



## THE CHOICE OF NATURAL SCIENCES TEXTBOOKS IN HIGH SCHOOL IN THE CONTEXT OF THE BNCC IMPLEMENTATION: THE PROCESSES AND DECISION SPACES OF TEACHERS

*A escolha de livros didáticos de Ciências da Natureza no Ensino Médio em contexto de implementação da Base Nacional Comum Curricular: os processos e os espaços de decisão dos docentes*

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### Abstract

This article focuses on the processes and spaces of choice of Natural Sciences textbooks, by teachers of Physics, Chemistry and Biology, who work in Secondary Education, via PNLD 2021, in the context of the implementation of the BNCC. The objective of the qualitative research was to characterize this process from the perspective of teachers who work in these disciplines. The framework that supported this study consisted of the theoretical production on Textbooks and Curriculum Policies in the area of Education and Science Education. A total of 102 teachers of the disciplines in the area participated. It was concluded that the spaces for teachers' choice in this process are limited by working conditions; by the teachers' non-participation in the formulation of policies and in the decisions about what knowledge is and is not in the school; the limitations in the presence and organization of knowledge in the LDs and the risk of impoverishment of the students' education, but the teachers' commitment to the students' education in the face of limitations is evident.

**Keywords:** BNCC; Textbook; PNLD

### Resumo

Este artigo tem foco nos processos e os espaços de escolha dos livros didáticos de Ciências da Natureza, pelos professores de Física, Química e Biologia, que atuam no Ensino Médio, via PNLD 2021, em contexto de implementação da BNCC. O objetivo da pesquisa, metodologicamente qualitativa, visou caracterizar esse processo a partir dos professores que atuam nessas disciplinas. O referencial que fundamentou este estudo consistiu na produção teórica sobre Livro Didático e Políticas Curriculares da área de Educação e Educação em Ciências. Participaram 102 professores das disciplinas da área. Concluiu-se que os espaços de escolha dos docentes, nesse processo, são limitados pelas condições de trabalho; pela não participação dos docentes na formulação das políticas e nas decisões sobre quais conhecimentos estão e não estão na escola; as limitações na presença e organização dos conhecimentos nos LD e o risco do empobrecimento da formação dos estudantes, mas, evidencia-se o comprometimento dos docentes com a formação dos estudantes diante das limitações.

**Palavras-Chave:** BNCC; Livro Didático; PNLD

## **INTRODUCTION**

The National Textbook Program (PNLD) (PNLD is an acronym for *Programa Nacional do Livro Didático*, in Portuguese) was created as provided by Decree-Law No. 91,542/1985 (BRASIL, 1985). This was an important step for Brazilian education concerning the systematic and free distribution of textbooks (LD) (LD is an acronym for *Livros Didáticos* in Portuguese) to all public basic education students in the country. It is a Government Program where the collections available for choice by teachers of Brazilian public schools undergo evaluation by specialists who analyze aspects related to the physical and pedagogical quality of the LD. After the selection of the didactic material, the result is published in the Textbook Guide (from now on just called guide), accessed online, in order to allow teachers to choose the LD that seems most appropriate. Since 2009, textbooks have been distributed for the subjects that make up the area of Natural Sciences, namely: Biology, Chemistry, and Physics.

In January 2010, Decree No. 7,084 (Decreto n 7,084, 2010) regulated the evaluation and distribution of teaching materials for all basic education, thereby guaranteeing regularity in distribution. The evaluation process, the choice, and the acquisition of works occurred periodically, ensuring alternating three-year cycles that interspersed the early years of elementary school, the later years of elementary school, and high school.

As of Decree No. 9,099/2017 (Decreto n 9,099, 2017), the program changes its name and is now called the National Program for Books and Teaching Materials, while maintaining the same acronym PNLD. From that year on, there is an expansion in the action of the program that starts to evaluate and make available didactic, pedagogical, and literary works, software, educational games, and training materials also aimed at school management. The Program also begins to address the teaching segment of Early Childhood Education, which was not previously covered, extending the textbook renewal cycle from 3 years to 4 years, to meet the textbook exchange for a given segment per year.

Regarding the choice of textbooks, since 1996 the books that arrive at schools are chosen by the teacher of the subject, following the Guide. This aims to present the main characteristics of the approved collections, through reviews prepared after the evaluation made by specialist teachers from different areas of knowledge, from several regions of Brazil. (FNDE, 2015). With the information contained in the Guide, the teacher is better able to select a collection that will help them in their classroom activities and that is in line with the daily lives of their students. (FNDE, 2015).

Since 1930, the history of textbooks in Brazil has been nothing more than a sequence of decrees, laws, and government measures that have unfolded in a disorderly manner, leading to the conclusion that textbooks do not have a distinct history in the country (Freitag; Motta & Costa, 1987). The selection of textbooks by teachers has fluctuated over time, with periods in which they had control over the selection and others when they did not. The assessment of textbook quality over time is another aspect that deserves attention, as there have been periods with no quality control in place. According to El-Hani, Roque and Rocha (2011, p. 232), the PNLD:

*"[...] can also contribute to establishing a general standard of quality for educational materials published in our country, without necessarily homogenizing them, as the diversity of qualities exhibited by the approved materials indicates. To avoid homogenization, it is very important to maintain a wide range of criteria guiding the evaluation process of the materials."*

After many changes that range from distributing textbooks only to disadvantaged students to even not distributing textbooks by the government, despite this action being mandated by the Constitution in force at the time, there has been progress in the textbook policy in Brazil. Nowadays, there is a free and systematic distribution of textbooks that have been evaluated by experts and chosen by teachers. The books are provided to students in the Brazilian public basic education system and are reused for a period of four years, requiring organization and a significant number of resources from the federal government<sup>1</sup>. Given the substantial investment by the federal government, it is important to reflect on the role of the textbook.

### **Functions of the Textbook**

According to Choppin (2004), school textbooks have four essential functions that can vary significantly depending on the sociocultural environment, period, subjects, educational levels, methods, and modes of use. The first function mentioned by the author is the referential, curricular, or programmatic function, where the textbook serves as a faithful translator of the curriculum or teaching program, provided that one exists. The

<sup>1</sup> For access to the funds spent on PNLD: <https://www.fnde.gov.br/index.php/programas/programas-do-livro/pnld/dados-estatisticos>

textbook, therefore, serves as a "privileged support for educational content, a repository of knowledge, techniques, or even skills that a particular social group deems necessary to transmit to the new generations" (Choppin, 2004, p. 553).

The second function, referred to as instrumental by the author, refers to what the textbook can offer in terms of learning strategies since it presents exercises or other types of activities aimed at facilitating the memorization of knowledge or problem-solving. The third and oldest function, according to Choppin (2004), is the ideological and cultural one. This function tends to cultivate or even indoctrinate the young generations in an explicit, systematic, and ostensive manner. Since the textbook is a human production, it carries in itself ideologies, cultures, and philosophical aspects of its authors within itself. The fourth and final function performed by the textbook is documentary. This is not a universal function and is found only in pedagogical environments that prioritize the child's personal initiative, aiming to promote their autonomy, assuming a high level of teacher training as well.

Choppin (2004) does not point out differences in the functions of the textbook based on the users, whereas Gérard and Roegiers (1998) consider the two main users of the textbook to indicate its general functions: those related to the student and those related to the teaching.

When considering the student, the functions are directly related to the learning that takes place in and outside the school context. According to the authors, these functions concern the transmission of knowledge, the development of skills and competencies, consolidation, evaluation, and assistance in the integration of acquired knowledge or even reference and social and cultural education. When the focus is on the teacher, the authors highlight the functions of scientific and general information, pedagogical training linked to the subject, assistance in learning and classroom management, and aid in the assessment of students' achievements.

The scientific and general information function is related to the teacher's search for information, providing them with indispensable knowledge in their teaching practice. The second function of the textbook for teachers, according to Gérard and Roegiers (1998) - pedagogical training linked to the subject - refers to the continuing education of teachers, providing them with various clues on how to improve or even renew their practice. According to the authors, even a student's book without the accompaniment of a teacher's manual can fulfill this function, as the indications, activities, and types of documents it contains "can lead the teacher to be more attentive to the students' possibilities." (Gérard & Roegiers, 1998, p. 90). The function of assistance in learning and classroom management provides the teacher with numerous tools that enable learning to improve day by day. The function of aid in the evaluation of acquisitions helps with the evaluation instruments that can be proposed in the student's or teacher's book.

In presenting the functions of the textbook, the authors ultimately indicate common points. The referential function presented by Choppin (2004) is very similar to the functions of scientific and general information and pedagogical training linked to the discipline presented by Gérard and Roegiers (1998). Even with the conceptual errors that some textbooks may contain, it can be considered that they are safer sources of information than those contained, for example, on some Internet websites, since, in the digital universe, anyone can insert any type of information without undergoing a prior evaluation.

Irrespective of the name of the function presented by the authors, the textbook has the role of supporting the content that must be transmitted to the student and the teacher has the role of mediator of this transmission. The establishment of ideal conditions for the activation of the learning process is, for D'Ávila (2008), what mediation consists of, also understood by the author as the act of intervening, but intervening with the capacity for transformation.

Throughout the learning process, the student must assume the position of a learner who actively participates in actions that lead them to learn and change their behavior (Masseto, 2009). The author asserts that a change of attitude and mentality is expected from the student and that they will see the teacher as a partner who can help them in the learning process. The teacher, in turn, can make this process more dynamic, performing with the student the orientation of this learning experience.

Masseto (2009) indicates, among the characteristics of pedagogical mediation, the exchange of experiences, the debate of doubts, questions, or problems, and the creation of exchanges between learning and real society, in which people interact as collaborators to establish connections between acquired knowledge and new concepts. In light of this, the teacher can present to their student, depending on their reality, different knowledge that are often contemplated in the textbooks selected by the teachers themselves, but that need a direction, a mediation. It is incumbent upon the educator to transform the elaborated knowledge, the produced knowledge, into school knowledge (Afonso, 1996).

The textbook should favor, in addition to orientation, a pedagogically effective dialogue between the student and the teacher, so that the presentation, recognition, and assimilation of the object can occur through dialogue (Rangel, 2005). It should also foster an appropriate approach between teacher and student concerning the object of knowledge.

According to Lajolo (1996), it is only through the interaction between the knowledge brought from the world and the knowledge brought by books that knowledge advances. This knowledge brought by the book should be known by the teacher so that, through planning its use, they can choose the best way to establish an important dialogue between what is present in the book, its contents, and behaviors, and what their students think. (Lajolo, 1996).

One of the concerns of teachers should be to make use of books and other available media, learning how to select and utilize them while avoiding their potential dangers, as they exert a great influence on our lives. (Netto; Rosamilha & Dib, 1974).

The mediation of scientific knowledge in the classroom is, according to Lopes (1999), the role of the Science teacher, assisting students in the elaboration of the personal meaning of the means that this knowledge needs to be validated. Science education in the current world should enable people to assess for themselves the scope of a scientific breakthrough news report, without the exaggerations of the media, which end up mythicizing and increasing the public's estrangement towards science. (Lopes, 1999). The student should be able to read or listen to a news article related to the field of science and be able to assess on their own the extent to which it is real or not.

Science teaching should no longer be seen as a simple transmission of concepts, but rather as a process of transforming students' preconceptions, making familiar what was previously unfamiliar to the student by building familiarities between the already known and the unknown (Lopes, 1999).

When choosing a textbook, the teacher often expects this aid from it, since, among its functions, were mentioned the transmission of information, the structuring and organization of learning, and that of guiding the student in the apprehension of knowledge. The choice of the textbook is one of the stages planned in the PNLD. According to the PNLD Guide 2021 (MEC, 2021, p. 16):

*"It is the responsibility of schools and educational networks to ensure that the teaching staff of the school participates democratically in the choice process. To record the participation of teachers in the selection and provide transparency to the process, the decision regarding the choice of instructional materials should be documented through the Minutes of Selection."*

For the process of choosing the textbook to occur, it is important to evaluate the books available in the Guide. According to Gérard and Roegiers (1998), the evaluation prepares for a decision, and the evaluation is an intentional process that must have clear criteria to assist in the decision-making process. The authors also bring the concept of evaluating, which consists of collecting a set of information that is sufficiently relevant and valid in order to examine "the degree of adequacy between this set of information and a set of criteria appropriate to the objectives defined at the start or appropriate in the course of the process, in order to make a decision" (Gérard & Roegiers, 1998, p. 95).

In this context of PNLD and the processes of choosing textbooks, there is currently a debate about the reformulations and political-curricular reorientations underway in Brazil, which directly affect the curricular components and knowledge present and/or absent in the books, in the processes of choice and decision of teachers and in the evaluation of textbooks itself.

Therefore, it is necessary to indicate the political relations that are given between the textbook and the educational and curricular policies in progress via the High School Reform (Lei n 13,415 , 2017) and the National Common Curricular Base - BNCC. (MEC, 2018).

### **The Textbook and the Educational and Curricular Policies via the Common National Curriculum Base**

The processes of choice and decisions of teachers regarding the textbooks that will be used in their classes and schools are not disconnected from the network of relations and political disputes posed to Brazilian education, especially public education.

In this direction, it is essential to emphasize the context of reorientations and curricular reformulations in which the textbooks emerge and the focus of this research, which investigates the choice of textbooks of

Natural Sciences by area of knowledge, by teachers of Physics, Chemistry, and Biology, who work in high school. This enhances the cruciality of the High School Reform (Lei n 13,415, 2017) and the implementation of the BNCC (MEC, 2018) as political actions of these reforms.

The impeachment of President Dilma Rousseff (PT) followed by the investiture of President Temer (MDB) in 2016, marks the beginning of the radicalization of neoliberal policies increasingly associated with the private interests of the business community. Amid these policies, educational policies are inserted.

Among these educational policies, Temer decrees Provisional Measure 746/2016, which later becomes Law No. 13,415, of February 16, 2017 (Lei n 13,415, 2017), which, by reformulating Art. 36 of Law No. 9,394, of December 20, 1996, creates the New High School System. (acronym NEM, in Portuguese). This movement did not occur in a consensual way, there was the occupation of schools by secondary students, teacher claims, and scientific associations in the area of Education, in the struggle for quality public education, with a humanistic character of broad human formation (Laval, 2019). Even in the face of struggles and resistance, the process of implementing the NEM remained.

The claims in favor of broad humanistic education, typical of the republican school, emerge because of the High School Reform (Lei n 13,415, 2017) and its changes in the Law of Guidelines and Bases of National Education - LDBEN (BRASIL, 1996), point to the emptying of knowledge in this stage of education of Brazilians. The Reform of High School structures it by areas of knowledge, in a way that students start to attend in the first year a general basic training of the disciplinary knowledge of the areas already mentioned, and in the other two years, they start to attend formative itineraries according to the areas of knowledge and itineraries available by the education system and the school.

High school curricula should also consider the socio-emotional competencies, and the life project, with the BNCC as the document that aims to guarantee the set of essential learning to be studied in schools and the reference for national evaluations. This synthesis of the structure of the NEM and its relationship with the BNCC is detailed in section IV of the LDBEN updated by the Reform of Secondary Education (Lei n 9,394, 1996).

Associated with this, the BNCC, also built with little consultation with primary and higher education teachers, but with the support of the education industry, presents the knowledge provided for secondary education by areas of knowledge. This knowledge is presented in the form of learning objects, in dialog with the conceptions of the right to learning; articulated with the conceptions of lifelong learning from a utilitarian perspective (Laval, 2019), and focused on the formation of socio-emotional competencies and, at the same time, on the fine line of proposing a minimum and controlled curriculum to be taught.

It is emphasized that in the processes of construction of the BNCC and the reform of Secondary Education, it is not possible to carry out a linear analysis of the facts, but a dialectical analysis based on the contradictions and non-linearity of the historical and chronological aspects, which are fundamental to historicize the object of study in question and the interests in dispute.

According to the study of the researcher Michetti (2020, p. 2), the genesis of this document takes place in a social space permeated by "strategies of legitimation, consensualization, and discursive concertation put in place by the agents who sought to establish it, focusing on the performance of foundations and family and corporate institutes", but in this space of dispute are also present researchers in the field of education, teachers in primary and higher education, scientific associations and popular movements for public education, competing for projects of education and society beyond those advocated by foundations and family and corporate institutes.

Michetti (2020, p. 1) also points out that several studies have been devoted to analyzing the performance of nonprofit social organizations that involve the business community in policy formulation. According to the researcher, some studies analyze the performance of organizations in a more general way, some studies examine specific institutions and programs, and others that analyze the BNCC itself in a more specific way.

Considering the research already conducted and in progress on the subject, such as Ferreti and Silva (2017), Hypólito (2019), Michetti (2020), Santos and Ferreira (2020), Souza (2018; 2022), among the main analyses and criticisms of the BNCC are its alignment with global and local capitalist neoliberal policies, the emptying of knowledge, and the standardization of the curriculum aligned with the risk of a minimum curriculum. This becomes the education offered to the working class and the formation of Brazilian youth.

Linked to the emptying of knowledge historically produced by humanity in the curricular proposals through the BNCC, in High School, there is also the inclusion of entrepreneurship education and socioemotional skills development. This highlights the formative process of a new type of worker, an entrepreneurial and flexible worker, based on meritocracy and the management of psychological suffering and failures through socio-emotional competencies and life projects. (Safatle; Silva Junior & Dunker; 2021).

In this context, if schools start offering flexible knowledge and a semi-education, the role of knowledge in schools also changes. It no longer prioritizes the social function of education but rather promotes an entrepreneurial function of knowledge, that is determining which knowledge is necessary for students to become entrepreneurs, not just in the sense of creating innovative artifacts or generating extra income, although this already poses its own set of problems.; the conception of entrepreneurship articulated with socio-emotional competencies in the new High School through the BNCC points to a self-entrepreneurship, focusing on the formation of subjectivity of this worker, detached from the structural conditions in which social and educational inequalities are rooted, and focuses on the individual, meritocracy, resilience, and life project within the meritocratic and individualistic logic of contemporary capitalist and neoliberal society, placing the individual as solely responsible for their actions, regardless of their social conditions of life.

In this relationship where the role of knowledge in schools is reconfigured, the school itself also changes its role and becomes a provider of flexible knowledge to shape the flexible and self-entrepreneurial worker. In dialogue with Laval (2019) and Souza (2022), it is considered that educational policies in the current context of capitalist and neoliberal society are also guided by a new configuration of the State, the Market-State. Thus, the interests of the school as a service provider and the formation of the flexible worker are articulated to the logic of the market, also through educational policies formulated in partnership with the education industry. (Freitas, 2018; Peroni, 2020).

In these reconfigurations of the school, Souza (2022, p. 140) from Laval (2019), points out the following contrasts

*“The educational policies that shape the role and function of schools, guided and managed within the Market-State, align with the interests of schools as providers of individual services, which are associated with further contrasts, such as:*

*(1) While schools used to be the place for teaching and learning knowledge, from the neoliberal perspective, they become institutions that develop competencies and skills. Schools no longer focus on being the locus of knowledge, but rather the locus of competencies for the market.*

*(2) If the teacher was the mediator of knowledge and there was a pedagogical relationship, in which the teacher provides knowledge; in a school with a neoliberal bias, the teacher is the manager of the competencies to be developed in the students, the teacher is the facilitator, or coaching teachers, rather than a knowledgeable individual.*

*(3) The knowledge produced and taught by the republican/humanistic school, which aimed at providing a broad human education, is now considered obsolete. In the neoliberal school, knowledge becomes flexible, depending on the interests of families, students, and policy-makers. The focus shifts towards flexible education for flexible work/jobs, in a society where education and schools are no longer seen as essential - leading to a deschooling effect, while at the same time, there is a pedagogization of social relations as a whole. In other words, people learn in the "school of life."*

In relation to the reconfiguration of the function of the school and the place of knowledge within the school, in this moment of capitalist and neoliberal society, where the emphasis is on the formation of flexible and entrepreneurial workers, the school has become a provider of flexible knowledge that serves individual interests. Educational policies have been formulated with significant influence from the education business sector, within a state-market framework, highlighting the process of privatization of Brazilian education through policy direction, as indicated by Peroni (2020, p. 2): “Processes of public privatization can occur through execution and direction, where the private sector operates directly in the provision of education or in the direction of public policies or schools, while ownership remains public.”.

However, it is not restricted only to a direction of educational policies or policy formulation, there is control of the implementation of policies in everyday school life, whether by the adequacy of textbooks, new guidelines for teacher training and large-scale assessments, which ratifies the finding of the BNCC as a

catalyst for political-educational reforms in Brazil in the history of the present time. As Peroni also points out (2020, p. 3):

*“The state is the one that pays the teachers and even determines which institutions are involved in partnerships or the purchase of educational packages. Meanwhile, the private sector begins to determine the training of teachers, the monitoring, the content of the classes, and the management. It is important to emphasize that the private sector operates with the approval of the public sector since they share the same perspective as the political class, which is why they are hired. [...].*

*“The privatization of education, as a process of capitalization, goes beyond the mere privatization of education; it also means the advance of capitalism. It is a competition for public funds with a profit motive: education becomes capital. This is part of the capitalist development within the education system”.*

In seeking to summarize the debate exposed so far in this article, it is not only the formulation of policies by the education industry that is in dispute and the whole problematic already presented of the function of the school and the place of knowledge in the flexible school and in the training of the entrepreneur, there is also a dispute over the control of the knowledge that is in the school and the work of teachers, which is radicalized by the association between the neoliberals and the neoconservatives. (Apple, 2002; Peroni; Caetano & Arelaro, 2019; Peroni, 2020), because "the interest in the Brazilian BNCC involves both neoliberals and conservatives. The center of this dispute is a project of nation and worker training, in which education becomes the target of the interests of big capital" (Peroni; Caetano & Arelaro; 2019, p. 51).

Therefore, according to the research developed by Portugal and collaborators (2021, p. 46-47), the curricular organization of the New High School can induce:

*“The emptying of the knowledge present in schooling; the deepening of social, educational and economic inequalities considering the important role of social mobility that education occupies in Brazil; the alignment of training for the labor market in the sense of human capital formation and cheap and semi-skilled labor; and the protagonism of social organizations and the education industry in the formulation of Brazilian public educational policies, to the detriment of the participation of basic education teachers, researchers, entities and scientific societies in the area of Education”.*

These elements and critiques of the BNCC may also be associated with the character or mischaracterization of the school in neoliberalism, a school that ceases to be the place of knowledge and becomes a service provider; that offers knowledge according to the student's demands and interest in the formative itinerary, focused on a certain private property of knowledge; that offers knowledge according to how this knowledge forms the subject to be flexible; a flexible school for the formation of a flexible subject for the work world. However, if on the one hand, the school and knowledge are flexible, on the other hand, there is a control of this flexibility.

This control can occur through national examinations that aim to evaluate the implementation of the BNCC; the control of teacher training, as it should be aligned with what will be taught via BNCC, as the Common National Base for Initial Teacher Training - BNC-FI (MEC, 2019) and the Common National Base for Continuing Teacher Education - BNC-FC (MEC, 2020) recommend; control of the production of teaching materials and resources used, as the textbook should also be aligned with the objectives and competencies of the BNCC.

Research developed by Peroni, Caetano and Arelaro (2019), and Rodrigues, Pereira, and Mohr (2021), ratify this alignment of educational and curricular policies around the BNCC, illustrated by the following fragment:

*“We have found an alignment between the proposals for teaching/learning and assessment of basic education with those recommended for teacher training. There are influences of external experiences regarding the prescribed rescaling, but it is noteworthy that the general competencies of the BNCC of Basic Education have the same number and nature as those present in the BNC-Training and BNC-Continuing Education. That is, in addition to teacher training being proposed, for the first time, from the idea of competencies, focusing on the development of practical, efficient, and productive skills, it seeks to erase the training projects that had been developed*

*until then, thus promoting the de-characterization of the teaching profession through control and standardization of educational processes”.* (Rodrigues; Pereira & Mohr, 2021, p. 1).

Regarding the specificities of Educational and Curricular Policies via the National Common Curricular Base for the Natural Sciences, research in the area of Education and Science Teaching (Antunes Júnior; Cavalcanti & Ostermann; 2020; Franco & Munford; 2018; Krützmann, Alves & Silva; 2023; Mattos, Amestoy & Tolentino-Neto; 2022; Munford; 2020; Piccinini & Andrade; 2018; Rodrigues, Pereira & Mohr; 2021; Siqueira & Moradillo; 2022; Santos & Ferreira; 2020; Selles & Oliveira; 2022; Souza; 2018, 2022; Veras *et al.*; 2021), has shown similar aspects to those indicated so far in this article, such as concern over the emptying of knowledge, the implications of the education industry in the formulation and implementation of educational policies, as well as the impacts of this on the place and function of knowledge of Biology, Physics, and Chemistry in the education of Brazilian students.

According to Selles & Oliveira (2022), neoliberal guidelines for the development of curriculum policies challenge the purposes of the school subject Biology, as they lead to the dissolution of biological knowledge within the field of Natural Sciences. However, it is not only the school subject of Biology that is being challenged, but all the disciplines within the field of Natural Sciences, such as Physics and Chemistry, are being diluted within the area and under the consequences of the emptying of knowledge in the structure of the High School Reform, in which the majority of students would only have access to basic knowledge in these subjects, while only a portion of students would have access to further knowledge in Biology, Physics, and Chemistry through educational pathways.

Thus, when analyzing the BNCC and the specificities of the Natural Sciences, in their constitution and historical movement as a state policy with the active participation of the education industry, Piccinini & Andrade (2018, p. 34) indicate that *“there has been no renewal/innovation in the field; conservatism prevails pari passu with the process of linking education in general, and scientific education in particular, to the interests of monopolistic associations focused on education.”*

In this regard, Veras *et al.* research (2021) provides a literature review of articles available on the CAPES Periodicals Portal and Google Scholar on the area of Natural Sciences in the BNCC, covering the period from 2017 to 2021. The study analyzed 38 articles and found that even the articles addressing

*“the same area of knowledge, delve into different issues, with topics related to Practice, Scientific Education, Health, and the structural elements of the BNCC text in its different versions standing out. The articles that analyzed the construction process and the different versions of the BNCC present as points of convergence the perception that the homologated version of this official document has a structure that is contrary to what is expected, by scholars in the area, of education in Sciences”* (Veras *et al.*, 2021, p. 346).

It is noteworthy, in the study by Veras *et al.* (2021) that, among the 38 articles analyzed, 13 address the "development of practices" and "implications in teaching practice" linked to the BNCC and the Natural Sciences, and the most recurrent references in the articles refer to the studies by Alice Casimiro Lopes, Elizabeth Macedo, Michael Apple, Dermeval Saviani, Myriam Krasilchik, Attico Chassot, and Lúcia Sasseron.

Linked to this, considering the relations between the formulation of policies and the context of pedagogical practice, Krützmann, Alves & Silva (2023), present the impacts of the BNCC on the work of science teachers in the final years of elementary school, from the perception of teachers. In the research developed by the authors, four interviews were conducted, which were analyzed from the Grounded Theory, with the following questions: How do you think the BNCC will impact your day-to-day routine in the classroom? and for science teachers, how does the BNCC impact teaching? Among the results of the research by Krützmann, Alves & Silva (2023), it is evident that from the perception of the participating teachers about the BNCC is that there is an expansion of the contents by fragmentation and contextualization, which alters the teachers' performance, as the researchers indicate:

*“The second category was named Expanding the contents through fragmentation and contextualization and is directly related to the contents of the science component and its modifications. Firstly, it is worth highlighting the teachers' perception that there has been an expansion in the content normally worked on by them. [...]. The expansion mentioned above refers mainly to the increase in content related to Physics and Chemistry in the discipline, which was previously more focused on topics close to the training of biologists, such as zoology, anatomy, botany, and*



*ecology, among others. On the other hand, there is an intertwining of different contents in the same school year, for example, fragmenting a coherent unity in teaching and learning. The example brought up by a participant is the study of the human body, where the workload has been reduced because, in the curriculum proposal for the eighth grade, to which the human body theme belongs, other content unrelated to it has been added. This, according to the participating teachers, is a negative point of the BNCC” (Krützmann, Alves & Silva, 2023, p. 10).*

Linked to this, Rodrigues, Pereira and Mohr (2021, p. 3) ratify the problems of this movement of expansion and fragmentation of science knowledge in the BNCC.:

*“Even though there has been an attempt to include knowledge objects related to Geosciences, Physics, and Chemistry since the Early Years, the fragmentation of content persists and has been deepened. For example, knowledge focused on Botany and Zoology was practically erased from the document, as well as the teaching of content related to the study of the Human Body was proposed in an even more fragmented way. In addition, the emphasis on the development of skills related to solving everyday problems limits the learning of issues related to historical, philosophical, and sociological aspects of science, as well as preventing knowledge from being the object of experiments and critical reflections”.*

According to Cavalcanti and Ostermann (2020, p. 152), the propositions of the BNCC for the Natural Sciences do not constitute new guidelines for education with perspectives that promote new initiatives. On the contrary, they reinforce traditional curricular perspectives and the hegemonic discourse for Science Education, not problematizing scientific neutrality, emphasizing myths about the relationships between Science, Technology, and Society, reproducing the linear model of scientific development, and not considering the results of research in the field of Science Education.

Focusing on the textbooks, Art. 21 of Resolution No. 3/2018 (Resolução n 3, 2018), which updates the National Curriculum Guidelines for Secondary Education, provides that for the implementation of these Guidelines articulated to the BNCC, it is incumbent upon the education systems to provide "acquisition, production and/or distribution of adequate teaching and school materials". It was provided in the sole paragraph of Resolution No. 3/2018, after paragraph 34, that:

*“Sole paragraph: The Ministry of Education must align the National Textbook Program (PNLD) and other national programs aimed at distributing textbooks and educational materials, physical and digital resources for students and teachers, to comply with what has been defined for general basic education and educational pathways, organized following these Guidelines.”.*

Thus, as of 2022, high school textbooks that reach Brazilian public schools are no longer disciplinary but organized by areas of knowledge, in accordance with the BNCC, the High School Reform, and the National Curriculum Guidelines for High School.

Briefly presented, these networks of neoliberal political relations that were radicalized after the impeachment of President Dilma Rousseff (PT), especially in Brazilian education, with the High School Reform, the Teacher Training Policies (BNC-FI, BNC-FC), and the textbook, also aligned with the BNCC, it is evident how important it is to study how the processes of selection and decisions of teachers about the textbooks that will be used in their classes and schools take place, in the face of these relations and political disputes that have been imposed on education, disputes in which the educational economy has played a fundamental role and that have challenged educational projects.

In this context of political formulation and disputes, we can ask ourselves rhetorically: do teachers have autonomy in choosing textbooks? How is knowledge provided for science in secondary education given the post-reform curriculum organization, the BNCC, and the textbook? Who selects the knowledge to be taught in school? The market? The industry? The teachers or the BNCC?

The above questions mobilize us to reflect on the work of teaching in this context and on the focus of this research with basic education teachers, as well as to show ways and spaces for teacher autonomy in the face of the orientations and controls constructed by the BNCC.

Therefore, the objective of this research was to characterize the processes and spaces of selection of

textbooks of natural sciences by area of knowledge, by teachers of Physics, Chemistry, and Biology who work in High School; via PNLD - 2021 in the context of the implementation of the BNCC. In the following sections of this article, the methodological aspects that make up this research, the analysis, and the discussion of the data are presented.

## **METHODOLOGY**

In this research, we focused on the selection process that was carried out based on the development of the Guide for the educational works evaluated in the Call Notice No. 3/2019 for the integrative projects in the field of Natural Sciences and their Technologies. This Call Notice conducted the invitation for the registration and evaluation process of educational materials, literary works, and digital resources for the PNLD 2021, aimed at high school students and teachers. Educational materials for integrative projects and life projects for high school were presented and evaluated.

Teachers of basic education in the field of Natural Sciences (Chemistry, Physics, and Biology) participated in the research. These teachers were invited to participate in the research one month after the end of the textbook selection period in public schools in the country, in the year 2021. To participate in the research, teachers received a link to access the Google form and, if they agreed to participate, they had to digitally agree to the informed and voluntary consent form. In the discussion and analysis of the data, when fragments of the data are presented, the participants will not be identified, thus ensuring their anonymity, and will be referred to only as research data.

The data collection instrument consisted of a questionnaire with objective and dissertative questions for the characterization of respondents and on the process of selecting and using the textbook, this instrument is fully included in the appendix of this article. The questions were divided into three sections that addressed: the characterization of the research participants; information about the process of selecting the LD and finally questions related to the use of the LD by the participants.

The data gathered through the questionnaire were organized and systematized using qualitative research techniques (Flick, 2009), and the following categories emerged from the data from the qualitative analysis:

1. The "least empty" collections/books concerning the presence of the knowledge of Physics, Chemistry, and Biology necessary for Secondary Education according to the teachers;
2. The elements of the construction of the textbook and the organization of the knowledge of the curriculum component with the implications of this for the education of students;
3. Day-to-day life, interdisciplinarity, and the protagonism of students, and
4. The alignment of the book to Curricular Policies: BNCC, New High School, State Documents.

Due to space limitations, this article will discuss only the information that deals with the characterization of the participants and the selection process, addressing how this moment was with colleagues in the field of Natural Sciences, positive points, and difficulties encountered. Therefore, the next section presents the analysis and discussion of the data.

## **DATA ANALYSIS AND DISCUSSION**

In this section of the article, we present the data analyzed and discussed in an articulated way in the categories presented, that is, they are not discussed in isolation, but in the articulations between the emerging categories and those presented above. From this point on, we present first the characterization of the research participants and then, in an articulated manner, the discussion of the data that constitute the categories indicated.

As for the characterization of the participants, 103 responses were obtained from the Google form and one of the participants did not accept to participate in the research. Thus, the total number of respondents was 102 teachers, 62 women and 41 men from 15 different states of the country and the Federal District. Most of the teachers (75) were aged between 31 and 50 years old.

Regarding the academic background of the participants, most of them have a degree in Biological Sciences and the others have degrees in Chemistry, Physics, and Natural Sciences. Of the total number of participating teachers, only 4 did not have any type of postgraduate degree at the time of the research.

Table 1 presents the teaching experience, weekly workload, and subjects taught by the research participants.

**Table 1 - Participants' Characterization: Teaching Experience, Weekly Workload, and Taught Subjects.**

Teaching Experience	Up to 20 years of age	Over 21 years old	Over 31 years old
	74 participants	23 participants	5 participants
Weekly Workload	Up to 30 hours a week	Between 31 and 40 hours a week	Over 41 hours a week
	31 participants	45 participants	26 participants
Taught Subjects (a teacher can teach more than one subject simultaneously)	Biology	Nature Sciences	Physics/Chemistry
	85 participants	37 participants	6/17 participants

Source: Survey data (2023). Developed by the researchers.

Given the objective of this research, which is to characterize the processes and spaces of textbook selection for the Natural Sciences by subject area (Physics, Chemistry, and Biology) among high school teachers, within the context of the implementation of the BNCC through PNLD 2021, we can observe that the data emerges from this selection process and is related to the functions of textbooks as presented by Gérard and Roegiers (1998) and Choppin (2004). Therefore, the analysis and discussion of the categories presented above are interconnected.

For the textbook selection process, the Guide, developed based on the Notice nº 3/2019 for the integrative projects in Natural Sciences and their Technologies, included 13 collections that could be consulted and chosen by the teachers<sup>2</sup>.

Regarding the participants in the process of selecting textbooks, half said that only teachers participated in this moment. For the others, in addition to the teachers, the pedagogical coordinator, the principal or vice principal, other school staff, or the community participated, and most of the participation was from the pedagogical coordination.

In this process of choosing textbooks per area of knowledge, a significant number of participants pointed out that it was carried out by voting among Physics, Chemistry, and Biology teachers, however, the data also indicate that the process was not always democratic, as can be seen in the following report: *“in one of the schools, we read the material, discussed it briefly, stated our points of preference and agreed on a vote. In the other, we were not even asked”* (Research data, 2021, p. 6).

The research data indicated that the choice was made quickly, with little time, and with participation weakened by the fact of the teachers' vacations and the lack of working time available to carry out this activity. Below are some fragments of the teachers' responses to these elements:

*“The participation was in one committee and with limited time, as it encompassed our vacation period. Preventing joint participation and broad discussion”.* (Research Data, 2021, p. 4).

*“I did not participate in the selection of textbooks, because the deadline set by the School (or state/federal government bodies) extended through the worker's vacation month (July) and ended at the beginning of August, and there would be no time for me to carry out the analysis in a satisfactory time”.* (Research Data, 2021, p. 5).

*“We made the selection during free periods since we did not have a designated time for discussion or training regarding the textbook choice, which is crucial for the*

<sup>2</sup> Available at: [https://pnld.nees.ufal.br/pnld\\_2021\\_proj\\_int\\_vida/componente-curricular/pnld2021-didatico-ciencias-da-natureza-e-suas-tecnologia](https://pnld.nees.ufal.br/pnld_2021_proj_int_vida/componente-curricular/pnld2021-didatico-ciencias-da-natureza-e-suas-tecnologia) Accessed on Jan. 30, 2023

*upcoming year. It is worth noting that the curriculum for Santa Catarina is not yet finalized, which made the selection process more challenging". (Research Data, 2021, p. 7).*

The fragments presented highlight the impact of teachers' working conditions on the process of selecting textbooks, which undermine the valorization and quality of their work since even though there is the legal provision of non-teaching hours, during which teachers could engage in planning, studying, and analyzing textbooks, it is not always guaranteed in schools, as emphasized by the researcher Grochoska. (2015, p. 102):

*"The approval of Law PSPN 11.738/2008 [National Professional Salary Floor Law], in addition to defining the remuneration, indicates the need for reorganizing the teacher's workload and stipulates that 2/3 of their workload should be allocated to non-teaching hours. However, despite the legal requirement, only a few municipalities and states comply with this provision, as it requires resources for hiring additional professionals.*

*The non-teaching hours, however, should be understood as one of the elements of the teacher's valorization policy, as it affects both educational quality and the teacher's quality of life, since, besides providing moments for planning and study, it also serves as an alternative to prevent the teacher from taking work home, which often becomes overwhelming due to the workload (number of students) and interference affects their living conditions, the time spent with family, leisure, sports, culture, among other aspects."*

Evidencing that only the non-teaching hours would not be sufficient for the work demand of the analysis of textbooks in the collective selection processes, it would be important for public education networks and systems to provide collective workspaces with remuneration for such a task, not generating unpaid work and excessive workload for teachers.

Connected to this, the research subjects indicate that even if the teachers select the textbooks, there are situations in which the states do not adopt the chosen textbooks, as follows:

*"It was a frustrating experience due to the textbook selection process in the field of Science. We made a choice, but the state decided to use the same book in all schools without respecting our selection. Anticipating this, we did not dedicate ourselves to the Biology textbook selection". (Research Data, 2021, p. 6).*

*"It was futile. The same book was chosen for the entire state of Paraná". (Research Data, 2021, p. 6).*

It is worth recalling that the choice of textbooks by teachers is provided for in the PNLD besides the fact that this selection must be made carefully so that this textbook is appropriate to the socioeconomic and cultural context of the students who will be using it. (CHOPPIN, 2004). The choice of a single textbook for the whole state does not seem to favor this adequacy, since the cities have different socioeconomic and cultural contexts.

When questioning the research subjects about the selection process, how it occurred by area of knowledge, and what criteria were adopted, the answers complement each other, since, when describing the processes, the teachers also point out the criteria adopted. One issue addressed by the participants in the process of choosing the textbook deals with the perception of emptying the contents in this material, which can be verified in the following statements:

*"We gathered with the science (nature) teachers to make the selection. We analyzed several collections, around 7 if I'm not mistaken, but we couldn't reach a consensus on good collections. In the end, we chose **the least empty one!**". (Research Data, 2021, p. 7, emphasis added by the author).*

*"After the list of pros and cons, we made a ranking of the 3 best in each subject [physics, chemistry, and biology]. The 2 books we could agree on as the most complete. However, **in all cases, we noticed the absence of content that had been previously covered in our disciplines and that we considered important**". (Research Data, 2021, p. 11, emphasis added by the author).*

*We chose the ones that **contemplated more contents** and taking into account the contents of the other disciplines **since there are collections that do not contemplate certain contents that are essential** for us to proceed with them” (Research Data, 2021, p. 13, emphasis added by the author).*

The participants' statements highlight their perception regarding the emptying of content and knowledge in the Nature Sciences collections presented in the PNLD 2021. This fact may be a reflection of the structure present in the BNCC that must be taken into consideration when preparing this material, with the risk of not approving it if it was not in accordance with the BNCC. In Notice nº3/ 2019 it is established that:

*“The student books are divided into areas of knowledge, with six volumes per area. Each set of six volumes of the student book should address, in an equitable manner, all the general and specific competencies and skills of each area of knowledge (except for the English language in the area of languages and their technologies). When addressing specific skills and competencies, it is important to explicitly articulate their due connection to the general competencies, contemporary themes, and youth cultures, as indicated by the BNCC. (FNDE, 2019, p. 6).”*

This seemingly emptying of content can also impact the students' learning process, since one of the textbook's functions is referential or curricular (Choppin, 2004). As the contents of the didactic works are emptied, the repository of knowledge, as referred to by Choppin (2004), also becomes empty, diminishing or even losing this important function.

The emptying of knowledge indicated by the participants in this research also emerges in other investigations in the field of Education and Science Teaching. Rodrigues, Pereira and Mohr (2021) point to this emptying, highlighting that the fragmentation of knowledge has been deepened; Krützmann, Alves and Silva (2023) also signal this expansion of the presence of Physics and Chemistry knowledge in the BNCC, but it is an expansion in both directions, an expansion of the presence of knowledge and an expansion of the superficiality of their approach and the inconsistencies in the internal organization of this knowledge in the curricular component of Natural Sciences.

This possible emptying of content also reflects on a function that is directly related to students, as it concerns learning and the transmission of knowledge (Gérard & Roegiers, 1998). In this sense, questions related to the elements of the construction of the textbook and the organization of the knowledge of the curricular components were perceived in the participants' statements, with the implications of this for the students' education. Some of the participations are as follows:

*“It was emphasized **the quality of the content, the proposed exercises, the illustrations, the experiences, and the protagonism of the student**”.* (Research Data, 2021, p. 14, emphasis added by the author).

*“Note the **use of images** related to the **texts** and the opening section with the **research proposal**. In addition to supporting texts and practices, **didactic approach, proposed themes, diversified methodology, investigative activities, experimentation**”.* (Research Data, 2021, p. 15, emphasis added by the author).

*“The teachers, by subject area, observed **the content, layout, methodological sequence, spelling, and interactivity**, among other aspects. Then, the subject areas [physics, chemistry, and biology] communicated and established **what would bring less harm to the students' education, as the books focus on some applications** but do not delve into the methodological and sequential process of learning”.* (Research Data, 2021, p. 8, emphasis added by the author).

The participants' statements make clear their concerns about the learning process that the textbook can help with. The instrumental function of the textbook pointed out by Choppin (2004) reflects this criterion adopted by teachers in the process of selection since the textbook can offer teachers strategies to facilitate the learning process, by presenting exercises or other activities that assist in the memorization of knowledge or in the solution of problems by students.

The teachers also point out as a criterion of selection the presence of the student's protagonism and investigative proposals in the textbooks analyzed. This concern is explained by the BNCC's proposal to promote students' protagonism through the investigative approach, and this protagonism should be prompted

by contextualized challenges and problematizations, stimulating students' curiosity and creativity. (MEC, 2018).

In addition, the use of diversified methodologies appears as a criterion adopted for the selection of the material. This search for diversification is important since the textbook is a place for teachers to search for information, exercising this material the function of pedagogical education linked to the discipline, giving clues to the teacher on how to develop their teaching practice. (Gérard & Roegiers, 1998). When the diversification of materials is present in the book, this can serve as a stimulus for the teacher to reflect on this need in their practice and perhaps even to adopt it.

The discussion presented emphasizes the inquiries of the teachers who participated in the research with the place of knowledge in the textbooks, highlighting the category that pointed out the selection by the collections/books "less empty" concerning the presence of the knowledge of Physics, Chemistry, and Biology necessary for High School according to the teachers, however, this category is directly linked to the second category of analysis that refers to the elements of the construction of the textbook and the organization of the knowledge of the curricular component with the implications of this for the training of students.

Nevertheless, considering that the reformulation of the textbooks occurs in the movement of educational reforms catalyzed by the BNCC, as we have already presented at the beginning of this article, the first and second categories are also connected to the fourth category that points to the alignment of the book to the Curricular Policies: BNCC, New High School, State Documents, etc.

In this direction, it is interesting to note the teachers' concern to select books that best comply with the BNCC and their state's curriculum. This indicates a concern on the part of these teachers in the face of the implementation of the BNCC and the new High School curriculum. The alignment of textbooks with curricular policies such as the BNCC, the new High School, and state curricula conforms to the referential, curricular, or programmatic function of the textbook indicated by Choppin (2004), with this material playing the role of "carrying in itself" the teaching program. This selection criterion can be seen in the following statements:

*"The criteria I adopted **took into account the New High School and the Curriculum in motion**". (Research Data, 2021, p. 13, emphasis added by the author).*

*"It was observed that the **best books fit the parameters of the BNCC of High School and the state guidelines** of the teaching modality in question. In addition to defining which of the books would be best used by the students of the school. And that it could be well implemented and worked on by teachers in the area of Natural Sciences." (Research Data, 2021, p. 14, emphasis added by the author).*

*"Whether the material contemplated the **sequence of contents and activities proposed by the BNCC**, and how it related the areas of knowledge with the contextualization of the contents." (Research Data, 2021, p. 15, emphasis added by the author).*

It would appear that the participating teachers looked to the textbooks for support in this time of implementation of new educational policies. It is worth remembering that this was the first textbook selection process that was conducted for secondary education after the approval of the BNCC for High School, which took place in 2018. As presented earlier in the text, the emptying of the contents perceived by the teachers when analyzing the textbooks of the PNLD 2021, reflects this relationship of the textbooks with the BNCC, which is also emptied in contents.

Linked to this discussion, Spinelli Junior and Cássio (2017), when analyzing the contributions of Chemistry teachers to the public consultation of the first version of the BNCC, indicate that "teachers' curricular visions are strongly structured by teaching content, and that many of these visions echo the relationship of these teachers with the official curricula of their own teaching systems" (Spinelli Junior & Cássio, 2017, p. 5511).

Another aspect that deserves attention in the teachers' statements is the criterion that points to the selection of textbooks that would take into account the New High School, considering that the textbooks chosen in the 2021 PNLD arrived in schools in 2022, the year of implementation of the New High School in all Brazilian schools. How does this material effectively assist teachers in this new process? This is a question that has not yet been answered.

Another problematic aspect that arises from these data and the concern of teachers to select books that would better suit what the BNCC proposes, is the following contradiction: on the one hand, this position of teachers concerned with the adequacy to the BNCC emerges from the commitment to work, however, on the other hand, the risk that this concern of teachers may show an alignment with the BNCC without a critical stance of the document, of how it was constructed and of the projects of education and society that are in dispute in the project of construction of the BNCC and of the actions of the education industry.

Nonetheless, even in the face of this contradiction, there are reports in the research data that show the relationship between the emptying of content and the BNCC: *“The BNCC has destroyed the organization of science content. It is a giant step backward in terms of curriculum. We have warned so much, yet we were not heard”*. (Research data, 2021, p. 24).

In the following excerpt, another aspect related to this relationship between the emptying of knowledge, alignment with the BNCC, and the textbook is presented. However, it is not only presented as research data but also as a lament, indicating how teachers participate or do not participate in the formulation of educational policies, in which they are not always heard:

*“In a world where there are discussions about the possibility of a vaccine turning someone into a reptile and beliefs in a flat Earth, it would be important to work on and prioritize the natural sciences even more, however, we were not asked about it; the changes came as suggestions from someone who doesn't even have classroom experience, compressing important subjects and topics. My discontent is so great that I don't even have the energy to discuss any objections. As usual, something has been imposed on us and we will have to comply. And if, by any chance, the method fails, the blame will be entirely on us, once again”*. (Research data, 2021, p. 24-25).

In this direction, when asked about the positive points and difficulties in the process of selecting the textbooks, the research participants signaled aspects that contribute to the articulated analysis of the categories, indicating the relationships that occur between the possible emptying of the contents, with the structural elements of the books and the alignment of the curricular policy via BNCC, highlighting the aspects related to interdisciplinarity, daily life and contextualization.

Considering the positive points, or not so much, in the process of selecting textbooks, we present some fragments that illustrate the most recurrent statements of the participants:

*“By combining the contents of the natural sciences in one collection, it was possible to observe how each area makes use of the book differently”*. (Research data, 2021, p. 16).

*“I notice that interdisciplinary work can be very positive, but in the selection of the textbook it did not occur”*. (Research data, 2021, p. 16).

*“Interdisciplinarity across subjects”*. (Research data, 2021, p. 16).

*“Promotes integration between curricular components”*. (Research data, 2021, p. 16).

*“Comprehensiveness of the area, an affinity between subjects”*. (Research data, 2021, p. 17).

*“I see no positive points”*. (Research data, 2021, p. 17).

*“It was the least bad”*. (Research data, 2021, p. 17).

*“Contents very summarized I could not identify positive points”*. (Research data, 2021, p. 17).

The data reveals criticism of the textbooks, for example, indicating that they had no positive points, however, some statements indicate as positive points, which also consist of criteria used for the choice of the textbook by the participating teachers, the relationship of its content with daily life and interdisciplinarity, as well as contextualization, as the following fragments exemplify:

*“The Natural Sciences group analyzed the **application in everyday life of the subjects** covered in the book, in addition, the language, the figures used, the font size, and the depth*

*of the content were analyzed.”*. (Research data, 2021, p. 10, emphasis added by the author).

*“In my school, we chose collections that prioritized interdisciplinarity”*. (Research data, 2021, p. 11, emphasis added by the author).

*“We hope to have chosen the most contextualized and dynamic book within the reality of our students”*. (Research data, 2021, p. 11, emphasis added by the author).

*“When selecting the textbook, we analyzed the interdisciplinarity and pedagogical practice, we made a study of the works approved by each one. We have selected some of our best tips to guide schools in the process of choosing materials, always prioritizing the student in evidence of the construction of their own learning”*. (Research data a, 2021, p. 11, emphasis added by the author).

Considering the space limitations in this article and the theoretical deepening necessary for the discussion about the conceptions used of interdisciplinarity, day-to-day life, and contextualization in the New High School, in the BNCC, and the curricular policy, in general, which is at the root of the structuring of the textbooks in question, these aspects will be discussed and analyzed in greater depth in future studies.

In the same direction as the positive points, in exposing the difficulties encountered in the choice process, we present the fragments that illustrate the most recurrent statements. However, some difficulties can be of two natures, one more connected to the work of the teacher and the other related to the limitations or negative points that teachers identify in the textbooks analyzed and selected. The following difficulties were highlighted:

*“Confusing guidance and limited time to prepare the selection made the process difficult.”*. (Research data, 2021, p. 16).

*“I noticed a lot of resistance from teachers with the new format”*. (Research data, 2021, p. 19).

*“Teachers working in many schools due to a reduction in the workload of subjects”*. (Research data, 2021, p. 21).

*“Methodological sequence and fragmented contents”*. (Dados de Pesquisa, 2021, p. 19).

*“Finding a book that followed a line of content divided correctly for the 3 grades, but no book contemplated, so we chose the one that least excluded content necessary for a good learning of the students”*. (Research data, 2021, p. 19).

*“Although they are related disciplines, each one has its particularities and dynamics to be worked on, so it was difficult to find a book that met the expectation of each area of knowledge”*. (Research data, 2021, p. 19).

*“The contents that we thought were necessary were very summarized”*. (Research data, 2021, p. 20).

In light of the above, it is clear that the process of selecting the LDs is limited by the working conditions of the teacher since little time is made available for them to analyze the books before making their choice. Another point that deserves attention is the concern of teachers regarding the organization of knowledge present in the textbooks of Nature Sciences for High School and the risk of impoverishment of students' education, but nevertheless, teachers are committed to the education of students, even with the limitations presented.

However, it is worth reflecting on what has been the function of this new textbook, organized by knowledge area, in school. Does the material being distributed assist the teacher and the student in the learning process? How to make the selection process a moment of exchange between teachers, ensuring time for analysis of the textbooks so that the teacher knows the material to be used and discussion so that this is indeed a democratic process? These and other issues still need to be discussed, and this research is but a step along that path.



## CONCLUDING REMARKS

This article sought to characterize the processes and spaces of choice of textbooks of Natural Sciences by area of knowledge, by teachers of Physics, Chemistry and Biology, who work in High School; via PNLD - 2021 in the context of implementation of the BNCC.

Based on the articulated discussion of the emerging categories, it was concluded that the spaces for choice of teachers in this process are limited by working conditions, lack of teacher participation in policy formulation, and decisions regarding which knowledge is and isn't included in schools.

The research data also highlighted that, in the processes and spaces for choosing the textbooks, teachers are concerned with the place and importance of the knowledge of the Natural Sciences in the students' education, by signaling the limitations in the structural elements of the construction of the textbooks, the presence and organization of knowledge in the textbooks, considering the risk of impoverishing the students' education in the Natural Sciences.

Finally, considering the limitation of the article's pages and the expressive number of research data, it is intended to continue the analysis and discussion of the data in future articles, mainly deepening the investigation about the category on day-to-day life, interdisciplinarity, protagonism, and contextualization, elements that appear significantly in the curriculum policy via BNCC and in the participants' statements. However, these terms often emerge in educational documents related to the slogans of educational policy and pedagogical common sense and not necessarily to human formation (Evangelista, 2014), however, it was not possible to further elaborate and present this discussion in this text.

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## APPENDIX

### Data collection instrument

**Research title:** The selection of textbooks of Natural Sciences by knowledge area in High School in the context of the implementation of the BNCC: the processes and decision spaces of teachers.

Teachers of natural sciences, welcome to our research.

This research project aims to characterize the processes and the places of selection of the textbooks of Natural Sciences by area of knowledge, by the Physics, Chemistry and Biology teachers, who work in High School; via the National Textbook Program - 2021 in the context of the implementation of the BNCC.

This research is being developed by Professor. xxxxx of xxxxx of xxxxx of University xxxxx (xxx/xxx) and by Professor xxxxxx of xxxxx of University xxxxx (xx/xxxx).

Your participation is very important for us to understand how the process of selecting the textbook by area of knowledge was carried out in 2021. We ask you to answer this questionnaire until 11:59 pm on September 6, 2021.

Read the Informed Consent Form available at the following link: xxxxx

If you agree to participate in the survey, in the first question of the questionnaire click on YES. This online questionnaire also requests your e-mail address only so that you can receive a copy of your answers, you will not be identified at any point in the survey.

Thank you in advance for your participation!

If you have any questions, please contact us at the following e-mail addresses: xxxxxxx; xxxxxxx

### Questions

#### Participant Characterization

1. Gender.

- Female
- Male
- Other:

2. Age.

- 18 to 25 years.
- 26 to 30 years.
- 31 to 40 years.
- 41 to 50 years.
- 51 to 60 years. Over 61 years old.

3. State in which you reside.

- Acre (AC)
- Alagoas (AL)
- Amapá (AP)
- Amazonas (AM)
- Bahia (BA)
- Ceará (CE)
- Distrito Federal (DF)
- Espírito Santo (ES)
- Goiás (GO)
- Maranhão (MA)
- Mato Grosso (MT)
- Mato Grosso do Sul (MS)
- Minas Gerais (MG)
- Pará (PA)
- Paraíba (PB)
- Paraná (PR)
- Pernambuco (PE)
- Piauí (PI)

- Rio de Janeiro (RJ)
- Rio Grande do Norte (RN)
- Rio Grande do Sul (RS)
- Rondônia (RO)
- Roraima (RR)
- Santa Catarina (SC)
- São Paulo (SP)
- Sergipe (SE)
- Tocantins (TO)

4. City in which you live.

5. Time you have been working as a teacher.

- 1 to 5 years.
- 6 to 10 years.
- 11 to 15 years.
- 16 to 20 years.
- 21 to 25 years.
- 26 to 30 years.
- Over 31 years old.

6. What is your current working regime in hours/class per week?

up to 10 hours/class.

- Between 11 and 20 hours/class.
- Between 21 and 30 hours/class.
- Between 31 and 40 hours/class.
- more than 41 hours/class.

7. What is your current employment relationship?

- Effective Teacher in the Public Sector.
- Substitute Teacher in the Public Sector.
- Teacher in Private Schools and Effective Teacher in the Public Sector.
- Teacher in Private Schools and Substitute Teacher in the Public Sector.
- Other.

8. Academic qualification at the undergraduate level:

- Currently pursuing a Bachelor's degree in Education of Physics or Chemistry or Biological Sciences or Natural Sciences.
- Currently pursuing a Bachelor's degree in Physics or Chemistry or Biological Sciences or Natural Sciences.
- Graduated in Physics.
- Graduated in Chemistry.
- Graduated in Biological Sciences.
- Graduated in Natural Sciences.
- Other.

9. Academic qualification at the postgraduate level. (Check all that apply).

- No postgraduate degree.
- Specialization in Science Education.
- Currently pursuing a Master's degree in Education or Science Education (academic program).
- Master's degree in Education or Science Education (academic program).
- Currently pursuing a Master's degree in Education or Science Education (professional program).
- Master's degree in Education or Science Education (professional program).
- Currently pursuing a Doctoral degree in Education or Science Education.
- Doctoral degree in Education or Science Education.
- Other.

10. Subject you teach (check all that apply).

- Biology.
- Science.
- Physics.
- Chemistry.
- Other.

### **On the textbook selection process**

1. Briefly describe how teachers participated or did not participate, in the process of selecting the textbook in the school(s) where you work:

2. Besides the teachers, did anyone else participate in the process of selecting the textbook for the school(s)?

Yes

No

2.1 If yes indicate who: (check all that apply).

Principal/Vice Principal

Pedagogical coordinator

Staff

Community

Other

3. Briefly describe how the choice of the textbook by subject area took place with your fellow Physics, Chemistry, and Biology teachers.

4. Did you make use of the PNLD 2022 Textbook Guide at any time when choosing the textbook?

Yes

No

4.1 If yes, please write at what moment of the selection it was used:

5. Briefly describe the criteria used to select the textbook by subject area.

6. Point out the positive aspects of the selection of the textbook by area of knowledge.

7. Point out the difficulties of selecting the textbook by subject area with your fellow Physics, Chemistry, and Biology teachers.

8. Would you be willing to participate in a brief interview about the process of selecting the textbook by area of knowledge of Nature Sciences?

Yes

No

8.1 If yes, please leave a phone number or e-mail address so we can contact you:

9. Point out your considerations, which were not contemplated in the questions asked, about the selection of the textbook by area of knowledge of Nature Sciences. Feel free to write what you consider important.

### **About the use of textbooks**

10. Do you use the textbook during your teaching practice?

Yes

No

10.1 If yes, briefly describe how you use it

10.2 If no, justify the reason for not using it.

11. If you would like to make any comments about the textbook, please feel free to do so.