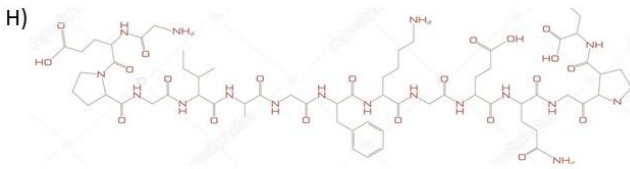
E) 

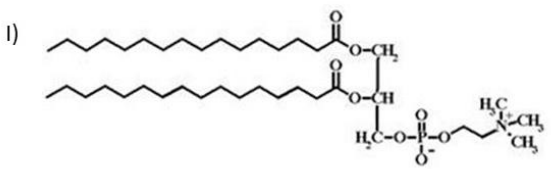
Source: the authors.

Figure 2 - Extract of the fixation activity performed by Ledoc/São Mateus 7th period students.

F) 

G) 

H) 

I) 

Source: the authors.

We try, always, to transpose the fragmented perspective of knowledge (divided between biological sciences and chemistry), and we realize that this transposition implies, besides a holistic vision about knowledge, empathy and humility. The collaborative work is not simple, it requires from the teachers involved the understanding that all areas are equally relevant, that there is no knowledge superior or inferior to another and that it is impossible to exhaust them in an initial training course. Thus, during this process we discuss various aspects of the scientific knowledge we have worked on, ranging from the terminologies used, through representations with images to the conception adopted, on the same subject, in the different scientific visions we have experienced. As we go through this path, we notice the concreteness of Paulo Freire's (2002) speech, when he says: "who teaches learns by teaching and who learns teaches by learning" and materializes, in this speech, the conscience of the teacher as an unfinished human being.

Besides this aspect, we notice that our individual praxis is also a challenge when adopting co-teaching. Although we know that it is impossible to have homogeneity in the teaching action of two different teachers, considering our personal, academic and professional individual formations, we try to reflect in

what way we can adapt our teaching methods. We understand that quite different and divergent methodologies would not be so useful, and could cause obstacles to the teaching process, especially in the interpretation of the students about the content worked. Thus, we reflected and dialogued after our classes about the methodology adopted and its possible implications, taking into consideration some dialogues we have with the class about this aspect. Our goal is not to homogenize our teaching action, but to enhance our dissimilarities, which are often positive aspects of teaching, to complement each other and not to diverge. We understand, in this way, that in this way we will potentialize our collaborative teaching practice, besides favoring a unique construction of our experiential knowledge (Tardiff, 2002). Our presence and interaction always, inside the classroom, allows us to have a unique look at each other, fostering a reflection that would hardly be possible under an individual and solitary look.

Finally, although the challenges are not exhausted here, the choice of the bibliographies to be used was a considerable obstacle, perhaps the most relevant. There is an enormous difficulty, in our academic environment, to find unified and integrated materials that are adequate and accessible to the students of

the Degree in Rural Education when dealing with the Natural Sciences. Nor in our academic background, even if we are graduates, have materials in this format been presented to us and disseminated, which translates into a difficulty apart. In this sense, we treat bibliographical references with special attention in what concerns the adequacy of contents in front of the two sciences worked in an interdisciplinary way. We worked with different references that were in dialogue because we did not have access (or production) to a single, universal, and interdisciplinary reference. We gave guidance to students to avoid possible misunderstandings and to favor the broad use of the material made available, since we analyzed the materials previously. We have made important and necessary adjustments to the terminologies, image representations, interpretations and other obstacles that may be encountered in the materials. In our classes, we use this difficulty to discuss with students the limitations and potential of textbooks used in basic education. We analyzed the fragmentation observed in textbooks and discussed how the teacher of basic education could overcome this difficulty. Our intention is that, in the future, we may have a unique material available to the students.

Final considerations

It was from the proposal of training by area of knowledge, one of the great differentials of the Degree Course in Rural Education, that the motivation for this experience was to break barriers that constantly fragment knowledge and insist on opposing this training proposal. Based on an interdisciplinary proposal and reinforcing that we understand it as a first step towards the deconstruction of the fragmentation of curricular contents and pedagogical actions, this report sought to present a real possibility of one of the aspects that reaffirm training by area of knowledge: co-teaching.

The construction of this discipline, although the existence of disciplines is the subject of debate (Chassot, 2016), especially when it points in the direction of interdisciplinary training and by area of knowledge (Caldart, 2011), represents for us a great advance. We have broken many obstacles, starting with ourselves, to build it and offer it collaboratively. These obstacles range from the interdisciplinary construction of the contents to the bureaucratic aspects of the educational institution for the consolidation of the offer. Individual barriers had to be overcome because as teachers of different areas many concepts and terminologies

were outdated in relation to areas that are not our domain.

However, as classes progressed, we realized that students were enthusiastic about co-teaching. In a brief dialogue during the classes, we noticed that the students value this proposal, identify the interdisciplinarity present in the discipline, and glimpse the possibility of working with the content in this way, both in co-teaching and in an individual but interdisciplinary approach.

The collective construction and the time of dedication that we invested together in the elaboration of the classes touched on and implied that we worked with respect, empathy, understanding and partnership in teamwork. In addition to the challenges faced by institutional and academic barriers, co-teaching, which is still not understood by many professors, is proving to be an important tool to begin the materialization of interdisciplinarity in training by area of knowledge.

We reaffirm that the experience of interdisciplinary co-teaching presented in this text also represents the possibility of this initiative being transposed to basic education, through the educators we will train. Even in schools in the countryside, we have also verified the disciplinary format, reinforced by the didactic material used, which follows the same fragmented model and not by area of knowledge.

To conclude, we emphasize that this study signals the first step of an initiative to put into practice interdisciplinarity as a pedagogical practice of two teachers of the Degree Course in Rural Education. However, we are aware that much still needs to be done. One of the goals, which is already being thought of in practice for these disciplines and will be portrayed in later texts, is the adoption of methodologies and dynamics in classes that consider thematic axes of rural education. We conceived this perspective as essential for the whole teaching and learning process to make sense to the student, because it considers his/her daily life and makes it possible for him/her to see, and in fact be, the subject of this process.

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Article Information

Received on October 30th, 2019

Accepted on July 17th, 2020

Published on November, 25th, 2020

Author Contributions: The author were responsible for the designing, delineating, analyzing and interpreting the data, production of the manuscript, critical revision of the content and approval of the final version published.

Conflict of Interest: None reported.

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How to cite this article

APA

Muscardi, D. C., & Cornelio, V. E. (2020). Co-teaching *praxis* as an interdisciplinary experience in Natural Sciences teaching. *Rev. Bras. Educ. Camp.*, 5, e3837. <http://dx.doi.org/10.20873/uft.rbec.e3837>

ABNT

MUSCARDI, D. C.; CORNELIO, V. E. Co-teaching *praxis* as an interdisciplinary experience in Natural Sciences teaching. *Rev. Bras. Educ. Camp.*, Tocantinópolis, v. 5, e3837, 2020. <http://dx.doi.org/10.20873/uft.rbec.e3837>