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SOILS AND DESERTIFICATION IN CURRICULAR PARAMETERS, BNCC AND TEXTBOOKS: CHALLENGES TO TEACHING PRACTICE

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ABSTRACT

In the last few years, the theme linked to desertification and directed to soil degradation has gained notoriety, but there are gaps regarding the presence of this problem in didactic materials and educational curricula. Assessing and including desertification and the role of soil degradation in teaching materials is not an easy task. In this context, this article aims to analyze how the curricular parameters and textbooks of the educational areas of basic education in Geography, Science and Biology address the relationship between soils and desertification, having as a research focus the schools of municipalities in the Mesoregion of the Sertão do São Francisco, semi-arid in the states of Pernambuco and Bahia. The study was developed through the analysis of 34 textbooks, worked on in the aforementioned schools between the years 2018 and 2024, with the following evaluation criteria: approach to the study theme; incentives for propositions of activities and resources used in the communication of the theme between the author and the teacher. The National Curriculum Parameters, the curricula of the states of Bahia and Pernambuco and the National Common Curricular Base (BNCC) were also analyzed. The aim was to analyze how the theme soils and desertification are presented and fostered to be developed in Elementary School, Final Years and High School. Despite being a theme in evidence today, there are gaps regarding the inclusion of the relationship between desertification and soils in textbooks. A relationship found in only two books, one directed to the teaching of Geography and the other to Biology. As for the national curriculum parameters and the state curricula and the BNCC, the theme under study is stimulated, sometimes directly, sometimes indirectly. However, it was not reciprocated in textbooks. From the results raised, teachers need complementary materials to assist the textbook and thus develop their classes that involve the relationship between soils and desertification, because in

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addition to conceptual mistakes, most of the materials did not present the key theme of this article.

Keywords: Pedagogical Praxis. Degradation of Drylands. Curriculum.

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INTRODUCTION

The soil is currently gaining dimensions never thought of in recent decades. This comes from the need to preserve and/or conserve this essential resource for human survival (FAO, 2015), and in the maintenance of various systems - natural physical (Given, 2018). Soils are resources that do not renew themselves, and it is necessary to have a different look for constant monitoring in order to prevent degradation and promote their sustainable use (Orgiazzi *et al*., 2018; Barbosa Neto; Olive tree; Souza, 2018).

Soils are formed through the interactions of physical-natural factors, such as climate, relief, living organisms, time and geological structure, which will compose the source material (Rossiter; Bouma, 2018), that is, resulting from chemical, physical, and biological factors (SSSA, 2023; Jiang *et al.,* 2024).

Inadequate management causes losses and degradation of soils in various parts of the world, especially erosion, contamination, salinization, among other problems (Castro; Saints; Araújo, 2021; Saints; Santos, 2021). The aforementioned impacts, when they occur in dry regions, contribute directly and indirectly to the desertification process (Nascimento, 2023; Castro; Santos, 2020).

Desertification can be defined as the process of land degradation in regions that have a semi-arid, arid or dry sub-humid climate, driven by anthropogenic activities and climate variation (UNCCD, 1994). One of the physical systems that most contribute, when degraded, to the desertification process are soils. In practically all areas susceptible to desertification, or already in an advanced state, soils present some type of degradation, with emphasis on losses due to erosion.

In view of what has been presented above, it is observed the importance given to the relationship between soil and desertification and the need for preservation and/or conservation of the same. In this context, the role of teaching comes in, whether in the formal or informal environment, as long as it is interdisciplinary and interconnected with the reality of each worked/studied environment.

Lima *et al.* (2021), emphasizes that due to its importance, soil should be valued in the school curriculum, in the search to contribute to the formation of students who build knowledge that values soils, as well as work on their preservation. Falcão and Sobrinho (2014) point out that the problem is that, in many cases, the contents developed on soils are worked on in a mechanized way, prioritizing only the memorization of the contents, without a proper depth to overcome the difficulties through contextualization, imagination

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and creativity of the students.

Another problem that should be highlighted is that the textbook is still the only tool used by many teachers in the classroom. It should be added that some of these materials present problems such as content that is far from the students' reality, outdated information, among other problems (Lima *et al.,* 2021; Olive tree; Marques, 2017).

In addition to what was mentioned above, Albuquerque, Silva and Silva (2021), emphasize that although discussions regarding desertification and soil degradation have been an eminent discussion in the last two decades, the teaching materials have gaps in presenting this theme and in many cases, as highlighted by Silva, Novaes and Junior (2009), the teaching materials do not present this theme of socio-environmental interest, especially for the Brazilian semi-arid region.

In view of the presented, two questions were constructed that guided the development of this study, namely: Do the realities portrayed and presented in the previous paragraphs reflect on the didactic materials worked on in the schools of the Mesoregion of the São Francisco Valley, states of Pernambuco and Bahia? How have textbooks addressed, in recent years and currently, the relationship between the theme of soils and desertification?

In this context, this article aims to analyze how the Curriculum Parameters, the educational curricula of the states of Bahia and Pernambuco and the BNCC and the textbooks of the educational areas of Basic Education of Geography, Science and Biology address the relationship between soils and desertification, having as an investigation the schools of the municipalities of the São Francisco Valley Region, semi-arid region of the states of Pernambuco and Bahia. It is worth noting that this article is part of a monitoring project developed on the subject in a school in the region, which completed six years in 2024.

MATERIALS AND METHODS

FIELD OF STUDY

The target schools of this study are located in the Northeast of Brazil, in the states of Pernambuco and Bahia, in the region of the São Francisco Valley, more precisely in the municipalities of Petrolina and Lagoa Grande (Pernambuco) and Juazeiro (Bahia) (Figure 1). Four schools were selected taking into account: acceptance for the development of the research; a mixture of schools located in rural and urban areas and the presence of

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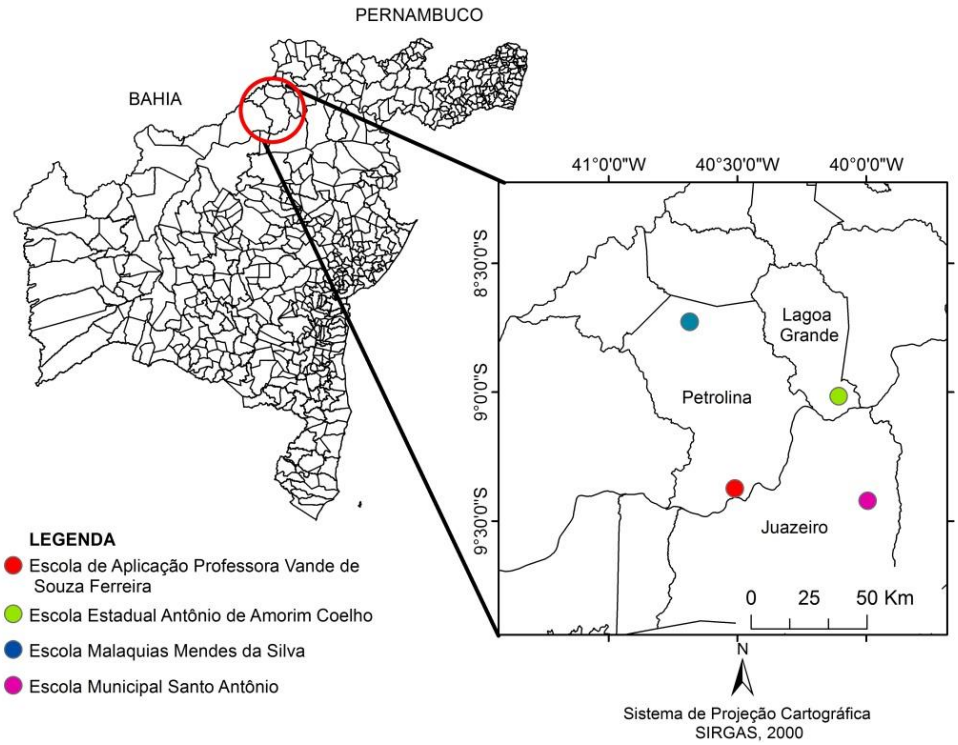
students who live in areas susceptible to desertification related to soil degradation. In this sense, the Vande de Souza Ferreira schools, Antônio de Amorim Coelho State School, Malaquias Mendes da Silva School and Santo Antônio Municipal School were part of the study.

The Professora Vande de Souza Ferreira Application School is located in the city of Petrolina (Pernambuco), Vila Eduardo neighborhood. It currently has 608 students enrolled and 47 professors. It serves the level of Basic Education with stages of elementary years and regular High School. The educational institution has been in operation for 30 years (SIEPE, 2024).

The Antônio de Amorim Coelho State School is located in the city of Lagoa Grande (Pernambuco), in the Chafariz neighborhood. It currently has 769 students enrolled and 69 professors teaching in 2024. The school serves Basic Education students with stages of Elementary, final years and High School. This educational establishment has been founded for 31 years (SIEPE, 2024).

Figure 1: Location of the schools participating in the study



Source: authorship, 2023.

The Malaquias Mendes da Silva School is located in the district of Rajada, in the rural area of Petrolina. It has 554 students enrolled and 42 professors in 2023. The school

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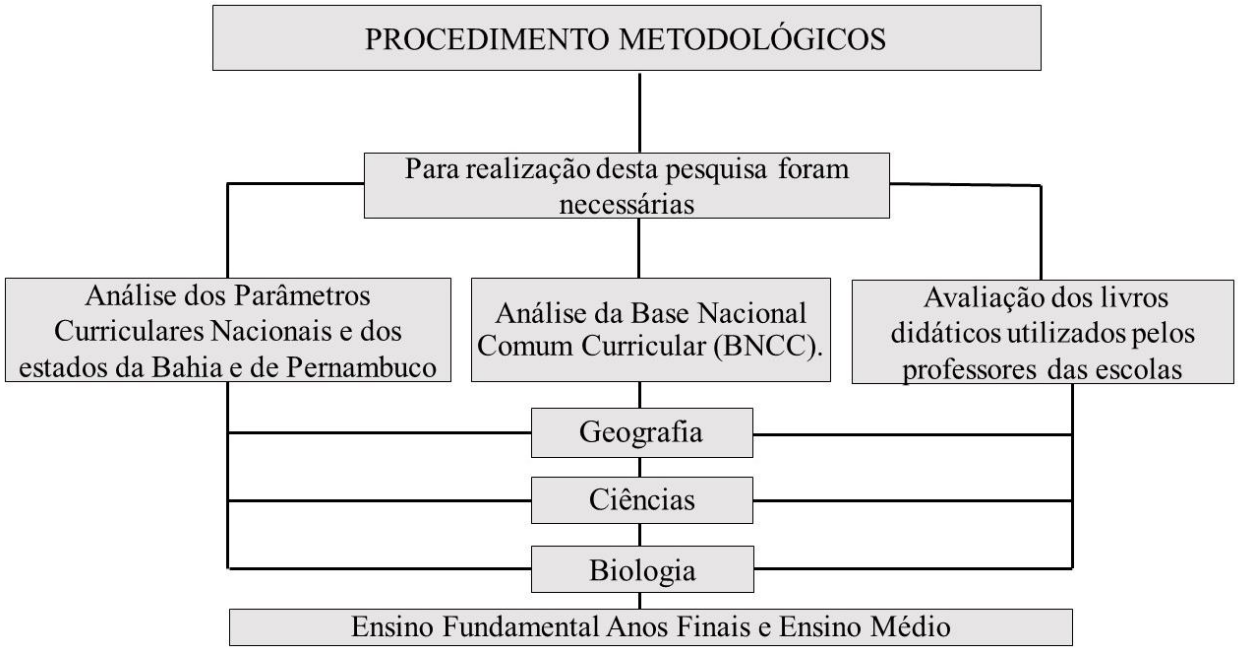
serves Basic Education students (High School) and completed 18 years of activity in 2023 (SIEPE, 2024).

The Santo Antônio Municipal School is located in the rural area of the municipality of Juazeiro (Bahia), in the Curaçá-NH03 Irrigation Project. The educational institution serves the levels of Early Childhood Education, Elementary School initial and final years and Youth and Adult Education (EJA). The school was founded in 1985 and, in 2024, it completed 39 years.

METHODOLOGICAL PROCEDURES

To carry out this research, two stages of work were necessary, namely: evaluation of the textbooks used by the teachers of the schools involved in the last six years and in the second stage analysis of the Curriculum Parameters (PCNs) at the national level and the curricula of the states of Bahia and Pernambuco, of the BNCC (Figure 2).

Figure 2: Methodological framework to achieve the intended goal



Source: authorship, 2024.

The first stage was aimed at the analysis of textbooks, with 34 volumes being identified, both worked on in the schools involved in the study between the years 2018 and 2024. The list, as well as information regarding the educational areas and other specifications of the books, are presented in chart 1.

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The evaluation criteria of the books were adapted from the methodological proposals of Silva, Santos (2018) and Matos, Dantas (2023) emphasizing the: approach to the theme of study; incentives for propositions of activities and resources used in the communication of the theme between the author and the teacher within the thematic relationship soils and desertification and cognitive stimuli directed to the development of the theme under study.

In the second stage, the Curricular Parameters of Geography, Science and Biology at the national level and in the states of Bahia and Pernambuco and the National Common Curricular Base (BNCC) were studied. The aim was to analyze how the theme discussed in this study is presented and fostered to be developed in Elementary School, Final Years and High School.

Only the textbooks that presented the central theme of this article were discussed in the results. Therefore, it was possible to carry out a comparative and qualitative analysis between the collections, highlighting the approaches suggested by the National Curriculum Parameters, BNCC and the state curricula, not being the purpose of classifying the textbooks.

RESULTS AND DISCUSSION

DESERTIFICATION AND SOILS IN THE CURRICULAR PARAMETERS OF EDUCATION, BNCC AND TEXTBOOKS

Elementary school final years in geography and sciences

The National Curriculum Parameters consist of a reference base focused on the quality of Basic Education, providing support for managers, teachers and other entities linked to National Education (Nunes; Azevedo; Silva, 2016). Hence the importance of analyzing and observing its guidelines when using or studying the aspects directed to pedagogical practices, as is intended in this study.

Book - title	Educational area	Level	Year
Being a Protagonist Collection - SM Publisher	Geography	High School 1st year	2016
Being a Protagonist Collection - SM Publisher	Geography	High School 2nd year	2016
Being a Protagonist Collection - SM Publisher	Geography	High School 3rd year	2016
Being a Protagonist Collection - SM Publisher	Applied Humanities and Social Sciences	Middle school	2024
Projeto araribá - modern publishing house	Natural sciences	Elementary School Final Years - 6th Grade	2014

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Projeto araribá - modern publishing house	Natural sciences	Elementary School Final Years - 7th Grade	2014
Araribá Mais Ciências Project - Editora Moderna	Natural sciences	Elementary School Final Years - 6th Grade	2018
Araribá Mais Ciências Project - Editora Moderna	Natural sciences	Elementary School Final Years - 7th Grade	2018
Geographical Expeditions – modern publishing house	Geography	Elementary School Final Years - 6th Grade	2022
Geographical Expeditions – modern publishing house	Geography	Elementary School Final Years - 7th Grade	2022
Geographical Expeditions – modern publishing house	Geography	Elementary School Final Years - 8th Grade	2022
Geographical Expeditions – modern publishing house	Geography	Elementary School Final Years - 9th Grade	2022
Coleção Geografia em rede – editora FTD s.a.	Geography	High School 1st year	2016
Coleção Geografia em rede – editora FTD s.a.	Geography	High School 2nd year	2016
Coleção Geografia em rede – editora FTD s.a.	Geography	High School 3rd year	2016
Geography: readings and interpretation – publisher: LEYA	Geography	High School 1st year	2016
Geography: readings and interpretation – publisher: LEYA	Geography	High School 2nd year	2016
Geography: readings and interpretation – publisher: LEYA	Geography	High School 3rd year	2016
Biology, Unity and Diversity - PUBLISHER: FTD	Biology	High School 1st year	2016
Biology, Unity and Diversity - PUBLISHER: FTD	Biology	High School 2nd year	2016
Biology, Unity and Diversity - PUBLISHER: FTD	Biology	High School 3rd year	2016
Teláris Project – Ática Publishing House	Natural Sciences	Elementary School Final Years - 6th Grade	2015
Teláris Project – Ática Publishing House	Natural Sciences	Elementary School Final Years - 7th Grade	2015
Teláris Project – Ática Publishing House	Natural Sciences	Elementary School Final Years - 8th Grade	2015
Teláris Project – Ática Publishing House	Natural Sciences	Elementary School Final Years - 9th Grade	2015
Collection: Teláris Essencial Ciências - Editora ática	Natural Sciences	Elementary School Final Years - 6th Grade	2022
Collection: Teláris Essencial Ciências - Editora ática	Natural Sciences	Elementary School Final Years - 7th Grade	2022
Collection: Teláris Essencial Ciências - Editora ática	Natural Sciences	Elementary School Final Years - 8th Grade	2022
Collection: Teláris Essencial Ciências - Editora ática	Natural Sciences	Elementary School Final Years - 9th Grade	2022
Being a Protagonist – Publisher: SM	Biology	High School 1st year	2016
Being a Protagonist – Publisher: SM	Biology	High School 2nd year	2016
Being a Protagonist – Publisher: SM	Biology	High School 3rd year	2016
Being a Protagonist – Publisher: SM	Geography	High School 1st year	
Being a Protagonist – Applied Human and Social Sciences	Philosophy, Geography, History and Sociology	Middle school	2022

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In the Curricular Parameters of Geography (Brasil, 1998a) the theme desertification is suggested to be developed between the third and fourth cycles, corresponding to the 6th to the 9th year of Elementary School. Thus, it is mentioned in the axis "The study of nature and its importance for man (third cycle) - item erosion and desertification: death of soils and, in the axis, "Modernization, ways of life and the environmental problem" (Fourth cycle) - item Conservation and degradation of soils (erosion, loss of fertility, desertification, salinization, irrigation).

For the Curricular Parameter of Geography, Elementary Education, of the State of Pernambuco (Pernambuco, 2013a), the theme desertification is not mentioned, and only the soil theme is highlighted, with emphasis to be worked on throughout Elementary School, with a greater focus on learning between the 8th and 9th grades. As well as, in the National Curriculum Parameters of Geography, the state of Pernambuco concentrates studies on soils in the structure of their formation and in the relationship with human activities.

For Geography of Elementary School final years, all four schools in the region worked between the years 2018 and 2023 with the Geographical Expeditions collection, produced in 2015 by the publisher Moderna. As expected, none of the books in the collection, whether old as in the current one, mentions works with the theme of desertification. A problem that shows the dissonance between the curricular parameters and the common curricular base and what is addressed in the book.

For the educational area of Elementary School Sciences, the PCN (Brasil, 1998) of the area does not indicate guidelines for work on desertification. However, the approaches to soils appear in several axes of the parameter, with emphasis on the indicative of studies on soil characteristics in the third cycle, which will be "(...) aimed at understanding its deep integration with the rainfall regime, with the formation of relief and vegetation, and with the consequences of human occupation in Brazilian biomes" (Brasil, 1998, p.63).

At the state level, the Science parameter of the state of Pernambuco (Pernambuco, 2013b), does not present the proposal of work in schools regarding the theme desertification, but the theme soils has similar prominence to the national parameters of Science. The document presents the incentive for the study of soils in the sixth year of Elementary School, focusing on: identification of soil characteristics; differentiation of a clay and sandy soil; relationship between soils and agricultural production and the impacts caused to soils by natural and mainly human factors. For the state of Bahia, no parameters

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were found to guide the Elementary School final years, which cover the years from the 6th to the 9th grade.

It is observed that even though the association between desertification and soils is not clear, the aforementioned relationship can be worked on in the sixth year in the educational component of Sciences, especially when the relationship between forms of land use and soil degradation is associated. This role is up to the teachers.

The Science textbook used in all the schools targeted by this study in the final years of Elementary School is from the collection of the Araribá Project, written in 2015 and its updated version published in 2022, and only the one intended for the 6th grade addresses the relationship between soil and desertification.

In the didactic material, mentioned above, the highlighted theme is the soil presented in Unit 4. Initially, the theme "knowing the soils" is addressed with a focus on their formation, composition and types of soils. Fundamental thematic presentation for students to know the structure and basis of soils. Then, the book presents the uses and main degradations of soils and inserts some essential characteristics to characterize soils such as porosity, color, among others.

After the presentation of the soils, the desertification theme is addressed associated with other themes and, soon after, the importance and contribution that soils present to the desertification process, with emphasis on the contributions of erosion, compaction, contamination, agricultural management, deforestation, among others. As for the suggestion of activities, the material analyzed suggests some such as: field activities; collection of samples for small laboratory analyses and construction of rainwater erosion simulators.

In a study carried out by Albuquerque, Silva and Silva (2021), when analyzing 14 textbooks of basic education in Geography, only 10 presented discussions and approaches on the theme of desertification in their contents, but with conceptual gaps. A situation similar to the material of the Araribá Project in the 2015 and 2022 editions analyzed in the previous paragraphs.

Another document analyzed was the National Common Curriculum Base (BNCC), prepared by the Ministry of Education and Culture (MEC), which is a guiding document for the curricula of all Brazilian Basic Education (Brasil, 2018). In view of this, it is noted that the theme desertification was not found in the curricular proposals of Science and Geography for Elementary School final years.

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However, when carefully checking the curricular components of Geography and Science, it was noticeable to observe, in some thematic units, possibilities of working on discussions involving the relationship between soils and desertification.

In the 6th year, of the educational component of Geography, the thematic unit "connections and scales" were found in the skills that suggest relating "climatic patterns, soil types, relief and plant formations" (Brasil, 2018), possibilities of working on soil formation, as well as inserting discussions about desertification at the local scale from a geographical perspective and most importantly, interdisciplinary.

In the Science curricular component, the theme can be explored in the seventh year of Elementary School final years, in the thematic unit "Life and Evolution" in the characterization skills of the "main Brazilian ecosystems in terms of landscape, amount of water, type of soil, availability of sunlight, temperature" (Brasil, 2018).

High School in Geography and Biology

For High School, the Geography Parameter (Brasil, 2006, p.76) does not elucidate the indications for work involving soils and desertification. However, in several skills the themes can be developed, for example in the skills aimed at:

To verify the interrelation of social and natural processes in the production and organization of geographic space in its various scales; ability to diagnose and interpret the social and environmental problems of contemporary society.

As desertification is defined as the degradation of dry lands resulting from anthropic and sometimes climatic actions, according to UNCCD (1994), the relationship of production and organization of geographic space does not escape the problem of desertification and the contribution that soils can have from their management.

In the state of Pernambuco, the parameters of the area of Geography, High School, indicate that desertification and soils can be worked on in the 1st and 2nd year, with the expectation of learning about the same contents and guidelines for Elementary School (Pernambuco, 2013a).

For the state of Bahia, in the High School Curriculum Parameter (Bahia, 2015), the theme of soil and desertification can be worked on in axis 3, highlighting the discussions between nature, society and technique. The examples mentioned above, for the theme desertification and soils for the National Parameters of Geography of High School also fit into the guidelines of the state of Bahia.

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Based on the parameters listed above, the High School Geography textbooks follow its guidelines. In the two high schools, both use the collection "Being a protagonist" from the publisher SM, written in 2016. In the first year book, the solo theme appears in Unit II. In the aforementioned material, the factors of soil formation, focus on the weathering process, soil horizons, general characteristics, degradation, among other factors, are presented.

Soon after, in the same book, desertification appears. The authors present the concept of desertification, citing examples of/and close to the Brazilian semi-arid region, such as the desertification center in Gilbués, state of Piauí. There is also a presentation of the main agents that contribute to soil degradation and their subsidies to the desertification process, such as erosion and salinization. The material also presents suggestions for theoretical activities that associate soils with desertification. However, with the absence of practical activities.

In 2022, the collection was updated, already with the guidelines of the BNCC, the collection, now called Being a Protagonist – Applied Human and Social Sciences, no longer presents the discussions of the predecessor material.

For High School, in the Curricular Parameters of Biology (Brasil, 2000), no references to soil studies or their relationship with desertification were found. In relation to the PCN of Biology of the state of Pernambuco, it emphasizes the work of interaction between living beings, being oriented to the study of Brazilian environmental problems, including pollution.

Another aspect observed throughout the document, still in the same axis, was the study of land occupation, but without a direct relationship with desertification. For the state of Bahia, the theme is also not directly addressed. In this context, the relationship between soil and desertification can be worked in line with the theme related to Brazilian environmental problems.

Another aspect observed throughout the document, still in the same axis, was the study of land occupation, but without a direct relationship with desertification. For the state of Bahia, the issue is also not directly addressed. In this context, the relationship between soil and desertification can be worked in line with the theme related to Brazilian environmental problems.

In relation to the BNCC document for High School, the study of soils appears in the area intended for Natural Sciences and their technologies, in the skills aimed at analyzing the cycling of chemical elements in soil, water, atmosphere and living beings and

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interpreting the effects of natural phenomena and human interference on these cycles, to promote individual and/or collective actions that minimize harmful consequences to life. Thus, it is observed that the content covered is worked together with soil chemistry. Regarding desertification, the theme was not visualized in the BNCC proposal (Brasil, 2017).

In High School, a reflection made by Lima and Campos (2022) can be properly applied to the results of this study. According to the authors, the theme of soils in textbooks has been approached in a decontextualized way and worked away from a systemic approach and towards the semi-arid far from the problem of desertification.

It is observed that for the Teaching of Biology, High School, none of the books addressed desertification. This situation was also found in the study developed by Silva, Novaes and Junior (2009).

FINAL CONSIDERATIONS

Throughout this article, important topics on the theme of soils and desertification were mentioned and analyzed in official documents that guide Brazilian education. It was found that some of the official materials suggest that teachers work with the theme between the 6th and 9th grade of Elementary School final years, other materials do not mention the theme.

In view of what has been presented, it is observed that the theme soils and desertification are mentioned in the Curricular Parameters of Geography and Science in Elementary School final years and, in some points, in the Curricular Parameters of Geography and Biology in High School. However, in a synthetic way, a situation that reflects on the contents covered in the textbooks.

Based on the observations made, it is noticeable that most of the textbooks analyzed do not address the theme of soils and desertification in a clear and concise way and, when they do, it is done in a summarized and decontextualized way of the local reality. Among the books analyzed, the contents soils and desertification were found in some corresponding to the 6th year of Elementary School, final years and the 1st year of High School.

The results show that teachers need complementary materials to help the textbook and thus develop their classes on soils and desertification, as some textbooks bring mistaken information about these themes. In view of this, the teaching of soil and desertification must be taught in a playful, pleasurable way and with pedagogical practices

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aimed at the student reality, in this way, the results presented aim to contribute so that teachers can reflect, analyze and innovate their didactic methods.

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REFERENCES

1. Albuquerque, F. N. B., Silva, V. A., & Silva, L. S. (2021). O fenômeno global da desertificação nos livros didáticos de geografia no Brasil. Revista Ensino de Geografia, 4(1), 69–91.

2. Bahia. Secretaria da Educação do Estado da Bahia. (2013). Orientações curriculares e subsídios didáticos para a organização do trabalho pedagógico no ensino fundamental de nove anos. Superintendência de Desenvolvimento da Educação Básica. Salvador.

3. Bahia. Secretaria da Educação do Estado da Bahia. (2015). Orientações curriculares para o ensino médio área: Ciências humanas. Salvador.

4. Barbosa Neto, M. V., Oliveira, I. V. A., & Souza, D. M. R. (2018). Aplicação de oficinas sobre solos em escolas da educação básica da região metropolitana do Recife. Revista Ensino de Geografia (Recife), 1(2), 199–209.

5. Brasil. Ministério da Educação e Cultura. (1998a). Parâmetros curriculares nacionais: Ciências naturais. Brasília.

6. Brasil. Ministério da Educação e Cultura. (1998b). Parâmetros curriculares nacionais: Geografia. Brasília.

7. Brasil. Ministério da Educação e Cultura. (2000). Parâmetros curriculares nacionais: Ciências da natureza, matemática e suas tecnologias. Brasília.

8. Brasil. Ministério da Educação, Secretaria de Educação Básica. (2006). Parâmetros curriculares de geografia. Brasília: Secretaria de Educação Básica.

9. Brasil. Ministério da Educação e Cultura. (2017). Base Nacional Comum Curricular, Ensino Médio. Available at: http://basenacionalcomum.mec.gov.br/bncc-ensino-medio Retrieved on June 25, 2018.

10. Brasil. Ministério da Educação e Cultura. (2018). Base Nacional Comum Curricular. Available at: http://basenacionalcomum.mec.gov.br/ Retrieved on June 25, 2018.

11. Castro, F. C., & Santos, A. M. (2020). Salinity of the soil and the risk of desertification in the semiarid region. Mercator, 19, e19002.

12. Castro, F. C., Santos, A. M., & Araújo, J. F. (2021). Salinização dos solos e práticas agrícolas na comunidade quilombola de Cupira em Santa Maria da Boa Vista, Pernambuco - Nordeste do Brasil. Revista do Departamento de Geografia, 41, e174478.

13. Falcão, C. L. C., & Sobrinho, J. F. (2014). A utilização de recursos didáticos como auxiliares no processo de aprendizagem do solo. Revista da Casa da Geografia de Sobral (RCGS), 16(1), 19–28.

14. FAO. Food and Agriculture Organization of the United Nations. (2015). Status of the world's soil resources. Available at: http://www.fao.org/3/a-i5199e.pdf Retrieved on March 15, 2018.

15. Given, M. (2018). Conviviality and the life of soil. Cambridge Archaeological Journal, 28(1), 127–143.

16. Gomes, D. F. (2017). Socioeconomic indicators associated with the desertification process in "Microrregião do Sertão" of Pernambuco state, Brazil. Geama, 3(2), 63–67.

Revista ARACÊ
ISSN: 2358-2472

17. Jiang, Y., Zhang, Z., Jiang, J., Zhu, F., Guo, X., Jia, P., Li, H., Liu, Z., & Huang, S. (2024). Enhancement of nitrogen on core taxa recruitment by Penicillium oxalicum stimulated microbially-driven soil formation in bauxite residue. Journal of Hazardous Materials, 473, 134647.

18. Lima, G. A. C., Araújo, P. M., Reinaldo, L. R. L. R., & Xavier, R. A. (2021). Textura do solo: Importância da realização de atividades práticas no ensino de Geografia. Revista Tamoios, 11(2), 177–188.

19. Lima, J. S., & Campos, A. B. (2022). O conteúdo solos na Base Nacional Comum Curricular (BNCC) do ensino fundamental: Uma análise crítica. Terrae Didatica, 18, e022025.

20. Matos, J. O. G., & Dantas, S. P. (2024). Proposta de análise de livros didáticos de Geografia dos anos iniciais: Um olhar para linguagem cartográfica. Terra Livre, 1(60), 690–705.

21. Nascimento, F. R. (2023). Global environmental changes, desertification and sustainability. Springer Nature: London.

22. Nunes, M. S., Azevedo, R. J. G., & Silva, P. E. A. B. (2016). A abordagem de conteúdos relativos à ciência dos solos em livros didáticos de geografia para o ensino médio. Revista de Geografia – PPGEO - UFJF, 6(3), 271–281.

23. Oliveira, A. N. S., & Marques, J. D. O. (2017). Aula de campo no ensino de solos. Educitec, 3(5), 33–47.

24. Orgiazzi, A., Ballabio, C., Panagos, P., Jones, A., & Fernández-Ugalde, O. (2018). LUCAS Soil, the largest expandable soil dataset for Europe: A review. European Journal of Soil Science, 69(1), 140–153.

25. Pernambuco. Secretaria de Educação do Estado de Pernambuco. (2013a). Parâmetros curriculares de Biologia – Ensino Médio. Recife.

26. Pernambuco. Secretaria de Educação do Estado de Pernambuco. (2013b). Parâmetros curriculares de Geografia – Ensino Fundamental e Médio. Recife.

27. Rossiter, D. G., & Bouma, J. (2018). A new look at soil phenoforms – Definition, identification, mapping. Geoderma, 314(1), 113–121.

28. Santos, S. A., & Santos, A. M. (2021). Panorama da susceptibilidade à erosão dos solos em municípios do semiárido de Pernambuco. Revista Equador, 10(3), 1–25.

29. SIEPE. Sistema de Informações da Educação de Pernambuco. (2024). Available at: http://www.siepe.educacao.pe.gov.br/MapaCoordenadoria/listaEscola.do Retrieved on July 27, 2024.

30. Silva, F. P., & Santos, A. M. (2018). O domínio das Caatingas trabalhado nos livros didáticos de geografia. Élisée - Revista de Geografia da UEG, 7(2), 20–39.

31. Silva, M. M., Novaes, J. A. M., & Junior, R. A. P. (2009). Abordagem do tema desertificação nos livros didáticos de geografia e biologia no ensino médio. OKARA, 3(1), 168–185.

32. SSSA. Soil Science Society of America. (2023). Glossary of soil science terms (2nd ed.). Madison, WI: Soil Science Society of America.

33. UNCCD. United Nations Convention to Combat Desertification. (1994). United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa. A/AC, 247/27, Paris.