

## Brazilian Biomes in the light of the National Common Core Curriculum

### ARTICLE

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### Abstract

The theme “Brazilian biomes” was analyzed in the National Common Curricular Base (BNCC) in this research in order to verify the presence of the word Ecosystem in the current guiding educational document in force, highlighting the fragments of the texts, in order to problematize issues of the importance of the work of environmental preservation in basic education. It was observed that the subjects with greater affinity in the curricular component of Science, mainly for the second cycle of Elementary Education (EF). In High School (EM) the theme is not addressed, although the BNCC brings the need to train students with a keener scientific view of regional ecosystems. The theme is isolated for Science Teaching and without projection for EM. It is considered necessary for schools to discuss and increase their curricula with this topic, bringing the importance of local ecosystems. In this context, the support of universities becomes indispensable, whether in the production of didactic-scientific material, in the initial and continued training of teachers in order to contribute with educational strategies for the expansion of the theme and, mainly, for citizens to have knowledge and feel themselves belong to the environment in which they live.

**Keywords:** Educational guidance documents. Local ecosystems. Science Teaching. Environment.

### Os Biomas Brasileiros à luz da Base Nacional Comum Curricular

### Resumo

A temática “biomas brasileiros” foi analisada na Base Nacional Comum Curricular (BNCC) nesta pesquisa a fim de verificar a presença da palavra Ecossistema no

atual documento educacional orientador em vigência, destacando os fragmentos dos textos, a fim de problematizar questões da importância do trabalho de preservação ambiental na educação básica. Observou-se que os assuntos com maior afinidade no componente curricular de Ciências, principalmente para o segundo ciclo do Ensino Fundamental (EF). No Ensino Médio (EM), a temática não é abordada, embora a BNCC traga a necessidade da formação de estudantes com uma visão científica mais aguçada sobre os ecossistemas regionais. A temática está isolada para o Ensino de Ciências e sem projeção para o EM. Considera-se, necessário que as escolas discutam e incrementem seus currículos com esse tópico, trazendo a importância dos ecossistemas locais. Nesse contexto, o apoio das universidades torna-se indispensável, seja na produção de material didático-científico, na formação inicial e continuada de professores a fim de contribuir com estratégias educacionais para a expansão do tema e, principalmente, para que os cidadãos tenham conhecimento e sintam-se pertencidos ao meio ambiente em que vivem.

**Palavras-chave:** Documentos orientadores. Ecossistemas locais. Ensino de Ciências. Meio ambiente.

## 1 Introduction

Ecosystems, in general, are of incalculable importance for maintaining the vital processes of large regions and, consequently, for humanity. It would be no different when mentioning Brazilian ecosystems, which are considered extremely necessary for the planet.

In pandemic times, followed by considerable events on the national scene, including the notable degradation of ecosystems such as deforestation, fires and various other problems that are reported every day, there are many concerns about the reasons for this scenario. Some hypotheses have been raised about the causes of this degradation: government negligence, neglect by the population and lack of information on the subject. This raises the question of how education can help in this scenario.

First of all, we need to understand that the concept of ecosystem is:

an integrated set of physical, ecological and biotic factors that characterize a given place, extending over a space of varying dimensions. It is an integrated and systemic totality, involving abiotic and biotic factors, in their functionality and metabolic processes (ACIESP, 1997, p. 86).

When trying to understand the subject, other concepts emerge, such as the biome, which could be defined as the set of ecosystems that can characterize a geographical area. More specifically, the Brazilian Institute of Geography and Statistics (IBGE, 2004) defines a biome as a set of life (plant and animal) made up of a group of contiguous vegetation types that can be identified on a regional scale, with similar geoclimatic conditions and a shared history of change, which results in its own biological diversity.

Looking at Brazil's territorial dimension, one can see the presence of many different vegetation formations. All this diversity of biomes is due to the types of soils and reliefs that consequently have an impact on the richness of plant and animal species, giving rise to varied phytophysionomies (COUTINHO, 2006). This reflects the importance of increasingly studying ecosystems, especially those in Brazil, since it is a highly diverse country and it is important for students to know the environment to which they belong.

Brazil has an area of approximately 8.5 million square kilometers, with a diverse composition of soil types and climate that have repercussions on the wide and varied formation of vegetation, being so diverse that there are several ecosystem formations making up different biomes. Currently, six biomes with distinct characteristics are recognized: Amazon, Caatinga, Cerrado, Atlantic Forest, Pantanal and Pampa (IBGE, 2004).

Certainly, there are different ways of interpreting and positioning oneself on this broad topic, which varies according to the areas of training and action of the subjects in society, as well as according to their conceptions of science, technology, nature, the environment, politics and development (CANDIOTTO, 2013). Santos, Lahm and Borges (2009) also point out that knowledge of the subject of ecosystems is fundamental for promoting environmental awareness in basic education.

Along these lines, Landim, Diniz and Santana (2017) report that science teaching is fundamental for students to be able to understand the world around them and, based on this knowledge base, it helps to develop skills so that students can give informed and critical opinions inside and outside the school environment.

The authors also point out that for this to become a reality in schools, there is a need for a real adaptation of the curriculum to the local contexts in which the educational process takes place (LANDIM; DINIZ; SANTANA, 2017). Once students have worked interactively and dialogically on the characteristics of ecosystems, they feel part of the environment, resulting in greater closeness and awareness of caring for the ecosystem to which they belong.

Until 2017, the development of themes and content in Basic Education was directly based on the National Curriculum Parameters (PCN) published in 1997 to guide educators in planning, organizing teaching practices and restructuring knowledge aimed at training students to exercise citizenship. In this sense, the PCN reflect transformations in the Brazilian educational scenario, considered to be "[...] a catalyst for action in the search for an improvement in the quality of Brazilian education [...]" (BRASIL, 1997, p. 13).

When the word ecosystem is mentioned in the PCN, it is presented in the form of specific content, i.e. "comparison of different environments in Brazilian ecosystems in terms of vegetation and fauna, their interrelationships and interactions with the soil, climate, availability of light and water and with human societies" (BRASIL, 1998a, p. 72.).

This objective portrays the need for a relationship between man and nature and, consequently, the necessary understanding of human actions, so much so that another objective describes the need to develop students' ability to "value life in its diversity and the conservation of environments" (BRASIL, 1998b, p. 61). To this end, the development of students' skills in relation to this subject highlights the need to understand the environment and "particularly Brazilian ecosystems".

In this way, it is possible for students to develop closer relationships between the environment in which they live and its importance, representing the ability to be able to "interpret situations of environmental balance and imbalance by relating information about human interference and the dynamics of food chains" (BRASIL, 1998b, p. 61).

Currently, the guiding document for teachers' work is the National Common Core Curriculum (BNCC), which aims for students to develop scientific literacy throughout elementary school so that they can have "the ability to understand and interpret the world

(natural, social and technological), but also to transform it based on the theoretical and procedural contributions of the sciences" (BRASIL, 2017, p. 319).

According to Sabóia and Barbosa (2020, p. 4):

We need to reflect on what to teach, what has been required of students and how the content has been taught. The discussion on the BNCC allows educators to meet the common base without denying the diversity of Brazilians. Contemplating the content programmed since the PCNs and now in the BNCC for Early Childhood Education and Primary Education, with its organized contributions, is a responsibility of those in the classroom and those who study and plan public policies.

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The quote reflects a relationship between teaching in the light of the discussion of content that permeates the guiding documents and pedagogical effectiveness in the school setting. The existence of a guiding document at national level was essential for the dissemination of new documents at state and municipal levels, because in the past, education was affected by the alternation of governments, reflecting on didactic pedagogical planning.

The BNCC serves as a benchmark for building and adapting the curricula of all the country's education networks. Networks and schools continue to have the autonomy to develop teaching methodologies, pedagogical approaches and assessments through the curriculum, including elements of local diversity and pointing out how themes and subjects relate to each other. The BNCC and the curriculum therefore have complementary roles: the BNCC sets the direction for education, showing where we want to go, while the curriculum traces the paths (CURY; REIS; ZANARDI 2018, p. 65).

With regard to the ecosystem theme, the BNCC states that ecosystems should be studied emphasizing their characteristics, highlighting:

[...] the interactions of living beings with other living beings and with the non-living factors of the environment, with emphasis on the interactions that human beings establish among themselves and with other living beings and non-living elements of the environment (BRASIL, 2017, p. 326).

In this context, this study sought to verify the presence of the word ecosystem in the current guiding educational document, the BNCC, highlighting fragments of the texts, in order to problematize issues of the importance of environmental preservation work in basic education.

## 2 Methodology

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This research is qualitative in nature and was carried out by means of an exploratory documentary analysis, in which, according to Severino (2016), the contents of the texts of legal documents have not yet had any analytical treatment; they are still raw material. In this research, we first looked for the presence of the word "Biome", but the document does not include the word and, secondly, we identified the presence (or absence) of the word "Ecosystems" and the related keywords: Regional Ecosystems, Nature, Natural, Environment, Environmental, Environment and Biodiversity in the BNCC for Primary Education (PE) and Secondary Education (MS).

It is important to note that this article is part of the result of a bibliographical survey for the doctoral thesis of the Postgraduate Program in Science Education: Chemistry of Life and Health, which integrates the study for the training of teachers to work with the ecosystem theme in the classroom.

With regard to the research, in order to verify the theme of Ecosystems in the BNCC, the broadest word was used: "ecosystems" and the methodological contribution was content analysis, where, based on the word with the greatest breadth, several others with greater proximity were interconnected. Therefore, the presence of each word was quantified and its relationship with the context was verified to highlight units of records related to the topic in Basic Education (BARDIN, 2011).

In the second step, the words with the greatest relation to the object of study were checked, following the research by Burchard et al. (2020), in order to analyze the incidence of descriptors in the BNCC and check the words with a direct relation to the topic of ecosystems, such as: Brazilian Ecosystems, Regional Ecosystems, Nature, Natural, Environment, Environmental, Natural Environment, Environment, Biodiversity, biological, Biological Diversity and Ecology. To help with the analysis, the records were added to a table containing the quantification, pagination, reference unit and what was being mentioned.

After constructing the framework, the context in which the words were inserted was analyzed and the feasibility of the teacher's work in the classroom with the students was verified. Since the BNCC is a

[...] a guiding document for planning and organizing the curriculum of Brazilian schools, indicating basic knowledge for students. This is because one of the aims of this document is to develop minimum skills so that students can act in society in a critical-reflective manner (BRASIL, 2017 p. 319).

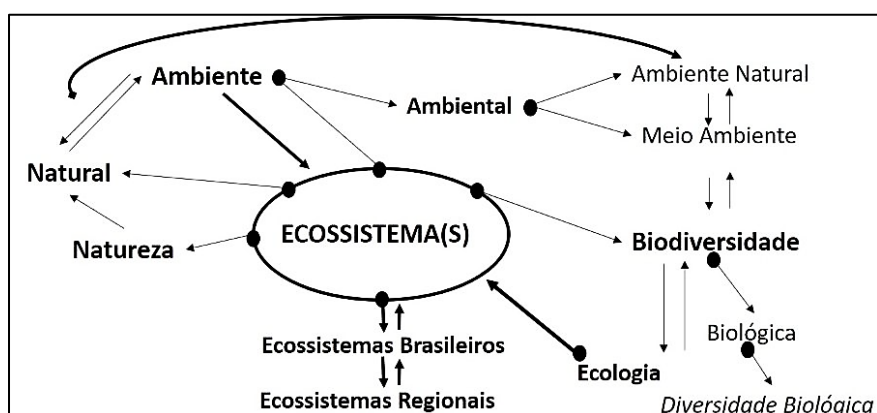
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Based on this reflection, the results were discussed and analyzed in a reflective manner, bringing together the potential of the themes in question with the viability of teaching activities the classroom.

### 3 Results and Discussion

In order to identify and facilitate the research described here, a scheme was constructed with the descriptors (Figure 1). Throughout the BNCC, the descriptors related to the word "Ecosystem(s)" were: Brazilian Ecosystems, Regional Ecosystems, Nature, Natural, Environment, Environmental, Natural Environment, Environment, Biodiversity, Biological, Biological Diversity and Ecology..

Figure 1 - Diagram of descriptors related to the theme Ecosystems throughout the BNCC

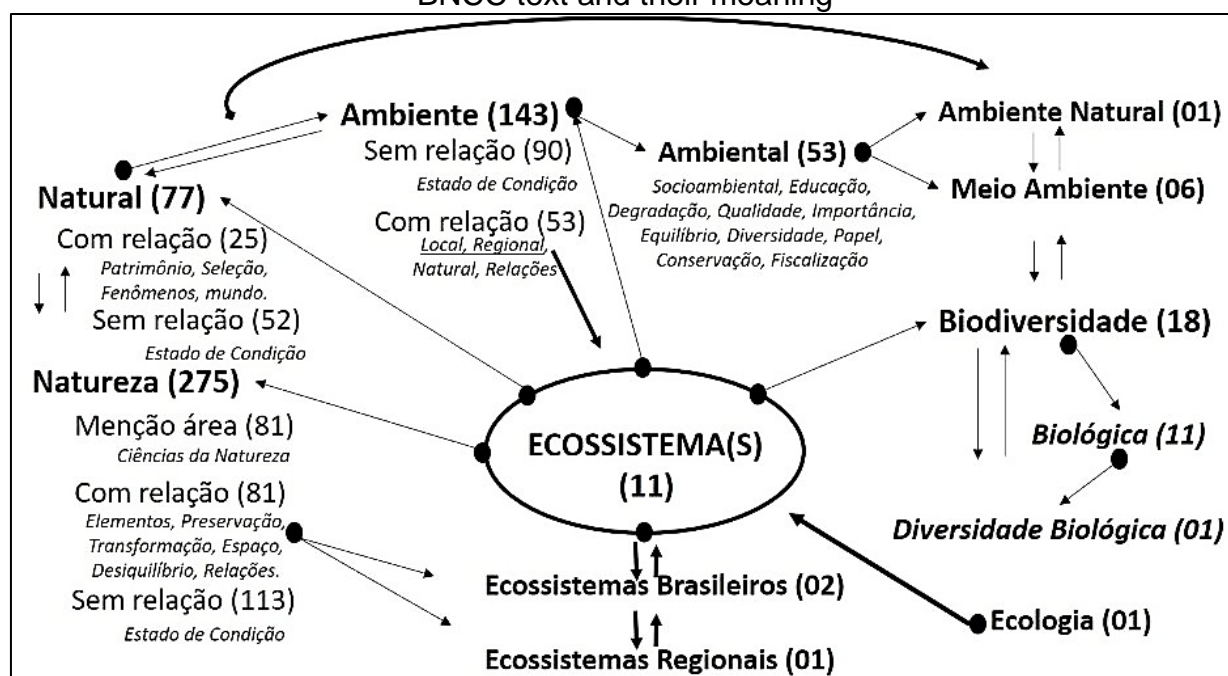


Source: The authors (2023).

<sup>1</sup> It has not been possible to translate the image in order to preserve the excerpt from the original work.

The theme of ecosystems was found to have 10 repetitions and the related descriptors were: Nature, with 275 repetitions, of which 113 were unrelated, 81 mentioned the area (Natural Sciences) and were related to the theme; Natural, with 77 repetitions and, of these, only 25 were related; Environment, with 143 repetitions and only 53 were related, such as the word Environmental, with 53 repetitions, and of these, Natural environment appeared 1 time, and Environment, 6 times; also, the word biodiversity is related 18 times with derivations, the word Biological 11 times, and Biological Diversity 1 time, and Brazilian and Regional Ecosystems 2 and 1 times respectively. To make it easier to organize the presence of descriptors related to the Ecosystem theme with the number of times they appear in the text and also their meaning, figure 2 is the union of these results.

Figure 2 - Diagram of the incidence of descriptors, the number of times they appear in the BNCC text and their meaning



Source: The authors (2023).

<sup>2</sup> It has not been possible to translate the image in order to preserve the excerpt from the original work.



However, although it seems that there are many descriptors related to the theme of ecosystems in the BNCC, it should be noted that only Brazilian Ecosystems, Local Ecosystems and Environment mentions for local and regional natural environments are directly related to the theme, the others are indirectly related.

The word Ecosystem(s) is mentioned 11 times in the document, 5 times for EY 1, 4 times for EY 2 and 2 times for MS. On the other hand, Brazilian Ecosystems was mentioned 2 times, once for FS1 and once for FS2; Regional Ecosystems once for FS2 and the word Ecology appears only once for the MS, as shown in Table 1 below.

Table 1 - Incidence of descriptors, with number of repetitions throughout the BNCC related to the Basic Education Stage and their respective pages in the document

Words	Repetitions	Pages			
		EI	EF1	EF2	EM
Ecosystems	11	X	325,326,326,329,339	341,346,347,347	556,557
Ecosystems	02	x	339	347	
Brazilian Ecosystems	02	x	326	347	
Regional Ecosystems	01	x		341	
Ecology	01	x			477

Caption: EI (early childhood education), EF1 (elementary school 1), EF2 (elementary school 2), EM (high school) Source: The authors (2021).

It is worth noting that when searching the document via a web browser, it reports that the word appears 16 times, but when the document is analyzed in a computer reading program, there are only 11 repetitions of the word ecosystems related to the area of Natural Sciences, and it is not mentioned in the other areas of knowledge.

In order to develop students' skills and abilities, the BNCC provides an alternative to the investigative process, which should be understood as:

[...] a central element in the education of students, in a broader sense, and whose development must be linked to didactic situations planned throughout basic education, in order to enable students to revisit their knowledge and understanding of the world in which they live in a reflexive way (BRASIL, 2017, p. 320).

Therefore, science teaching should promote situations in which students can:

[...] observing the world around them and asking questions; planning and carrying out field activities (experiments, observations, reading, visits, virtual environments,

etc.); complementing solutions and evaluating their effectiveness to solve everyday problems; developing intervention actions to improve the quality of individual, collective and socio-environmental life (BRASIL, 2017, p. 320).

In the early grades, along with the matter and energy unit, children should have their skills stimulated to recognize the importance of natural elements such as water and relate them to other elements in order to understand the need for ecosystem balance (BRASIL, 2017).

They also propose studying the characteristics of ecosystems, highlighting:

[...] the interactions of living beings with other living beings and with non-living factors in the environment, with emphasis on the interactions that human beings establish between themselves and with other living beings and non-living elements in the environment. It also addresses the importance of preserving biodiversity and how it is distributed in the main Brazilian ecosystems (BRASIL, 2017, p. 326).

Similarly, understanding what sustainability is presupposes that students, in addition to understanding the importance of biodiversity for maintaining ecosystems and the dynamic socio-environmental balance, are able to: "[...] evaluate consumption habits that involve natural and artificial resources and identify relationships between atmospheric, geological, celestial and social processes with the conditions necessary to maintain life on the planet" (BRASIL, 2017, p. 329).

In this way, the BNCC points to the need to understand ecosystems and, above all, to develop skills in which students can relate all the components and thus interpret them. In this way, an interaction is provided between the world in which the child lives, making them understand that they are part of this environment.

For example, in the Matter and Energy unit for 4th grade, students should "describe and highlight similarities and differences between the cycle of matter and the flow of energy between the living and non-living components of an ecosystem" (BRASIL, 2017, p. 339).

In 5th grade, still in the Matter and Energy unit, students need to:

Apply knowledge about changes in the physical state of water to explain the hydrological cycle and analyze its implications for agriculture, climate, electricity generation, drinking water supply and the balance of regional (or local) ecosystems (BRASIL, 2017, p. 341).

In the 7th year of elementary school, in the Life and Evolution unit, students will need to:

Characterize the main Brazilian ecosystems in terms of landscape, amount of water, type of soil, availability of sunlight, temperature, etc., correlating these characteristics to specific flora and fauna (BRASIL, 2017, p. 347).

In addition to:

Evaluate how the impacts caused by natural disasters or changes in the physical, biological or social components of an ecosystem affect its populations, potentially threatening or causing the extinction of species, changes in habits, migration, etc.).

The BNCC provides the same information, but in a reduced form, so much so that the word biome does not appear in the document. Brazilian Ecosystems are mentioned only twice and Regional Ecosystems only once, with an emphasis only on Primary Education, while it is absent from Primary Education. The word Ecology, on the other hand, only appears in the MS. In contrast, the guiding document prior to the BNCC, the PCN, not only mentions the need to understand ecosystems, but also indicates ways in which they can be approached, always focusing on the interaction between students and the environment in which they live throughout the basic education process (BRASIL, 1999b).

This is why Brazilian Ecosystems need to be addressed in Basic Education in order to help build students' knowledge and promote a critical and reflective attitude towards environmental issues, as the PCN and BNCC point out.

Along these lines, the PCN and the BNCC guide educators to develop local actions that are related to the reality in which the students are inserted and indicate problematization as an alternative for developing learners' critical sense. This is due to the fact that, in addition to bringing students closer to the content and their own reality, it will enable them to visualize real problems that are close to them and, as a consequence, to look for alternatives to solve the problems listed.

Considering that the PCN indicate that the study of Brazilian Ecosystems should begin in the Early Years (1st to 5th grade) and be developed in the Late Years (6th to 8th grade) and deepened in the Middle School, Castro, Carvalho and Pessano (2019), when investigating the perceptions of students in the Middle School about the biome of origin, in this case, the Pampa, diagnosed that the understanding was very fragmented. In line with

this, Souza, Dinardi and Pereira (2020), when researching the understandings of FS students in the same biome, indicated problems in the teaching-learning process. Corroborating this, Pinto et al. (2020) observed that kindergarten children had broad and distorted perceptions of the Pampa biome.

In addition, Paris et al. (2016) reported that primary school students in the north of the state of Rio Grande do Sul had a generic and superficial perception of the Pampa. Souza and Silva (2017) also found that students from the Caatinga associated the biome with abiotic factors, with a tendency to perceive biodiversity less. Machado and Abílio (2016), in turn, observed that educators had a simplistic and naturalistic view of addressing environmental issues in the Caatinga biome and preferred to maintain the traditional format and avoided approaches that required a theoretical basis.

Furthermore, Santos et al. (2016), when studying the environmental perception of teachers in the same biome, identified their difficulty in contextualizing teaching with the regionalized environment. Machado and Abílio (2016), on the other hand, pointed out that educators were aware of the problems of the Caatinga and that the problem of developing the themes was only related to the effectiveness of the actions, due to excessive workloads, as well as the lack of didactic and paradidactic materials contextualized with the biome.

In the meantime, some concerns have arisen in relation to the theme presented. Although the PCN are not mandatory guiding documents, they suggest many possibilities for activities related to the environment and, among them, ecosystems. However, many authors infer that Brazilian ecosystems are not perceived by students and educators..

Corroborating this, the distance between the subject taught and the student's reality means that they don't understand what they are studying (KRASILCHIK, 2000). Consequently, there will be no relationship between the student and the environment in which they live, reflecting on the construction of their identity in relation to belonging to their region, nor the development of an awareness of their actions.

However, the BNCC has reduced the need to address Brazilian ecosystems, limiting it to the second cycle of primary school, where these effects will probably already be seen in primary school science textbooks and, above all, in secondary school textbooks.

According to Mariani Júnior (2008), the same objectives as those in primary school need to be covered in secondary school, so that there is continuity in the content and in the individual's education. As for ecology, the author points out that:

The study of ecology in high school has been the subject of much discussion among educators and researchers, covering its various aspects, given the relevance of the subject in raising people's awareness of the need to recover areas that have already been impacted by man, as well as the sustainable management of areas that can, in some way, continue to be exploited for economic growth (MARIANI JÚNIOR, 2008, p. 14).

The same author also emphasizes the importance of teaching ecology by stating that: "[...] it is a way of preparing the new generations to take on the 'defense of the planet', in understanding the relationships of dependencies between living beings and the environment" (MARIANI JÚNIOR, 2008, p. 14).

Until then, authors such as Pessano et al. (2015), Paris et al. (2016), Machado and Abílio (2016), Santos et al. (2016), Castro, Carvalho and Pessano (2019), Pinto et al. (2020), Souza, Dinardi and Pereira (2020) indicated that studies on local ecosystems are not being adequately addressed in basic education and bring up the need to contextualize the content and, furthermore, Pessano et al. (2015) point out alternatives in relation to teacher training.

It should be noted that teachers' training implies establishing a relationship with the specific knowledge acquired in initial training associated with the repertoire of knowledge from continuing training acquired during their teaching career (RIBEIRO, 2022)

However, it should be noted that teacher training on environmental issues needs to be focused and study the reality in which the teachers find themselves. One suggestion is training spaces with an exchange of experiences, so that they can plan actions aimed at the community in an effective way.

However, the need for continuing teacher training must be considered, but the BNCC goes against the grain of the whole process previously established, since improving knowledge of the local natural environment can lead to solid and transformative actions in relation to environmental conservation, which can start with the region in which the learners live.

On this path, all that remains is cross-curricular work, i.e. Environmental Education, which, according to Abílio (2010), can stimulate values that are currently being lost by drawing attention to the local situation, such as knowledge of local species and, consequently, their appreciation.

School is one of the places, if not the only place, that can provoke and stimulate learning, where educators and learners end up rebuilding between science and society. For this reason, "formal" training spaces are strategic in the construction of knowledge, in the training of learners with the development of their skills and with their training in collective and transformative actions (BRASIL, 1996, 1998b).

Society has different ways of reacting to actions on the environment, which means that, depending on the culture of that society, there will be different perceptions in relation to the place where one lives and the interrelationship between human beings and the environment (FERNANDES et al., 2004).

Teixeira et al. (2016) state that it is necessary to know how individuals perceive the environment in which they live, their sources of contentment and discontent are of fundamental importance. In this way, "formal" educational spaces, in the light of their guiding documents, together with students' perceptions of pedagogical activities, can build collective and transformative actions.

It is also worth noting that the theme of "Brazilian Ecosystems" in the BNCC is not very expressive and this is related to the fact that the document includes other totally related themes such as ecology and environmental education. The former, in addition to being an extremely important topic for basic education (MARIANI JÚNIOR, 2008) and one that encompasses the theme researched here, is only mentioned once in the BNCC and environmental education, throughout the document, is only mentioned to indicate the National Environmental Education Policy (BRASIL, 1999a).

These results are in line with Candiotto's (2016) report on the problems of the degradation of Brazilian ecosystems and indicate that these problems are totally related to the political dimensions of the use of natural resources. Even though the BNCC indicates the need to address local ecosystems in PE, this theme is little discussed and related in

the document, corroborating the indications of Leite and Ritter (2017), who, when analyzing the representations of science in the BNCC, reported that the document is very simplistic.

## 4 Final considerations

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The aim of this work was to verify the presence of the word Ecosystem in the current guiding educational document, the BNCC, which can be inferred that the theme is confined to the Science curriculum component, with no use of the term or concept in other curriculum components, which can hinder interdisciplinary work in the school environment.

The subject is presented in a discontinuous way throughout the FS and is absent from the MS, with no indication of a possible interdisciplinary approach or at least a connection with Environmental Education, which is only mentioned in the document in relation to the National Environmental Education Policy (BRASIL, 1999a).

Another relevant factor is that if we consider the external assessments for secondary education, such as the National Secondary Education Exam (ENEM), which contains several questions that touch on knowledge of ecology and ecosystems, it would cause a learning deficit if teachers followed the BNCC faithfully.

Finally, there is a weakness in the document analyzed when it comes to interdisciplinary and contextualized work in teaching practice, since it mentions the study of regional ecosystems, for example. However, it is suggested at the end of this research that teacher training on the subject would make it possible to include these themes in the school environment, since there is apparently autonomy in the document when it comes to a curriculum base for the whole country.

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