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Science teaching in the conception of pedagogical teachers from the Crateús - Ceará

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Abstract
The present work appears during the Science Teaching discipline in a Pedagogy course in the Sertões de Crateús. In this perspective, the objective was to understand how Science Teaching is being carried out by teachers from the municipal network of five cities in this region. The investigation is characterized as exploratory and descriptive, with a qualitative approach. Data collection took place through a questionnaire applied to teaching teachers. We observed that in view of the current reality of teaching and its precarious conditions in relation to the requirements of educational investments, the challenge of proposing different strategies and teaching resources that arouse the interest and curiosity of students is notorious. However, it is reported about the social importance of Sciences, but that the initial training to work in this area is incipient, with a (self) training taking place in the course of teaching practice. Thus, it is relevant to expand the approach to science content in the initial training of pedagogues, in order to fill this gap.
Keywords: Teaching, Teaching methodology, Training.

O ensino de ciências à luz da concepção de docentes pedagogos dos Sertões de Crateús - Ceará

Resumo
O presente trabalho surge durante a disciplina de Ensino de Ciências em um curso de Pedagogia nos Sertões de Crateús. Nessa perspectiva, objetivou-se compreender como o Ensino de Ciências está sendo realizado pelos professores da rede municipal de cinco cidade desta região. A investigação caracteriza-se

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como exploratória e descritiva, de abordagem qualitativa. A coleta de dados deu-se por meio de um questionário aplicado à pedagogas em atividade docentes. Observamos que diante da atual realidade do ensino e suas condições precárias em relação aos quesitos de investimentos educacionais, é notório o desafio de propor diferentes estratégias e recursos didáticos que despertem o interesse e curiosidade dos alunos. Contudo, é relatado sobre a importância social das Ciências, mas que a formação inicial para atuar nesta área é incipiente, sendo ocorrida uma (auto)formação no percurso da prática docente. Assim, é relevante a ampliação da abordagem do conteúdo de ciências na formação inicial dos pedagogos, a fim de sanar tal lacuna.
Palavras-chave: Docência, Metodologia de ensino, Formação.

1 Introduction

The present work arises from the perspective of discussing the way Science Teaching has been worked in the classroom by teachers with a degree in Pedagogy. In this regard, it reports on the academic training of a group of teachers who teach Science to students in the early years of elementary school. It also addresses their conceptions about contextualized teaching; the teaching strategies that facilitate student learning; and the challenges and limitations to implement the teaching proposals.

This research is the result of the immersion that the future pedagogues developed during the subject Science Teaching, of a degree course in Pedagogy, offered by one of the campuses of a State University located in the Northeast region of Brazil, where the interest and the need to better understand the processes of formation of current teachers, as well as the execution of the teaching practice in the classroom, arose. This enables undergraduates to get to know the reality of the teachers being researched, with the intention of getting closer to the profession.

In all teaching areas, it is necessary to search for improvements in order to arouse the students' interest and curiosity. The prerogatives help in the renewal of teaching in its multiple areas, and thus, Fourez (2016) highlights the interruption of the traditional way in which Science Teaching has been worked in schools, thus causing dissatisfaction in students and teachers themselves.

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Nevertheless, it is also necessary to emphasize the precariousness of didactic instruments available to innovate teaching methods, since not all schools have materials for experiments (laboratories, reagents, etc.), games, multimedia resources, or other instruments that complement the lessons. However, it is necessary that the teacher seeks to reinvent himself amidst the limitations, looking for new methods and innovative educational practices to approach the contents taught in the classroom, in order to arouse the students' curiosity and desire to learn, proposing exciting classes that have the active participation of the student in the process.

The traditional way in which Science Teaching has been approached, consisting of many theoretical lessons and memorization of textbook contents, and the narrowing of the curriculum due to the favoring of other subjects has hindered the learning process, making it monotonous and discouraging. Regarding this reality, Pozo and Crespo (2009) point out that some wrong attitudes and beliefs about the study of science have been adopted, among them the idea that good learning reflects a passive behavior in which one should always wait for the answers from the teacher and the textbook, instead of seeking them and even questioning them.

The loss of interest in the scientific area may be a result of the lack of diversification of didactic and pedagogical strategies and resources. The practice, besides complementing the theory, arouses curiosity and enthusiasm about what is being discussed and provides a new opportunity to clarify possible doubts. Thus, when evaluations show grades that are lower than expected, it is important not to blame only the student for the result, because when we talk about the teaching and learning process, it is evident that there are those prepared for the first action and those qualified for the second; what sometimes goes unnoticed are the limitations of teacher training, working conditions, and the lack of diverse teaching materials.

In this way, it is necessary to develop the teaching praxis, conceptualized as a process of reflecting on one's own practice, whose realization is indispensable to the educator's role, who seeks to turn the students into active subjects in the process of teaching and learning. Thus, the practice and reflection based on theoretical foundations,

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correspond to the continuous praxis of transformation of the lived reality, in order to face the obstacles of everyday life in education, seeking to reinvent the teaching action, experiences and learning (CALDEIRA, 2013).

Following this line of reasoning, to better defend the proposed arguments and perceptions about issues that can effect the students' learning, we sought to understand the reality of Science Teaching, the training of teachers of the aforementioned area and what their scientific and pedagogical perceptions about the subject they teach through the application of questionnaires to teachers of basic education.

2. Methodological Path

The present research is exploratory and descriptive, with a qualitative approach. It focuses on the investigation of the scientific and pedagogical knowledge of pedagogical teachers, who teach Science to the initial years of elementary school.

The research was carried out in basic education institutions in the Sertões de Crateús, in the following cities: Crateús (13), Independência (3), Ipaporanga (2), Nova Russas (3) and Tamboril (3). These were selected because the students enrolled in the Science Teaching course, who were responsible for collecting the research data, live in these cities, which brought them even closer to the teaching reality, in which they will probably be inserted by the end of the course. The participants investigated were 24 basic education teachers. It is worth mentioning that in most of the cities, with the exception of Crateús, there is only one elementary school, which justifies the number of participants. It is essential to emphasize that the participants did not suffer any physical/mental risk, meeting the postulates of Resolution 510/2016 of the National Health Council (CNS) and to participate they were in agreement with the Free and Informed Consent Form - FICF.

For data collection, the future pedagogues, during the month of August 2019, went to the schools to talk to the teachers and request that they could fill out the questionnaire. This instrument contained ten objective and/or subjective questions, was

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divided into the following three sections: socioformative characterization; perceptions about Science Teaching, as well as training in this field of knowledge, in order to know the personal, academic and professional profile of these subjects.

As support, this research was based and defended through the study of works and analysis of institutional documents, respectively as: Borges (2012), Delizoicov (2011), Nascimento, Fernandes and Mendonça (2010), Lorenzetti (2001), Ghiraldelli (2006), Base Nacional Comum Curricular - BNCC and the Parâmetros Curriculares Nacionais - PCNs, which have rich and clear sources based on data and concepts that need to walk together with the teaching practice as well as guide the objectives to be achieved by the educational environment.

The analysis of the data obtained occurred through content analysis, being performed the description and interpretation of the results, as recommended by Bardin (2011). In order to preserve the identity of these professionals, their information was encrypted, identifying them in the following form: *teacher 1, teacher 2, ..., teacher 24.* The following are the findings of this research.

3. Results and discussion

Once the data for this research was obtained, the information was tabulated and interpreted. As a way to better understand this information, we divided the article into the following three subtopics: academic training for science teaching; context versus everyday life in the classroom; didactic strategies and teaching difficulties.

Academic Training for Science Teaching

The first observations regarding the respondents were related to their academic background. Of the 24 respondents, the following undergraduate degrees were identified: Pedagogy (11), Mathematics (1), Chemistry (2), Languages (1), Biology (8) and Geography (1). Although the predominance of teachers is in Pedagogy, the data are worrisome because of the performance of other areas of knowledge in the initial years of

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elementary education, and the Law of Directives and Bases of Brazilian Education (LDB) and the National Curricular Directives for the Course of Pedagogy indicate the formation of the professional pedagogue to act in these levels of education (BRASIL, 2006).

According to Tardif (2012), teacher professionalization is a complex process, given the scientific and pedagogical peculiarities required in the training of future teachers. In this context, the courses have their specificities to prepare graduates to act in a certain educational level, as well as in other educational spaces. Thus, the preparation of teachers transcends academic aspects and is inserted in personal contexts and professional performance of the subject in training (RESENDE; MESQUITA, 2013)

Pimenta et al. (2017) reflects that teachers of Early Childhood Education and the early years of Primary Education are able to teach the basic subjects: Portuguese Language, Mathematics, History, Geography, and Science. The authors point out that this training implies different knowledge and requires mastery of the various areas of knowledge, which ends up making the training dispersive, superficial, and fragmented.

Still on this reality, it is experienced by undergraduates in Pedagogy, since the training time for the Teaching of Sciences corresponds to only one subject of 4 credits (68 hours) in one semester, time considered minimal in face of the amount of skills, knowledge and abilities that need to be known so that the student in training can, in the future, act as a teacher in a conscious manner, encompassing in his teaching practice fundamental concepts to the teaching and learning of children in search of putting into practice what is seen theoretically, to effect learning in a significant manner. According to Delizoicov (2011, p. 9):

> [...]Teacher education, in most courses, is still closer to the 1970s than to today. [In our understanding, these perspectives cannot be restricted to a specific modality of training, as a prerogative often attributed to continuing education, but should permeate all its dimensions and modalities: initial and continuing, classroom and distance learning, specific to the area and of a more general nature [...]..

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In view of the statements about the process of teacher training for acting in Science Teaching and the considerations made by Delizoicov (2011), it can be considered that although progress has been made in some aspects of higher education, there is still much to be done and thought.

Some teachers, when asked about their training regarding science teaching, reported the absence of the proposal in the curricula, given the training in specific areas, and when it occurs in other courses, the teachers feel the lack of more training processes, as it is possible to verify in the following statements:

> As I graduated in Mathematics, I did not have training focused on science itself (Teacher 1).
>
> It is one of the subjects rarely seen in the pedagogy course, and it should be more studied and worked on in the contents of the University. The course does little to prepare you for the different teachings, it only offers one subject for each teaching and depending on the teacher who will apply it, it might not be well used (Teacher 3).
>
> My academic training was lacking in relation to science content (Teacher 6).
>
> I majored in Geography, but I am always looking for training in Science, in order to be better prepared (Teacher 7).
>
> My education is not specific to science teaching (Professor 14).).

Therefore, the teaching work depends on a link between the individual, social, work, professional experience, interaction and human knowledge interfaces (FREITAS; OLIVEIRA, 2019). Thus, it is noticeable the necessary willingness to invest in continuing education that better prepares them in science teaching. According to Chimentão (2009, p. 3) "The continued training of teachers has been understood as a permanent process of improving the knowledge necessary for professional activity, carried out after the initial training, with the aim of ensuring a better quality education".

In the document text of the BNCC (2017), it is pertinent "the overcoming of radically disciplinary fragmentation of knowledge, the encouragement of its application in real life, the importance of context to give meaning to what is learned and the protagonism of the student in his learning and in the construction of his life project"

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(BRASIL, 2017, p.15). This demonstrates the proposals of the national document for teacher training, with the intent of overcoming difficulties in pedagogical practice. All this reflects with the teachers' actions, which are described below.

Context versus Everyday in the Classroom

When the educators were asked about the relationship between what is learned at school and their daily lives, we obtained positive results regarding the relevance of the contextualization process between content and reality.:

> I always try to take it to their lives, showing how it applies to their lives and their daily lives (Teacher 2).
>
> I always try to work in a contextualized way with my students' way of life, as is the case of working on hygiene, vaccination, and the plants that exist in our semi-arid region (Teacher 4).
>
> Always making this relationship, trying to make this parallel between what the student already has of knowledge and expanding it, always contextualizing it with his day-to-day life (Teacher 7).
>
> There is no construction of knowledge without this relationship between theoretical and practical knowledge (Teacher 10).
>
> [...] the contents worked on give children the opportunity to understand the world and interpret the actions and phenomena that they observe and experience in everyday life (Teacher 18).).

Based on the answers obtained, it is verified how teachers have understood the need to work the school knowledge, within the perspective of contextualization, because it recognizes how learning becomes of quality when it moves towards the reality of life, no longer being something abstract and restricted to mere activities of copies and repetitions of what is present in the textbook.

In an educational document, the BNCC (2017, p. 331) considers that [...] students have experiences, knowledge, interests, and curiosities about the natural and technological world that should be valued and mobilized. This should be the starting point of activities that ensure they build systematized knowledge of science, [...]. This enables

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the insertion of students in various contexts, allowing learning according to their experiences.

Delizoicov (2011, p.48) states that:

> Understanding the symbolic universe in which our students are inserted, what is their first culture, what is their ethnic and religious cultural tradition, to which media they have access, to which groups they belong, can facilitate the learning of Natural Sciences. Allowing their worldview to emerge in the classroom, enabling them to perceive the structural differences, both in procedures and concepts, can facilitate the transition and feedback between the different forms of knowledge available to subjects..

Prudêncio and Guimarães (2017) emphasize the importance of considering the context and reality of students, so that what is learned in school will make sense to them and will arouse interest in learning more, because the knowledge acquired can intervene in their daily lives and will not seem something useless beyond the school walls. Contextualization may also be allied to the process of interdisciplinarity, where the fields of knowledge and the curricular components dialogue (CACHAPUZ, 2014).

However, among the respondents on this same guideline, there are three answers that were surprising when reflecting on several issues that implied these responses obtained, from training to even factors of social conditions that are linked to the teaching pedagogical practice.

> In part, because some content that is necessary in the formation of children cannot be contextualized in the school environment (Teacher 1).
>
> I did not understand (Teacher 11).
>
> I do not make this relationship, because they still do not have this notion, for having been at school for a short time (Teacher 23).).

Relating such answers with the training process that these teachers received, we realize how much this implies in this result, where in one of the cases the fact that the teacher did not understand the contextualization, leads us to believe that the training he received was both precarious as the skills that as an educator is necessary to develop. Thus, it is necessary that teachers understand the importance of the relationship of

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school content with the students' daily lives, so that in their cognitive issues the child grows up understanding that what he or she learns in school is directly linked to reality.

For Lorenzetti (2001, p. 51) "[...] the school [...] should, throughout schooling, provide initiatives for students to know how and where to seek the knowledge they need for their daily lives. [...]". So far, much has been said about the importance and the need for a different perspective of science teaching directed to the contextualization process itself that intends to promote positive effects for meaningful learning. However, we are led to reflect on ways to work this process within different didactic strategies that make the classes more conducive to student participation and that can allow them to act in the construction of knowledge in an active way. This reality has been reflected in the next subtopic.

Didactic Strategies and Teaching Difficulties

Regarding the strategies used in classroom activities, the teachers responded and exemplified several teaching methodologies related to the pedagogical practices of teachers, as can be seen below:

> Through science fairs with presentation of experiments films to address issues of everyday life and slides (Teacher 11).
>
> Exposure of practical classes with simple substances used at home; practice in another school's laboratory, slide of the content and dynamics about what is studied (Teacher 12).
>
> Providing opportunities for them to do investigations in class; proposing to solve problems, search for information in books and other sources, and share discoveries (Teacher 14).
>
> Research; compare; test; record and analyze data and share; arguments and point of view (Teacher 17).
>
> To achieve my goals, I make my classes more dynamic and attractive, so that the student realizes the moment he or she is learning and experiencing something new, and I employ playful activities that serve both for fun and learning (Professor 18).

It can be seen in the teachers' answers that they are aware of how essential is the use of strategies for presentation of school content and better exploration. According

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to Nascimento, Fernandes and Mendonça (2010, p. 69), the school should, therefore, promote situations in which the student is forced to think and not repeat [...]. In this context, there is the realization of methodological practices that facilitate student learning.

The different strategies act as indispensable agents in the teaching and learning process of children; they guarantee a diversity of attractive and instigating classes that attract the students' interest, leading them to actually get involved in the learning process. The strategies go beyond the traditional pedagogical currents in which many of us were inserted, in which teaching is nothing more than the mere reproduction of the educator's and textbook's educational demands. Nascimento, Fernandes, and Mendonça (2010, p. 64) state that:

> [...]School science" by emphasizing illustration, verification, and memorization of a perfectly established and non-controversial body of knowledge, presents science as an objective process, value-free, leading to absolute, unquestionable truths, through rigorous observation of regularities in phenomena and the establishment of generalizations.

Based on these issues, it is understood that the strategies, besides being a support to the teaching action, lead the students to recognize what they are taught in school, understanding that the contents can be questioned, verified and significant and not merely as an absolute knowledge that should only be repeated.

Therefore, the teaching practices mentioned above are strategies of utmost importance for classes to become innovative and more dynamic, instead of being monotonous and uninteresting to the student and even to the educator for not feeling motivation when performing mechanical practices, as also stated by Arruda and Siqueira (2021). The strategies that help in discussions about science, Nascimento, Fernandes and Mendonça (2010, p. 64) state that:

> [...] it becomes necessary that the school sees the movies, cartoons and news broadcasted by the media as an opportunity to explore the science contents involved, to reflect on the science-technology-society interactions [...].

However, although it is clearly evident that teachers recognize and make use of teaching strategies, it is known that in some cases there is difficulty in putting them into

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practice. The teachers, when asked about the difficulties in relation to content related to science concepts and the development of teaching strategies, were willing to say:

> Lack of specific training in the area; lack of technological apparatus to make the classes dynamic and enjoyable (Teacher 1).
>
> Some difficulties in the preparation of the plan, always trying to bring strategies that contemplate the heterogeneity of the class, about the content [...] (Teacher 7).
>
> Lack of material at school; sometimes it is difficult to execute these strategies for lack of materials (Teacher 8).
>
> Many times the contents of the curriculum in the textbooks are disarticulated from the reality of the learner and the teacher (Teacher 10).
>
> At the school where I work we have no science laboratory or materials to develop laboratory and/or practical classes, which makes abstract concepts difficult for students to associate. [...] In the use of videos, the main difficulty is that at school we have only one project, which limits its use [...]. In educational games, despite the lack of resources at school, I try to develop simple games that do not demand many costs (Teacher 15).

Among the teachers' statements, the pertinence of the lack of material to carry out teaching strategies are the most frequent, which leads us to reflect on the need for technological investments among other materials that enable greater understanding and exploration of knowledge in school to get out of the abstract patterns of textbooks, which often do not include the sociocultural dimension of the reality of life of students and contextualizing predominantly certain regions.

4. Final considerations

This article sought to analyze the way Science Teaching has been worked in the classroom, taking as basis the formation of teachers for Science Teaching in the Early Years of Primary Education, strategies to address the school content base in order to arouse the interest of students in becoming agents builders of scientific knowledge and the difficulties faced for the effectiveness of Science Teaching in order to highlight the relevance for the humanistic training of critical citizens.

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However, there is a need for actions aimed at the development of Science Teaching in order to improve the quality of this area and to break free from the constraints of the Textbook. It is important to recognize its relevance, however, it is necessary to bring to the classroom new proposals to work with scientific knowledge. Thus, science classes tied merely to the textbook end up leading to a dichotomy between science and other fields of knowledge. It is necessary to use new ways to propose challenging situations to students, so that science education does not simply refer to the transmission of knowledge.

It is therefore important that science teachers have a critical conscience and are able to hypothesize about current issues of collective interest, about political, economic, social and cultural aspects, and also about technological advances.

However, an intriguing fact to emphasize is the lack of preparation of some teachers to work in Science Teaching, where many for lack of preparation, including the reduced workload in graduation, or even with training directed to other areas and not to this specific area, for lack of indispensable knowledge and that are addressed mainly in the training of those who are dedicated to teaching in Basic Education as in the case of pedagogue.

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