Article

LINHAS CRÍTICAS

Iconographic content on climate change in a high school textbook collection for the new curriculum

Conteúdo iconográfico sobre mudanças climáticas em uma coleção de livros didáticos do novo ensino médio

Contenido iconográfico sobre el cambio climático en una colección de libros de texto del nuevo bachillerato

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Highlights

The article highlights an empty approach and gaps regarding climate change in the BNCC.

The interdisciplinary proposals of the BNCC on the topic were not identified in this investigation.

Capitalist intentions regarding the topic were identified in the analyzed natural sciences textbook collection.

Abstract

Climate change is a serious and urgent issue. We investigated how climate change is portrayed in a collection of post-National Common Curricular Base (BNCC, in portuguese) reform Natural Sciences textbooks, within the scope of the 2021 National Textbook Program (PNLD). We also explored the interrelationship between the topic of climate change, the BNCC, and the new high school curriculum. To do so, we conducted an analysis of the iconographic content, which began with a pre-analysis, followed by the coding and classification of the material, based on units of recording and context, as well as the interpretation and inference of the results. This analysis revealed a clear gap between the BNCC's proposals and their implementation in this textbook collection. In addition, we identified gaps and reductionism in the school content and in the historical-social contextualization presented in the textbooks.

Resumo | Resumen

Keywords

Education. Curriculum. Educational reform.

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Introduction

Climate change refers to the abnormal increase in the atmosphere's heat retention capacity, caused by the excessive accumulation of Greenhouse Gases (GHGs) over the past 150 years (Pinto et al., 2010). There is consensus that anthropogenic activities are directly related to the progressive rise of these gases, due to the large-scale emission of pollutants, particularly carbon dioxide (CO_2), which can generate severe impacts for all of humanity (Pinto et al., 2010).

Given the complexity of climate change and the challenges for its mitigation, education is necessary as it is considered a driving force in the process of human development, which involves the formation of social identities and the transformation of mindsets (Liotti & Campos, 2021). Moreover, education holds great significance and recognition in addressing and understanding various complex environmental problems, especially those of anthropogenic origin (Carvalho et al., 2009).

The potential of education in the process of human development is undeniable, and among the various resources used for this purpose, the textbook stands out as the primary organizing agent of knowledge in daily school life (Marpica & Logarezzi, 2010). Moreover, the support provided by this resource in activity planning and its role in the progression of learning are crucial both for students' and teachers' pedagogical processes (Marpica & Logarezzi, 2010). Therefore, it is necessary that environmental issues are not confined to a single subject in the school curriculum, but that, through the textbook, they acquire a transversal character. Thus, discussions on complex contemporary themes can be addressed from an environmental education perspective that is critical, problematizes, and transforms reality, linking to social, ideological, and ethical issues within society (Carvalho, 2017; Loureiro & Leroy, 2006).

In this perspective, the National Common Curricular Base (BNCC, in portuguese) defines as specific competencies for natural sciences and their technologies in high school, including “[...] analyze natural and technological phenomena [...] in order to propose individual and collective actions that [...] minimize socio-environmental impacts [...]” (Brazil, 2021, p. 553). The BNCC outlines in its text an education that encourages students to understand the complexity of various processes, such as the relationship between living beings and the environment, and the interrelationship between biogeochemical cycles, climate change, and the greenhouse effect. According to the BNCC, these interconnections will enable students to analyze, investigate, and discuss problem-based situations from different sociocultural realities.

In this context, iconographic content emerges as an indispensable resource for achieving the competencies proposed by the BNCC in natural sciences, acting as an essential didactic-pedagogical tool. Increasingly present in modern daily life, iconographic content becomes a fundamental element in the teaching-learning process, both in various fields of knowledge and at different educational levels (Martins et al., 2012). The representation of reality through images is used by science to convey information that may be complex, selecting and simplifying it.

Thus, iconography, when combined with other educational tools, can assist in the construction of essential meanings. However, this construction is subject to questioning regarding the role that visual representations play in the learning of scientific concepts (Martins et al., 2012).

To investigate how climate change is being represented in the iconographic content of textbooks for the new high school curriculum, we conducted an iconographic content analysis of a collection of natural science textbooks from the New High School (Novo Ensino Médio, NEM), included in the 2021 National Textbook Program (PNLD). The choice of this collection was motivated by the fact that it was one of the collections approved in the PNLD 2021 for the New High School. Furthermore, among the textbooks approved by the PNLD, this collection was the first to be used by a public institution in the region after the implementation of the NEM, and it is strongly aligned with the guidelines and provisions of the BNCC. Finally, this collection was easily accessible both in physical and virtual formats, ensuring practicality and flexibility in accessing the content.

Methodology

Of a documentary corpus nature, the iconographic analysis was carried out based on textbooks from a collection entitled "natural sciences and their technologies" (teacher's manual). This collection consists of six textbooks produced in 2020, selected by the PNLD 2021, intended for the new high school.

The collection selected for analysis belongs to the 2021-2023 period of the Federal Institute of Education, Science, and Technology of Paraná (IFPR) - Umuarama Campus, used by the integrated technical high school program (in chemistry, construction, and information technology). The titles of the books in the collection are: "Evolution and the Universe," "Energy and Sustainable Consumption," "Water, Agriculture, and Land Use," "Pollution and Movement," "The Human Body and Healthy Life," and "The Technological World and Applied Sciences."

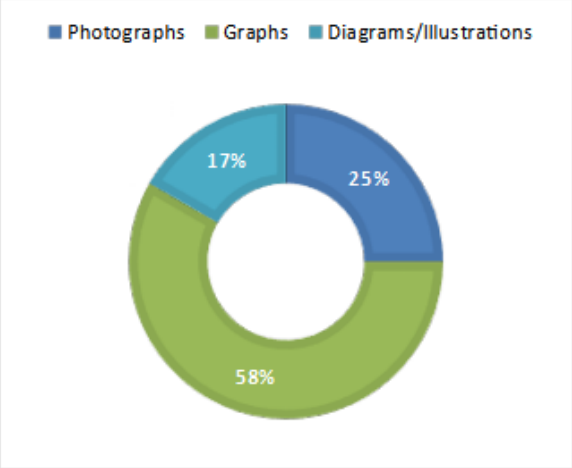
As the analysis methodology, the content analysis principles proposed by Bardin (2011) were adopted, where, through the manipulation of messages, it becomes possible to perceive information that was previously not evident due to the absence of indicators that would allow such investigation. The procedure was divided into three stages, with the first being "floating reading," in which a preliminary analysis of the material was conducted to identify the images related to the theme. Next, the material was explored with categories of analysis selected *a priori*, as proposed by Liotti (2019), regarding the iconographic content. As subcategories, photographs, diagrams, and graphs were analyzed in relation to the causes, consequences, and mitigation measures of climate change. Finally, the material analyzed was coded and classified based on the units of registration, units of meaning, and units of context, which delimit specific excerpts related to the theme (Liotti, 2019).

In the final stage, characterized by the interpretation and examination of the results obtained, the inferences and conclusions were based on the theoretical framework, which were used to argue the possible objectives of the new high school curriculum in the theoretical formation of students regarding climate change in this textbook collection.

Results and discussion

Upon analyzing the complete collection of natural sciences and their technologies textbooks, a total of 12 entries of iconographic content related to climate change were identified. These were categorized into photographs, diagrams/illustrations, and graphs. Graphs were the most frequent, with 7 samples, followed by photographs with 3 samples, and diagrams or illustrations with 2 samples. When compared to the iconographic analysis by Liotti and Campos (2021), in which 7% were maps, 13% graphs, 27% diagrams, and 53% photographs, the absence of maps in this collection is notable. Furthermore, a clear difference can be observed in the proportion of graphs and photographs, with diagrams being the only category to show a similar percentage (Figure 1). All identified content was found in the student textbooks, while no such content was found in the teacher's manual.

Figure 1
Division of the iconographic content according to its subcategories.



Source: the authors.

Regarding the units of context, three referred to the causes of climate change, two to the consequences, two to mitigation measures, and five encompassed units without context, a subcategory that did not directly relate to any specific aspect of climate change. Thus, considering that the collection is for natural sciences and the BNCC's interdisciplinary proposal suggests the inclusion of the three divisions — biology, chemistry, and physics — the expectation was for the presence of iconographies related to all these areas. However, no material related to chemistry or physics was identified, with the focus being solely on biology.

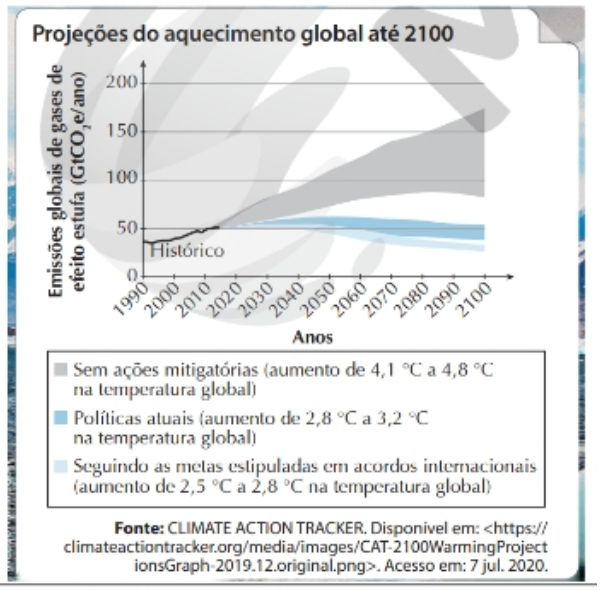
Regarding the content of the iconographic materials, for the causes, there were graphs showing global temperature variations and the influence of several factors, as well as another graph addressing the global energy matrix in 2017, in addition to the increase in carbon dioxide concentration in the atmosphere between the 1950s and the present (Chart 1). As for the consequences, one image depicted a polar bear on a melting polar ice cap and projections of global warming up to 2100 (Chart 1). In terms of mitigation measures, there was a photo of an electric vehicle as well as the first vehicle that used ethanol (Chart 2). In units without context, there was a diagram involving climate change for sustainable development; comparisons

between solar energy received and the planet's temperature; the influence of human and non-human factors on temperature; a diagram of Earth's energy balance; and the emission of greenhouse gases from food (Chart 2).

Chart 1
Examples of iconographic content found in the subcategories of causes and consequences of climate change.

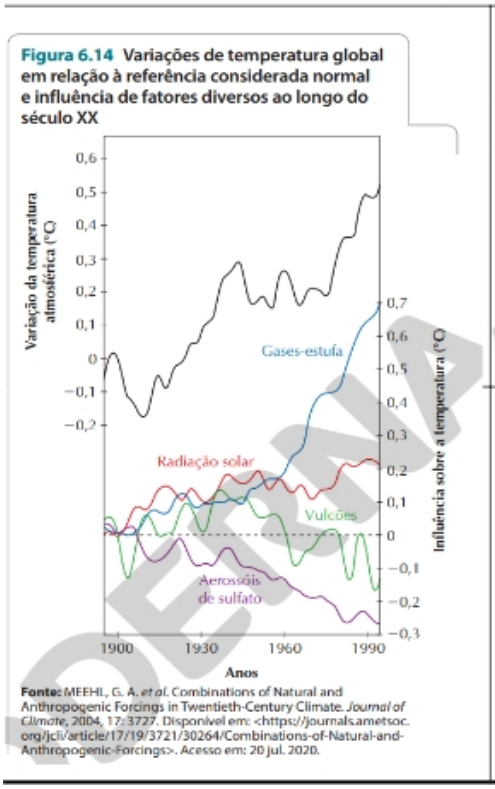
Consequences of Climate Change

UGUR GALLENKUS - COLEÇÃO PARTICULAR

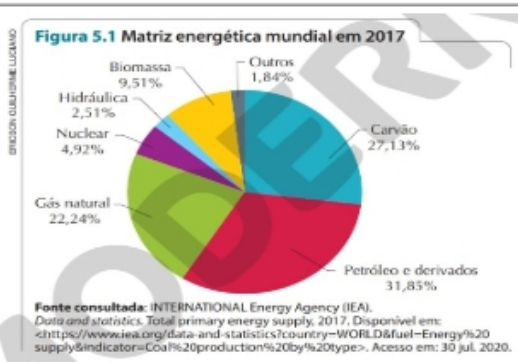


Fonte: CLIMATE ACTION TRACKER. Disponível em: <https://climateactiontracker.org/media/images/CAT-2100WarmingProjectionsGraph-2019.12.original.png>. Acesso em: 7 jul. 2020.

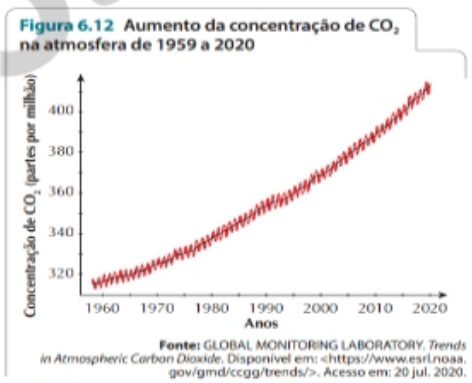
Causes of Climate Change



Fonte: MEEHL, G. A. *et al.* Combinations of Natural and Anthropogenic Forcings in Twentieth-Century Climate. *Journal of Climate*, 2004, 17: 3727. Disponível em: <https://journals.ametsoc.org/jcli/article/17/19/3721/30264/Combinations-of-Natural-and-Anthropogenic-Forcings>. Acesso em: 20 jul. 2020.



Fonte consultada: INTERNATIONAL Energy Agency (IEA). *Data and statistics*. Total primary energy supply, 2017. Disponível em: <https://www.iea.org/data-and-statistics?country=WORLD&fuel=Energy%20supply&indicator=Coal%20production%20by%20type>. Acesso em: 30 jul. 2020.



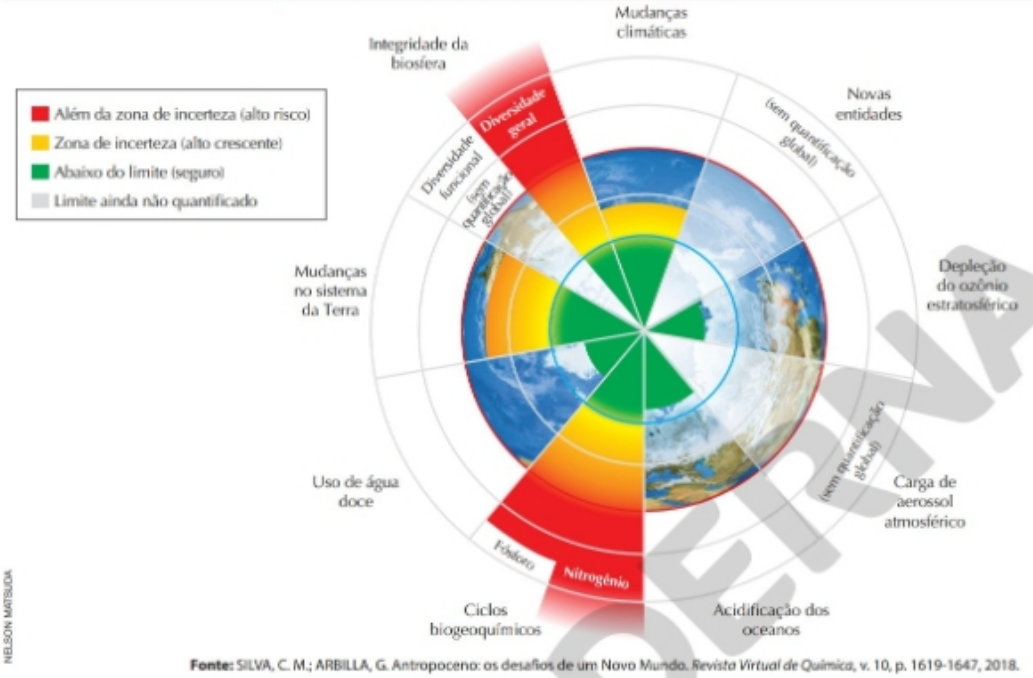
Fonte: GLOBAL MONITORING LABORATORY. *Trends in Atmospheric Carbon Dioxide*. Disponível em: <https://www.esrl.noaa.gov/gmd/ccgg/trends/>. Acesso em: 20 jul. 2020.

Source: elaborated by the authors based on Lopes and Rosso (2020).

Chart 2

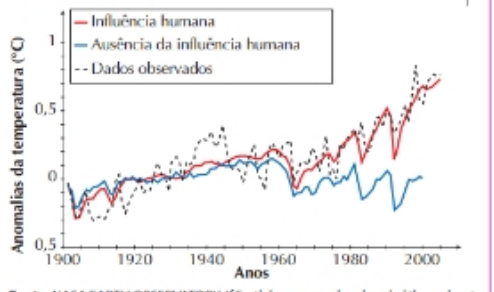
Examples of iconographic content found in the subcategories of mitigation measures and units without context of climate change.

Units Without Context of Climate Change



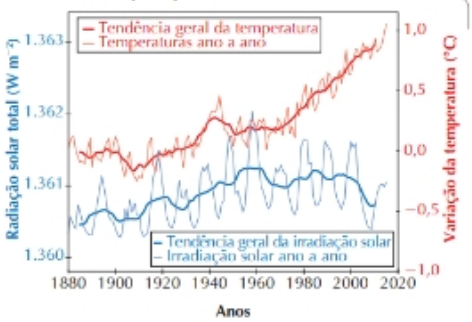
Fonte: SILVA, C. M.; ARBILLA, G. Antropoceno: os desafios de um Novo Mundo. *Revista Virtual de Química*, v. 10, p. 1619-1647, 2018.

Figura 6.13 Influência dos fatores humanos e não humanos na temperatura atmosférica entre 1900 e 2000

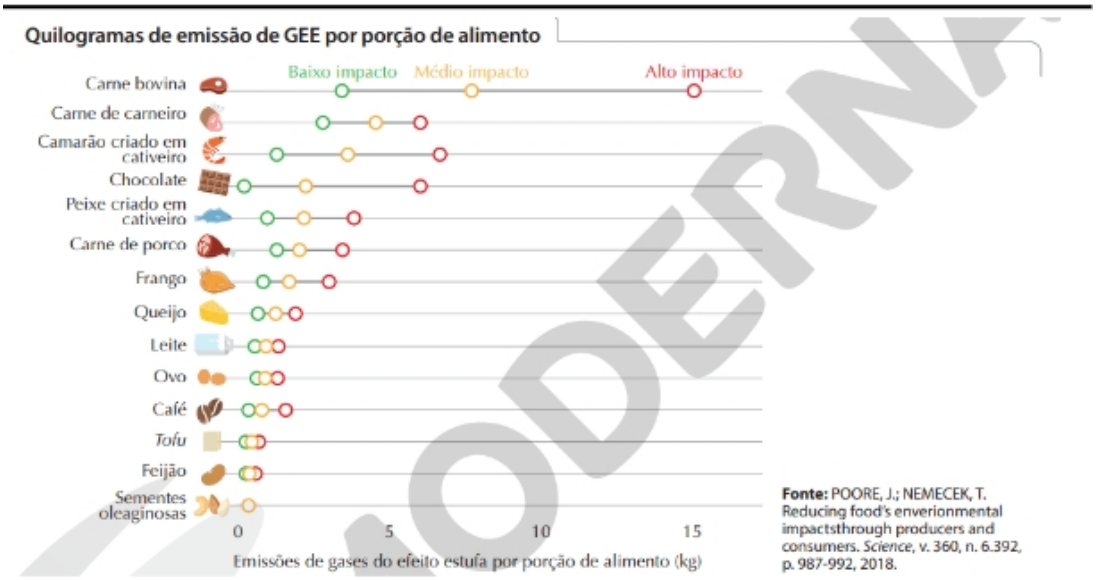


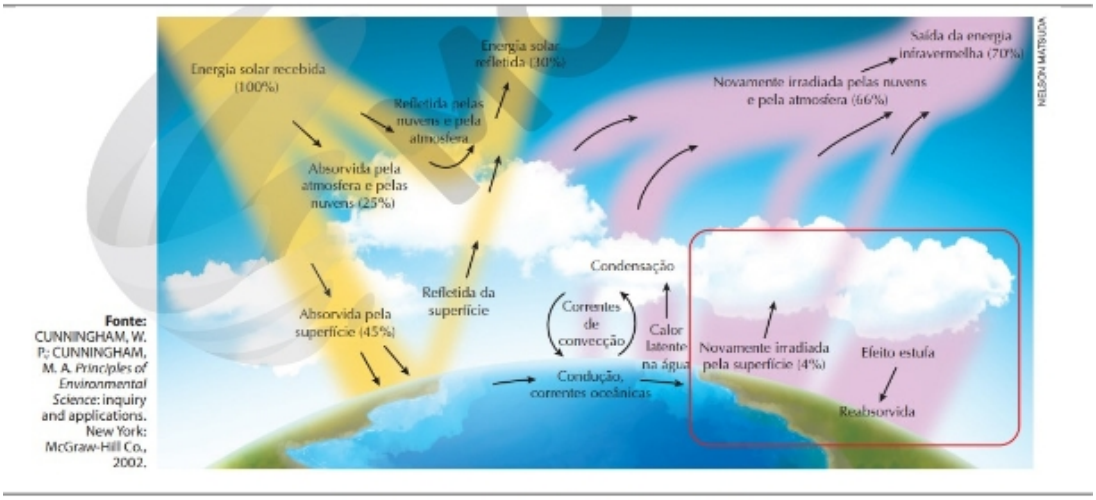
Fonte: NASA EARTH OBSERVATORY. *If Earth has warmed and cooled throughout history, what makes scientists think that humans are causing global warming now?* Disponível em: <https://earthobservatory.nasa.gov/blogs/climateqa/if-earth-has-warmed-and-cooled-throughout-history-what-makes-scientists-think-that-humans-are-causing-global-warming-now/>. Acesso em: 20 jul. 2020.

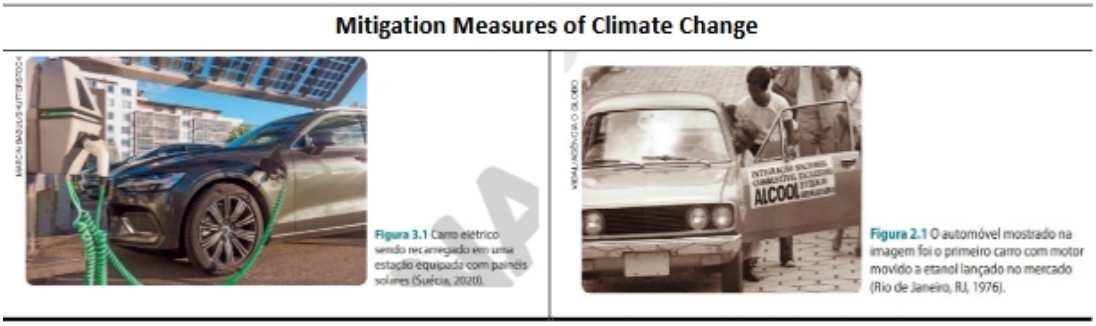
Figura 6.11 Comparação entre a variação da temperatura na superfície da Terra e a energia solar recebida pelo planeta



Fonte: NASA. What Is the Sun's Role in Climate Change? *Nasa Blog*, 6 set. 2019. Disponível em: <https://climate.nasa.gov/blog/2910/what-is-the-suns-role-in-climate-change/>. Acesso em: 20 jul. 2020.







Source: elaborated by the authors based on Lopes and Rosso (2020).

In this investigation, we identified a simplistic view of the iconographic resources available in this collection of textbooks and their relation to the analysis subcategories, as the iconography was not frequently used and, when it was, followed conventional patterns on the subject, without further exploration. According to Lajolo (1996), the textbook is a resource that can decisively and significantly influence the content and strategies that permeate teaching. Therefore, it is important to consider the contexts in the process of evaluating, selecting, and using the textbook in the school environment, as it represents a complex object of study

that deserves continuous and contemporary discussions (Martins & Eichler, 2020). Pinheiro et al. (2021) discuss the relevance of investigating both the epistemological and pedagogical intentionality brought by textbook authors, which often can hinder the teacher's performance in the classroom and the participation of educators in analyzing and critiquing the concrete reality.

Regarding the causes, we found graphs that highlight global temperature variations and the increase of CO_2 in the atmosphere, released by "anthropogenic actions". However, the graphs do not specify which humans are responsible for such actions, nor do they address the issue of environmental injustice. As evidenced in Liotti and Campos (2021), when referring to the consequences, these omissions lead to the lack of questioning of the economic model of those involved in climate change, resulting in a eurocentric western perspective. This results in the omission of consequences in developing countries, focusing only on western problems (Serantes-Pazos & Meira-Cartea, 2016).

The alliance between the educational goals of the BNCC and the capitalist mode of production is evident in the portrayal of environmental injustice in climate change education (Souza, 2022). This approach promotes the invisibility of populations that will be most vulnerable to the effects of the phenomenon, such as marginalized populations and ethnic groups that are not in the northern hemisphere (Souza, 2022). Moreover, it fails to explore the relationship between the capitalist structure and environmental impacts, where the wealthiest region of the planet emits twice as many GHGs as the poorest part (Süssekind, 2019).

Another point to consider is that the mitigation measures are limited to automobiles, whether electric or powered by ethanol. This approach accentuates some issues. First, it restricts the student to a false belief that the only way to mitigate climate change is through automobile fuel use. This disregards numerous ways to mitigate the issue, such as the proposition of public policies, raising public sensitization, reforestation, protection of forest areas, use of sustainable energy matrices, international climate agreements, industry regulation, among others. Additionally, it promotes ethanol as a clean fuel, although it mentions issues in the sugarcane production chain due to greenhouse gas emissions. However, it does not mention that ethanol, while less polluting compared to gasoline, is still a fuel that generates harmful emissions to the environment. In this context, Guarieiro et al. (2011) describe that ethanol generally produces fewer pollutants than gasoline and diesel, due to more complete combustion and lower CO_2 emissions, but it increases the emission of aldehydes, which also contribute to global warming.

Carneiro et al. (2020), when analyzing Biology textbooks related to the PNLD (2018-2020), noted that the content on the climate crisis was portrayed in a critical and reflective manner. However, the authors identified that textbooks can lead students to develop a sense of powerlessness in the face of climate problems, as they conceal the efforts of national and international researchers in mitigating this crisis. Furthermore, the materials do not sufficiently encourage students to engage in initial actions to combat climate change.

The complex and multifactorial nature of climate change encompasses a scope with social, political, economic, and environmental dimensions (Silva, 2019). Therefore,

for mitigation measures to be effective, it is essential to promote awareness and sensitization of the population, which holds transformative social potential, especially when facilitated by access to science and education. Thus, it is believed that, through education, individuals will acquire the competence to think and act differently in their reality, and that, among many actions, they will be capable of authentically mitigating climate change. With transformations in ways of thinking and living, students will have the potential to act as conscious citizens, playing a key role in the pursuit of actions to build and implement public and environmental policies that mitigate this phenomenon (Silva, 2019)

In without-context units, data that are difficult to understand are presented, both for students and teachers, as they fail to provide a coherent context regarding the topic, while adding information that does not contribute to knowledge construction. This can be observed in data such as greenhouse gas emissions associated with the production of various foods, or comparisons between Earth's temperature and the amount of energy it receives. These data reference climate change in a disconnected manner, lacking contextualized subcategorization, and are presented merely as figures that do not support a real and critical understanding. In this subcategory, the information is particularly disassociated from the images to which it belongs, hindering the reflection and critical analysis promoted by the BNCC.

The analysis of textbooks regarding the topic of climate change has already been conducted by several studies, such as Liotti and Campos (2021), who examined Chemistry, Physics, Biology, and Geography textbooks included in the 2015 Textbook Guide of the PNLD for the 2015–2017 cycle. The authors emphasized the lack of an interdisciplinary and contextualized approach to the subject in these materials, which hindered students' ability to fully grasp the phenomenon. Similarly, Rumenos et al. (2017) pointed out that, although some discussions on climate change were based on up-to-date scientific sources, the textbooks failed to address the controversies and complexities of the issue, an omission that could otherwise represent a valuable opportunity for didactic innovation.

In Brazil, the National Textbook Program (PNLD) was implemented by the government to pedagogically evaluate the textbooks for each subject established by the BNCC, aiming to ensure the quality of the materials provided to public schools (Amaral & Oliveira, 2011). However, the effectiveness of educational policies is questioned due to the capitalist logic of the State, as highlighted by Caviedes (2017), who discusses the interests of capital and their relationship with various institutions that serve a capitalist structure. According to the author, institutions such as the World Bank and the World Trade Organization exert significant influence over educational aspects, including educational and assessment policies and textbook programs, shaping them according to their dominant interests.

In this regard, the crucial importance of images in the teaching-learning process becomes evident. They hold pedagogical potential to convey various conceptions, whether messages, concepts, ideas, or values, thus playing a significant role in students' educational development (Pralon, 2012). However, simply looking at an image is not enough to ensure learning (Martins et al., 2012). Images may raise awareness, persuade, or convince students, nonetheless, it is the ability to read images that allows them to position themselves critically in relation to their reality

and the knowledge available. Accordingly, Martins et al. (2012) emphasize that images can serve as effective tools for learning scientific concepts, such as climate change and its consequences.

General implications

When comparing the results obtained in this study, it becomes clear that there are few iconographic resources related to the topic throughout the collection. A total of 12 entries were identified, nearly half of which fail to provide contextualization of the subject, being inserted randomly in divergent contexts. Therefore, the iconographic content can be seen as an ineffective tool for knowledge construction, due to the way it was designed. Addressing the depletion of iconographic content in the construction of knowledge, Orso (2020) highlights the attacks on scientific knowledge, both in Brazil and abroad, and their consequent influence on education. According to the author, such attacks can be observed, among other contexts, in the "[…] persecution of education professionals and educational and research institutions, and in the replacement of scientific knowledge in schools with compensatory social policies that empty the possibilities of teaching and learning" (Orso, 2020, p. 94), in addition to the presence of scientific denialism.

The theoretical goal of the high school reformulation is to provide quality education to all Brazilian youths, bringing schools closer to the reality of the students, taking into account the new demands and complexities that arise with the evolution of the labor market and society (Brazil, 2021). However, when discussing educational reforms, such as the BNCC, Santos (2019) highlights that these reforms are harmful, as they consent to impossible solutions, sow intangible results, and use falsehoods as alternative truths. Süssekind (2019) argues that the BNCC and high school reforms sell solutions to a problem they themselves create, where the mode of production is inseparable from arrogance, with the two working together to "[...] produce ignorance, invisibilities, and non-existences with effectiveness" (Süssekind, 2019, p. 101). In this way, what is present in the students' everyday lives is not addressed in numbers, indexes, or research methodologies, and is not recognized by curricular policies, which often disregard the real dynamics of a classroom (Süssekind, 2019). Thus, this education focuses solely on the valorization of knowledge prescribed outside the school environment, in the tests and textbooks proposed by the BNCC. These materials are designed by specialists who, although familiar with the theory, do not experience the reality of schools. This dissociation from practice has been a focal point and the subject of criticism by scientific associations (Associação Nacional de Pós-Graduação e Pesquisa em Educação [ANPED], 2015; 2018).

The justification presented for the recent changes in the BNCC, and consequently in high school education, revolves around the interest in meeting the demands of the productive sector, aiming to boost the country's economic growth, without a concern for the comprehensive education of students (Malanchen et al., 2020). Moreover, the implementation of the NEM in schools is limited to the mastery of a few selected competencies that advocate for a quick response to the labor market and the reproduction of the capitalist society structure, revealing a reversal of educational values (Malanchen et al., 2020). Given the nature of this reform, it is of

utmost importance that the topic of "climate change," a highly relevant issue in contemporary society, be addressed in a relevant and critical way in the redesign of high school education. As Freire (2000, p. 31) highlights, when discussing the importance of addressing nature and its ethical principles in education:

> Although none of that, in my judgment, makes those agents of cruelty any less responsible, the fact in itself that this tragic transgression of ethics has taken place warns us how urgent it is that we fight for more fundamental ethical principles, such as respect for the life of human beings, the life of other animals, of birds, and for the life of rivers and forests. I do not believe in loving among women and men, among human beings, if we do not become capable of loving the world. Ecology has gained tremendous importance at the end of this century. It must be present in any educational practice of a radical, critical, and liberating nature.

Thus, Orso (2020) suggests that the attack on science in education is related to the objectives of the dominant class in shaping the interests and worldviews of the population to align with their own interests. Both the lack of explanation and the limited visual representation of the various facets of climate change increase the likelihood that the topic will not be discussed in the classroom or, if discussed, will fail to question the colonialist model and the class divisions associated with it. Fortunately, it is possible not to fully follow what is proposed by the material, as it is a resource, not a manual. Nonetheless, there is a need for initial and ongoing critical training for teachers in order to open up new perspectives in teaching, an issue that has also been raised, considering the gaps and challenges involved. Despite studies on the approach to climate change in biology textbooks, there are still gaps that need to be addressed, especially regarding the content established by the NEM in relation to what is set by the BNCC. This proposal is relatively recent, and there is a lack of research on the collections approved or rejected by the Ministry of Education (MEC). In this work, we investigated only one of these collections, however, regardless of whether they are approved or rejected, all collections require in-depth analysis on the topic.

Final considerations

Climate change resulting from the intensification of greenhouse gas emissions due to anthropogenic actions is an undeniable fact, free from doubts and controversies, given its scientific and urgent nature. In this context, education addresses the possibilities of social changes concerning the issue by using different didactic resources, such as iconographic content. However, when it comes to the new high school, contradictions and implicit intentions are noted in one of its didactic collections approved by the PNLD 2021, which continues to uphold the capitalist social structure. The research revealed the incoherence between what is theoretically proposed by the BNCC and what is found in the analyzed collection of textbooks

Regarding the iconographic content, it was noted that there are few visual resources illustrating climate change and its aspects, providing limited support for the construction of critical and contextualized knowledge. This lack of characterization is found when addressing the causes, consequences, and mitigation measures of climate change. Materials classified as "units without

context" represented a significant portion, highlighting gaps, superficiality, and disruptive intentions in the transmission of scientific knowledge. Another point to be considered is interdisciplinarity, which is not present in the collection, as iconographic content is only found in the biology section. The shallow representations of the objects of study and their absence in the teacher's manual also indicate a lack of didactic-methodological support for educators, implying a deficiency in resources for lesson preparation.

Despite the challenges encountered, it is important to emphasize that, although the textbook is the main didactic resource used in daily school activities, it does not function as a manual, meaning that teachers are not required to follow it entirely without questioning. Moreover, lessons can draw on other sources of research, whether from teachers or students. In this regard, the textbook can be viewed as a resource that has both limitations and possibilities for teaching. Nonetheless, it is essential for the textbook to include content that promotes emancipation and environmental critical awareness among students, so that societal issues, such as climate change, can be reflected upon and inspire a change in attitude. Therefore, more in-depth investigations are needed on textbook collections for the new high school curriculum, as well as the proposal of new curricular reforms that integrate applied environmental education.

Finally, the digital nature of new student generations allows the textbook and its iconographic content to be conceived as stimulators of knowledge. In this way, a textbook can go beyond its printed pages, especially when complemented by digital resources, according to the school context. Thus, the textbook can serve as a didactic-pedagogical tool in the construction of critical, real, and contextualized knowledge that goes beyond the mere reproduction of the capitalist social structure.

References

Amaral, P., & Oliveira, C. E. Q. V. de. (2011). Astronomia nos livros didáticos de ciências: uma análise do PNLD 2008. *Revista Latino-Americana de Educação em Astronomia,* (12), 31-55. https://doi.org/10.37156/RELEA/2011.12.031

Associação Nacional de Pós-Graduação e Pesquisa em Educação (ANPED). (2015). *Ofício n.º 01/2015/GR: Exposição de Motivos sobre a Base Nacional Comum Curricular*. ANPED. http://ced.ufsc.br/files/2015/10/Exposi%C3%A7%C3%A3o-de-Motivos-a-BNCC-ANPED-e-ABdC.pdf

Associação Nacional de Pós-Graduação e Pesquisa em Educação (ANPED). (2018). *BNCC do Ensino Médio: alguns pontos para o debate.* ANPED. https://anais.anped.org.br/sites/default/files/images/anped_contra_bncc_em_para_cne_maio_2018.pdf

Bardin, L. (2011). *Análise de conteúdo* (1, Tradução: Reto, L. A., & Pinheiro, A.). Almedina.

Brasil. (2021). *Base Nacional Comum Curricular (BNCC).* Ministério da Educação. http://basenacionalcomum.mec.gov.br/abase/

Carneiro, K. I. L. R., Mello, G. J., & Junior, J. G. M. (2020). A crise climática nos livros didáticos de Biologia (PNLD 2018-2020) à luz do modelo do Conhecimento Especializado de Professores de Biologia. *Research, Society and Development*, *9*(12). https://doi.org/10.33448/rsd-v9i12.10573

Carvalho, I. C. D. M. (2017). *Educação ambiental: a formação do sujeito ecológico*. Cortez Editora.

Carvalho, L. M. de., Tomazello, M. G. C., & Oliveira, H. T. de. (2009). Pesquisa em educação ambiental: panorama da produção brasileira e alguns de seus dilemas. *Cadernos Cedes*, (29), 13-27. https://doi.org/10.1590/S0101-32622009000100002

Caviedes, J. F. R. (2017). *Crítica das políticas de avaliação externa na Colômbia e Brasil no contexto da sociedade capitalista*. [Tese de doutorado em Educação, Universidade Federal de Uberlândia]. Repositório UFU. http://doi.org/10.14393/ufu.te.2017.134

Freire, P. (2000). *Pedagogia da indignação: cartas pedagógicas e outros escritos***.** Editora UNESP.

Guarieiro, L. L., Vasconcellos, P. C., & Solci, M. C. (2011). Poluentes atmosféricos provenientes da queima de combustíveis fósseis e biocombustíveis: uma breve revisão. *Revista Virtual de Química*, 3(5), 434-445. http://dx.doi.org/10.5935/1984-6835.20110047

Lajolo, M. (1996). *Livro didático: um (quase) manual de usuário*. Em aberto.

Liotti, L. C. (2019). *O conhecimento escolar sobre mudança climática nos livros didáticos do Ensino Médio – PNLD/2015*. [Tese de doutorado em Educação, Universidade Federal do Paraná]. Repositório Institucional Rede Paraná Acervo. https://www.periodicos.ufpr.br/handle/1884/65131

Liotti, L. C., & Campos, M. A. T. (2021). Livros didáticos do ensino médio e o conhecimento escolar sobre mudanças climáticas. *Revista Brasileira de Educação Ambiental (RevBEA),* 16(2), 19-36. https://doi.org/10.34024/revbea.2021.v16.11102

Lopes, S., & Rosso, S. (2020). *Ciências da natureza e suas tecnologias: manual do professor* (1). Editora Moderna. https://pnld.moderna.com.br/wp-content/uploads/2021/07/Livro_lopes-rosso_evo_uni.pdf

Loureiro, C. F. B., & Leroy. J. P. (2006). Problematizando conceitos: contribuição à práxis em educação ambiental. Em C. F. B. Loureiro, & J. P. Leroy (Orgs.). *Pensamento complexo, dialética e educação ambiental* (pp. 104-161). Cortez Editora.

Malanchen, J., Matos, N. D. S. de, & Orso, P. J. (2020). *A pedagogia histórico-crítica, as políticas educacionais e a Base Nacional Comum Curricular*. Autores Associados.

Marpica, N. S., & Logarezzi, A. J. M. (2010). Um panorama das pesquisas sobre livro didático e educação ambiental. *Ciência & educação*, 16(1), 115-130. http://educa.fcc.org.br/pdf/ciedu/v16n01/v16n01a07.pdf

Martins, I., Gouvêa, G., & Vilanova, R. (2012). *O livro didático de Ciências: contextos de exigência, critérios de seleção, práticas de leitura e uso em sala de aula*. Dossiê Unicamp.

Martins, T. O., & Eichler, M. L. (2020). Neurociências cognitivas no estudo do sistema nervoso: um olhar crítico por meio do livro didático de educação básica. *Investigações em ensino de Ciências.* 25(2), 272-292. https://doi.org/10.22600/1518-8795.ienci2020v25n2p272

Orso, P. J. (2020). *Um espectro ronda a educação e a escola pública* (1). Editora Navegando.

Pinheiro, R. M. D. S. Echalar, A. D. L. F., & Queiroz, J. R. D. O. (2021). As políticas públicas de livro didático no Brasil: editais do PNLD de Biologia em questão. *Educar em Revista,* 37. https://doi.org/10.1590/0104-4060.81261

Pinto, E. P. P., Moutinho, P. Stella, O., Castro, I. Mazer, S., Rettmann, R., & Moreira, P. F. (2010). Perguntas e Respostas sobre Aquecimento Global. *Instituto de Pesquisa Ambiental da Amazônia (IPAM)*. https://ipam.org.br/wp-content/uploads/2010/05/perguntas_e_respostas_sobre_aquecimento_.pdf

Pralon, L. (2012). Imagem e produção de sentido: as fotografias no livro didático. Em Martins, I., Gouvêa, G., & Vilanova, R. (Orgs). *O livro didático de Ciências: contextos de exigência, critérios de seleção, práticas de leitura e uso em sala de aula (pp. 159-170)*. Acervo UFRJ.

Rumenos, N. N., Silva, L. F., & Cavalari, R. M. F. (2017). Significados atribuídos ao tema “mudanças climáticas” em livros didáticos de ciências naturais do ensino fundamental II aprovados pelo PNLD de 2014. *Ensaio Pesquisa em Educação em Ciências*, 19, 275-301. https://doi.org/10.1590/1983-21172017190113.

Santos, B. D. S. (2019). As três ignorâncias: arrogante, indolente e malévola. *Jornal Segunda Opinião.* https://segundaopiniao.jor.br/as-tres-ignorancias-arrogante-indolente-malevola-por-boaventura-de-sousa-santos/

Serantes-Pazos, A., & Meira-Cartea, P. A. (2016). El cambio climático en los libros de texto de la Educación Secundaria Obligatoria o una crónica de las voces ausentes. *Documentación social*, 183, 153-170. https://www.caritas.es/main-files/uploads/2017/12/Documentacio%CC%81n-Social-183baja.pdf

Silva, E. M. da. (2019). O papel da Educação Ambiental nas ações de combate as mudanças climáticas. *Revista Brasileira de Educação Ambiental (RevBEA),* 14(2), 387-396. https://doi.org/10.34024/revbea.2019.v14.2629

Souza, L. B. de. (2022). *A crise climática na escola: como a problemática das mudanças climáticas está sendo trabalhada em livros didáticos do Ensino Médio*. [Trabalho de conclusão de curso em Licenciatura em Ciências Biológicas, Universidade Federal do Rio Grande do Sul]. Repositório Digital LUME (UFRGS). http://hdl.handle.net/10183/240089

Süssekind, M. L. (2019). *A BNCC e o “novo” Ensino Médio: reformas arrogantes, indolentes e malévolas*. *Retratos da escola*, 13(25), 91-107. https://doi.org/10.22420/rde.v13i25.980

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Resumo

As mudanças climáticas são de caráter grave e urgente. Investigamos como as mudanças climáticas estão sendo retratadas em uma coleção de livros didáticos de ciências da natureza pós-reforma da Base Nacional Comum Curricular (BNCC), referente ao Plano Nacional do Livro Didático (PNLD) 2021. Ainda, exploramos a interrelação entre o tema mudanças climáticas com a BNCC e o novo ensino médio. Para isso, realizamos uma análise do conteúdo iconográfico, que iniciou com uma pré-análise, codificação e classificação do material, por meio das unidades de registro e contexto e pela interpretação e inferência dos resultados. Dessa forma, ficou evidente o abismo entre as propostas da BNCC e sua implementação nessa coleção de livros didáticos. Além disso, identificamos

lacunas e reducionismo no conteúdo escolar e na contextualização histórico-social presente nos livros didáticos.

Palavras-chave: Educação. Currículo. Reforma educacional.

Resumen

El cambio climático es de carácter grave y urgente. Investigamos cómo el cambio climático está siendo retratado en una colección de libros de texto de ciencias de la naturaleza posteriores a la reforma de la Base Nacional Común Curricular (BNCC), correspondiente al Plan Nacional del Libro de Texto (PNLD) 2021. Además, exploramos la interrelación entre el tema del cambio climático con la BNCC y el nuevo bachillerato. Para ello, realizamos un análisis del contenido iconográfico, que comenzó con un preanálisis, codificación y clasificación del material, por medio de las unidades de registro y contexto y mediante la interpretación e inferencia de los resultados. De esta forma, quedó evidente el abismo entre las propuestas de la BNCC y su implementación en esta colección de libros de texto. Además, identificamos lagunas y reduccionismo en el contenido escolar y en la contextualización histórico-social presente en los libros de texto.

Palabras clave: Educación. Currículo. Reforma educativa.

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