

Science Teaching in the *Base Nacional Comum Curricular* and in the *Currículo Referência de Minas Gerais*: analysis from the perceptions of in-service and pre-service teachers

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Abstract: This work aims to understand how the implementation process of the *Base Nacional Comum Curricular* (BNCC) and the *Currículo Referência de Minas Gerais* (CRMG) of Natural Sciences (NC) of Elementary School II (ES II) occurred in the schools of the Regional Education Superintendence (RES) of Diamantina (MG) — RES/Diamantina. Science teachers from ES and students of the Degree in Biological Sciences at the *Universidade Federal dos Vales do Jequitinhonha e Mucuri* (UFVJM) participated in the research. Discursive Textual Analysis was the methodology used to analyze four pre-established categories: 1) Scope of the curriculum; 2) Implementation of BNCC and CRMG; 3) Influence of BNCC and CRMG on Science Teaching, and 4) Characterization of the curriculum by the science teachers' teaching practice courses. The results indicate that the guidelines established by the BNCC and CRMG for the NC of ES II are a traditional curriculum and distant from an educational project aiming at a critical and emancipatory scientific education.

Keywords: Base Nacional Comum Curricular. Science Teaching. Currículo Referência de Minas Gerais. Public Policy.

La enseñanza de las Ciencias en la Base Nacional Común Curricular y en el Currículo Referência de Minas Gerais: análisis a partir de las percepciones de docentes en activo y en formación inicial

Resumen: Este trabajo tiene como objetivo comprender cómo ocurrió el proceso de implementación de la Base Curricular Común Nacional (BNCC) y el Currículo de Referência de Minas Gerais (CRMG) de Ciencias Naturales (CN) de la Escuela Básica II (EB II) en las escuelas de la Superintendencia Regional de Diamantina (MG). Profesores de ciencias de la EB y estudiantes de la Licenciatura en Ciencias Biológicas de la Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM) participaron de la investigación. El Análisis Textual Discursivo fue la metodología utilizada para analizar cuatro categorías preestablecidas: 1) Alcance del currículo; 2) Implementación de BNCC y CRMG; 3) Influencia del BNCC y del CRMG en la Enseñanza de las Ciencias; y 4) La caracterización del currículo por parte de la pasantía de Ciencias. Los resultados indican que las directrices establecidas por el BNCC y CRMG para la CN de EB II se caracterizan por ser un currículo tradicional y alejado de un proyecto educativo que apunta a una formación científica crítica y emancipadora.

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Palabras clave: Base Nacional Común Curricular. Enseñanza de las Ciencias. Currículo Referência de Minas Gerais. Políticas Públicas.

O ensino de Ciências na Base Nacional Comum Curricular e no Currículo Referência de Minas Gerais: análise a partir das percepções dos professores atuantes e em formação inicial

Resumo: Este trabalho tem o objetivo de compreender como ocorreu o processo de implementação da Base Nacional Comum Curricular (BNCC) e do Currículo Referência de Minas Gerais (CRMG) de Ciências da Natureza (CN) do Ensino Fundamental II (EF II) nas escolas da Superintendência Regional de Diamantina (MG). Participaram da pesquisa professores de Ciências do EF e discentes do curso de Licenciatura em Ciências Biológicas da Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM). A Análise Textual Discursiva foi a metodologia utilizada para analisar quatro categorias pré-estabelecidas: 1) Abrangência do currículo; 2) Implementação da BNCC e do CRMG; 3) Influência da BNCC e do CRMG no Ensino de Ciências; e 4) A caracterização do currículo pelo estágio de Ciências. Os resultados indicam que as diretrizes estabelecidas pela BNCC e CRMG para a CN do EF II são caracterizadas como um currículo tradicional e distantes de um projeto educativo que visa uma educação científica crítica e emancipatória.

Palavras-chave: Base Nacional Comum Curricular. Ensino de Ciências. Currículo Referência de Minas Gerais. Políticas Públicas.

1 Introductory aspects³

The initial pages of Resolution CNE/CP n. 2, of December 22, 2017, which institutes and guides the implementation of the *Base Nacional Comum Curricular (BNCC)* (BRASIL, 2017), specifically that of Elementary School (ES), presents not a curriculum but, as the name implies, a base, a curricular guidance document that indicates the competencies and skills that all students are expected to develop throughout the school journey.

Based on the guidelines of the ES *BNCC*, the *Currículo Referência de Minas Gerais* (CRMG) was prepared for Elementary School, approved in December 2018, resulting from a review of the curricula of all Minas Gerais educational networks (MINAS GERAIS, 2018). This document is the result of the collaboration regime established between the Secretary of Education of the State of Minas Gerais (SEE/MG) and the National Union of Municipal Education Directors of Minas Gerais, Minas Gerais Section (UNDIME/MG). For the construction of the CRMG, groups from different regions of the state got together to shape it, incorporating the guidelines and

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regulations of the BNCC.

As educators in this current context of setbacks and dismantling of education, science, and technology, some initial reflections emerge: Can the BNCC and the ES CRMG promote, even if minimally, an equitable education? In the scope of Scientific Literacy, mentioned in the BNCC and CRMG, can the objects of knowledge and the proposed skills develop scientific knowledge in students in such a way that they help them to understand, act, and transform the context in which they are inserted?

Thus, this work seeks to answer the following research question: *What do active teachers and those in initial training think about the Science curriculum, and how are schools implementing the BNCC and CRMG in Science Teaching in ES II?*

In seeking to verify how the discussion and implementation of the Science curriculum based on the BNCC are taking place, this study has as its main objective: to understand how the discussion and implementation of the Science curriculum based on the BNCC and the CRMG of ES II took place in the schools of some municipalities of the Regional Education Superintendence (RES) of Diamantina (MG) — RES/Diamantina.

Furthermore, the specific objectives of this research consisted of 1) Characterizing the scope, applicability, and purpose for the implementation of the BNCC proposals in Science Teaching; 2) Verifying the occurrence of the implementation and influence of the BNCC and the CRMG in Science Teaching in the schools of RES in Diamantina (MG); and, finally, 3) Identifying in the Science teaching practice course reports of the application of BNCC and CRMG in Science Teaching in schools of RES in Diamantina (MG).

There are many questions, criticisms, and doubts from teachers and researchers in Education and Science Teaching about how schools are adapting to the new guidelines of the BNCC and CRMG for Elementary School, which justifies this research in the current educational scenario: it is important to understand, deepen, and investigate the issues related to the planning of the implementation of these new curricula, in particular in ES. In other words, this research is justified because it aims to understand what in fact educators think, how much they know about these regulations, and what actions they intend to adopt.

2 Path taken by curricula from their theories

During the investigative process proposed in this work, some characterizations and reflections deserve to be addressed from the legislation referring to the BNCC of the ES (BRASIL, 2017), CRMG (MINAS GERAIS, 2018) and the works developed by authors who debate the “curriculum” and discuss it as essential for the field of Basic Education.

The curriculum has always been seen as a means for understanding and organizing the educational process. Studies on this theme imply evidence that demonstrates its different compositions and particularities, whether social, economic, political, or cultural (SILVA, 2009). Only from the study of the evidence that guides the curriculum can we understand it, noting that all of them have their historical landmark in education.

Thus, to conduct our analysis, we initially rescued the works of Silva (1999), Silva (2009), and Lopes and Macedo (2011), which present the “curriculum theories” as traditional, critical, and post-critical, bringing evidence and ways to compose the curriculum, instead of just discussing its content. According to Silva (2009), even if a curriculum — or the discourse referring to it — only intends to describe it, what is done is to produce a notion of curriculum, valuing school knowledge and contextualizing it with everyday life. The so-called “curriculum theories” and “educational theories” (which are broader) are loaded with statements about how things should be (SILVA, 2009).

For Silva (2009) and Lopes and Macedo (2011), curriculum theories are characterized by their conceptions and assumptions, as summarized in Table 1.

Table 1: Curricular Theories

Theory	curriculum design	assumption
Traditional	Curriculum as a program. Curriculum as a regulatory instrument.	Rationalization of the educational space and pedagogical work guided by the principles of effectiveness and efficiency. Control. Approximation of the factory model. Goals and productivity. Results assessment.
Critical	Curriculum as a project of society. Curriculum as an instrument of domination or emancipation.	Power relationship between classes. Denunciations: hidden curriculum, invisible pedagogy, reproduction of the dominant ideology in covert educational practices. Emphasis shift from: what to teach, what for,

	reproductive instrument.	and to whom.
Post-critical	Curriculum as an identity project. Curriculum as a practice of meaning.	Fragmented modern identities. Studies on the differences. Subjectivity and meaning. Crisis of the project of modernity. Criticism of the concept of ideology. Discourse and power relations.

Source: Adapted from Silva (2009, p. 17).

As seen in Table 1, traditional curriculum theories were influenced by the capitalist system, which organized student learning mechanically, without concern for contextualizing everyday needs, that is, without paying attention to learning that made sense to the student (LOPES and MACEDO, 2011). For Silva (2009), the traditional theory of the curriculum works in search of neutrality, having as its main purpose the promotion and recognition of the objects of education in schools, enabling a general and academic education.

In the 1960s, several social and cultural movements aimed to explicitly question society and its organizations (LOPES and MACEDO, 2011; SILVA, 1999; 2009). Thus, the first theories were born questioning the thinking and educational structure of that period, particularly the traditional conceptions of curriculum. Based on the dialectical-critical theory of Karl Marx (1818-1883), the critical theories that emerged attempted to understand the real role of the curriculum. Silva (2009) said:

[...] critical curriculum theories produce a complete inversion of the foundations of traditional theories [...]. Critical theories of curriculum, by contrast, begin by calling into question precisely the assumptions of present social and educational arrangements. Critical theories distrust the *status quo*, blaming it for social inequalities and injustices. (SILVA, 2009, p. 29-30).

Thus, with the school being identified as selective and excluding, the social movements made many criticisms that revealed dissatisfaction. These movements were the denounciators of the constant omission of education, centered on a traditional curriculum and emptying contents that were passed on vaguely, without any real meaning. Discovering other curricular options was the alternative found by these movements, which influenced the way of thinking and doing school in modernity. Thus, Eyng (2015) states that:

Critical theories operate the fundamental concepts of: "ideology, cultural and

social reproduction, power, social class, capitalism, social relations of production, awareness, emancipation, and liberation, hidden curriculum, resistance” (SILVA, 2009, p. 17). Such concepts support the understanding that curricula are ideologically situated and inserted in power relations, especially in the interests of class struggles. In this line, the curricula are understood as a space of resistance, as a way of liberation from economic-capitalist oppression, and the possibility of emancipation based on awareness. (EYNG, 2015, p. 36).

Although it is not a theory per se, one cannot fail to reflect on the *hidden curriculum* that marks the daily life of educational processes because it is always present. According to Silva (2009, p. 78), “the hidden curriculum is constituted from aspects existing in the school environment that, without being part of the official curriculum, contribute, in a contained way, to relevant social learning,” i.e., the hidden curriculum is driven by the implicit actions that cut across school institutions. These actions are present but not in a planned or organized way in the curriculum.

Despite being covered up, the hidden curriculum plays a significant role in school functioning. For this reason, it must be unveiled to allow the understanding of what such knowledge and practices suggest so that “it is possible to ensure the school as a space for guaranteeing the right to social quality” (EYNG, 2015, p. 13).

When looking at the theoretical basis of post-critical theories, the main authors bring a multiculturalist conception to the curriculum that highlights the numerous diversities existing in the world (SILVA, 2009).

Eyng (2015) underscores that:

Post-critical theories operate the fundamental concepts of: “identity, otherness, difference, subjectivity, meaning and discourse, knowledge-power, representation, culture, gender, race, ethnicity, sexuality, multiculturalism” (SILVA, 2009, p. 17). In this line of theorization, curricula work as practices of subjectivation, meaning, and discourses produced in knowledge-power relations, with curricula being understood as forms of selection and representation of culture, comprising demands of issues of gender, race, ethnicity, sexuality, and multiculturalism. Curricula produce heterogeneous and diverse identities, which, in a dialogical and ethical process, enable emancipation based on active citizenship. (EYNG, 2015, p. 37).

As described by Eyng (2015) and Silva (2009), multiculturalism is a reaction against the dominant curriculum that favors a specific social layer. Silva (2009, p. 85) states that “multiculturalism is a legitimate claim by dominated cultural groups to have their cultural forms recognized and represented nationally.”

From the reflections on the theories of the curriculum, its understanding has a

political-social meaning and cannot be neutrally presented. Throughout the history of teaching, curricular perspectives have demonstrated pedagogical actions and ways of teaching that were determined by the social, economic, and cultural conditions that describe the role of the school, students, and educators in the curriculum. It is also possible to observe that power relations interfere with the constitution of the school curriculum and with the way it welcomes or excludes those who participate in it.

3 The prescribed curriculum: guidelines from a *Base Nacional Comum curricular* for science education in elementary school

In Brazil, compulsory education was established during the schooling period of Elementary School and High School through Art. 4 of the *Lei de Diretrizes e Bases da Educação Nacional* (LDB) 9394/96 (BRASIL, 1996) and expanded in the *Plano Nacional de Educação* (PNE) (2014-2024) to children from 4 to 17 years old (BRASIL, 2014). Thus, as in other countries, this obligation is based on a basic philosophy of compulsory education, which provides for “the reduction of inequalities of origin among citizens” (SACRISTÁN and GOMEZ, 1998, p. 171).

Faced with compulsory education, the common curriculum is essential to offer the development of the population as a society in a fundamental way. The need for a curriculum that can meet the entire Brazilian school population is under debate, and according to the Ministry of Education (MEC) (BRASIL, 2017, p. 1), the BNCC seeks to “[...] to promote the right of all students to learn.”

According to the MEC (BRASIL, 2017), the construction of the *Base* followed careful steps. The official website of the BNCC⁴ brings information that explains its construction, being noticeable the concern to explain “what it is,” “why,” and “what for” a *Base* in the Brazilian Education System that many researchers and specialists in the field of education do not accept (ALVES and DA SILVA, 2020; CARREIRA, 2019; SILVA, 2018).

There are many criticisms of the BNCC, especially regarding its linkage with specific formats of systemic evaluation (RANULFO; FERNANDES, and ALLAIN, 2019), resulting in a restricted concept of educational quality; standardization of teaching materials and teacher education courses; influence of business forces in its construction; reinforced cultural marginalization absence of reflections put and

⁴Available at: <http://basenacionalcomum.mec.gov.br>

discussed by the fields of daily life and curriculum for almost 50 years; accountability and blaming of learners for failure in education, etc. (ALVES and DA SILVA, 2020; CARREIRA, 2019; SILVA, 2018).

Since the beginning of its implementation, the BNCC has brought changes in the way of working with learning by developing skills instead of determining which content should be taught. In Science Teaching, the ES BNCC reinforces the importance of Scientific Literacy (SL), defining that Science should be used from a neoliberal perspective, as a tool to provide students with the ability to understand and interpret the natural, social, and technological world, but aiming at productivity (RANULFO; FERNANDES, and ALLAIN, 2019).

In the BNCC, the SL is characterized mainly for involving the learner's ability to understand and interpret the world and transform it from theoretical and scientific bases in a procedural way (BRASIL, 2017). Sasseron and Carvalho (2011) investigated the concept of Scientific Literacy, stating that although there is a "semantic plurality" between Scientific Literacy, as proposed in the BNCC, they realize that the discussions and concerns about Science Teaching are the same: contributing to the construction of "practical benefits for people, society and the environment" (SASSERON and CARVALHO, 2011, p. 60), through teaching that aims at citizen education with the mastery and use of knowledge scientific.

The Science Teaching proposed by the BNCC (BRASIL, 2017) suggests organizing learning situations emerging from challenging issues. A good part of the actions that take place in the educational space is not in the explicit curriculum of the ES BNCC in the form of Thematic Units, Objects of Knowledge, and Skills, but is part of an unofficial curriculum, as discussed earlier: the hidden curriculum. An example of this curriculum is when the ES BNCC mentions that "the school, as a space for learning and inclusive democracy, must be strengthened in the coercive practice of non-discrimination, non-prejudice, and respect for differences and diversities" (BRASIL, 2017, p. 14). However, the document presents a contradiction with the suppression of the terms "gender" and "sexuality," the latter being articulated only to the notions of basic health, different from what was proposed, for example, in the *Parâmetros Curriculares Nacionais* (PCN) of the ES (BRAZIL, 1998).

For Basílio (2017), dealing with gender and sexuality at school is essential to break with violence and the traditional way in which men and women are socialized,

as the school is a space to exercise citizenship for the benefit of equity:

Discussing gender is addressing a set of structural problems in the country, such as violence against women, rape culture, wage inequality between men and women, the murders of transvestites and transgender people (Brazil is the country that kills the most of this population in the world), the predominant model of aesthetics that disqualifies, for example, black women. (BASÍLIO, 2017, s/p).

Suppressing these themes from the BNCC reflects a traditional curriculum and a conservative view as a threat to the so-called “traditional family,” but, above all, it moves away from a critical curriculum by disregarding the debates of educators and academics, research, and achievements of the social movements in search of equality of rights. The process that followed until the final drafting of the BNCC was loaded with various influences: international organizations, political agents, and policymakers (ALVES and DA SILVA, 2020; CARREIRA, 2019; SILVA, 2018).

Such a state of influence that emphasizes the political aspect of the initial and final texts of the ES BNCC exposes the effects of ideology on the perception of power dynamics between different perspectives on educational ideas, curriculum, and quality of education. When comparing, albeit briefly, the first versions and the final text of the ES BNCC, it is clear that, although the structure of its text and its fundamentals are still present, the design of the curriculum, as usual, was emphasized in a list of contents (Objects of Knowledge) and skills that are similar in teaching objectives, as well as the concept of education, limited to school, and Scientific Literacy, aimed at international systemic assessments, especially present in the text from the second version until the final text of the *Base*.

4 The *Currículo Referência de Minas Gerais*

The *Currículo Referência de Minas Gerais* (CRMG) for ES is a document prepared from the educational foundations set out in the Federal Constitution (FC/1988), in the *Lei de Diretrizes e Bases da Educação Nacional* (LDB 9394/96), in the *Plano Nacional de Educação* (PNE/2014), and in the BNCC guidelines (BRASIL, 2017).

The document results from the collaboration between the Secretary of Education of the State of Minas Gerais (SEE/MG) and the National Union of Municipal Education Directors of Minas Gerais (UNDIME/MG). It was produced in a process in

which studies of curriculum documents from different networks — state and municipal — were considered as a fundamental source for the elaboration of a reference curriculum for the entire state. In 2018, a state commission was established by the Secretary of Education of the State of Minas Gerais (SEE/MG), composed of political representatives and an executive committee, to conduct and make decisions, a technical coordination for forwarding the works and groups of resume work to write the document.

The CRMG for ES had its construction in dialogue with the BNCC (BRASIL, 2017), intending to be an opportunity to strengthen the collaboration regime and to consolidate a *Sistema Integrado de Educação Pública* (SIEP) throughout the state of Minas Gerais (MINAS GERAIS, 2018).

When analyzing the CRMG Science Thematic Units (TU) for the ES (MINAS GERAIS, 2018), it appears that there is a complementation of the three TU in the BNCC of the ES (Matter and Energy, Life and Evolution, and The Earth and the Universe) called: Science and Technology, with 33 pre-established skills, aiming at the construction of a contemporary and critical education, in which the student must recognize the role of Science and Technology in everyday life and their impacts on society and the environment (MINAS GERAIS, 2018).

It should be noted that this new UT (which is not in the BNCC) does not make it clear whether it is concerned with contributing to discussions related to the Nature of Science (NoS) and Technology (NoT) or the Scientific Literacy of students. What can be seen is that the new UT emerged due to technological growth, and its impact on the economy and industries, which, according to the CRMG, favors, innovates, and expands the form of production and technological and economic development (MINAS GERAIS, 2018).

5 Methodology

5.1 Research characterization

To achieve the proposed objectives, this research went through the Research Ethics Committee (REC) and was approved under the number CAAE: 36660620.0.0000.5108. Its development was based on a qualitative approach (LAKATOS and MARCONI, 2003), being also presented as exploratory-descriptive and documentary research. The exploratory-descriptive approach consists of

collecting information from a group of actors in science education (teachers and undergraduates) and, using them, deepen and understand the phenomenon to be studied (see general research objective). Thus, this research is exploratory and descriptive for providing greater familiarity with our research problem to answer it by understanding the occurrence of the implementation of BNCC and CRMG in Science Teaching in schools in Diamantina.

According to Lakatos and Marconi (2003, p. 120), this research is also documentary, as it seeks to “collect data from primary sources such as written or unwritten documents belonging to public archives; private archives of institutions and households, and statistical sources.” In this way, the documentary research developed in this work was based on the analysis of data present in the reports of the Supervised Teaching Practice in Science Teaching, of the 2019/2 and 2020/1 classes, of the Degree in Biological Sciences at UFVJM.

5.2 Characterization of the research context, scenario and participants

For the development of this research, 20 teachers who work with the curricular unit Science in ES II (6th to 9th grade) from public and private schools of the Regional Education Superintendence (RES) of Diamantina (MG) – RES/Diamantina, were invited. They were chosen because the group hosted the pre-service teachers of the Degree in Biological Sciences at UFVJM. Therefore, not all RES/Diamantina teachers. The teachers were contacted to participate in the research via email, due to the Covid-19 pandemic context in 2021. Approximately 14 questionnaires were returned, with teachers identified as P1, P2, P3, etc. Table 2 summarizes the number of participants distributed in ten schools in the municipalities of Diamantina, Gouveia, Datas, and Couto de Magalhães de Minas.

Table 2: Characterization of the investigated professors

City	Network	Number of schools	Number of professors contacted	Number of professors who participated in the survey
Diamantina	Public	5	12	8
Diamantina	Private	2	2	1
Datas	Public	1	2	2
Gouveia	Public	1	2	1
Couto de Magalhães de Minas	Public	1	2	2
Total		10	20	14

Source: Own Authorship.

The invited teachers work in the neighboring cities of Diamantina, where the pre-service teachers from the Supervised Teaching Practice Course in Science Teaching the Degree in Biological Sciences at UFVJM in 2019 and 2020 do their training. This fact allows us to correlate the views of pre-service teachers (in the Degree in Biological Sciences) and in-service teachers in Basic Education in Science Teaching.

This research also had the contribution of the undergraduates of the Biological Sciences course at UFVJM who took the Supervised Teaching Practice in Science Teaching in the second half of 2019 and the first half of 2020. According to the UFVJM academic calendar, the first half of 2020 occurred in 2021, as the activities were remote during this period. In all, 20 undergraduates answered the questionnaire sent for data collection and identified for analysis as L1, L2, L3, etc.

5.3 Data collection techniques and instruments

The techniques and instruments used in data collection consisted of sending two questionnaires with open questions in an online form to the participants' email because the Covid-19 pandemic impaired face-to-face application.

The online questionnaire applied to the teachers of the Science subjects of ES II sought to verify their perception about the BNCC and the CRMG in the active school, about how the school prepared (or was being prepared) to comply with the regulations of these curricula, and the possibilities and difficulties found in public and/or private schools in Diamantina and region.

The second questionnaire was applied to the undergraduates via an online form, also seeking to understand their perceptions about the BNCC and the CRMG at the school where they were doing their pre-service training, as they were (or are) present in the school day-to-day and could report other points of view on the applicability of BNCC and CRMG in Basic Education and Science Teaching.

The second data collection technique consisted of documentary and exploratory research on the reports of the pre-service teachers who attended the Supervised Teaching Practice in Science in the second half of 2019 and in 2021 (class 2020/1), in addition to the documentary research of the BNCC and CRMG. Thirty reports were analyzed, identified in the research analysis as Intern 1, Intern 2, Intern 3, etc.

5.4 Data analysis methodology

The collected data were analyzed from the Discursive Textual Analysis (DTA) of Moraes and Galiazzi (2006) and Moraes (2003), which sought to answer the problem and achieve the guiding objectives of the research. DTA is defined as “a data analysis approach that transits between two established forms of analysis in qualitative research, which are: Content Analysis and Discourse Analysis” (MORAES and GALIAZZI, 2006, p. 118). The DTA organizes the research corpus into three stages of data analysis: unitarization, categorization, and metatexts.

1) *Organization of the corpus*: The corpus is formed by textual productions, which “can either be produced especially for research or can be previously existing documents” (MORAES, 2003, p. 194). In this work, the corpus was composed of the ES BNCC (BRAZIL, 2017), the ES CRMG (MINAS GERAIS, 2018), the answers to the questionnaires (answered by the in-service and pre-service teachers), and the reports of the Supervised Teaching Practice in Science Education, classes 2019/2 and 2020/1 (year 2021).

2) *Unitarization*: It consists of a process of deconstruction of the texts of the corpus and, according to Moraes and Galiazzi (2006, p. 118), at this stage, “the texts are separated into units of meaning” and it is necessary to “interpret and isolate elementary ideas of meaning about the investigated themes” (MORAES and GALIAZZI, 2006, p. 123). In this research, the unitarization consisted of carefully re-reading the answers to the questionnaires and the teaching practice reports and separating/defragmenting the relevant texts into units of meaning. In addition, the participants’ opinions in the reports and answers in the questionnaires were separated and defragmented. After completing this process, the different meanings that emerged were analyzed to be categorized and added to this work.

3) *Categorization*: Categorization is a process in which there is a continuous comparison between units of meaning, forming sets of similar elements (MORAES, 2003). The categories can also be pre-established or emerge during the research. For this work, the units of meaning, after being defined in the unitarization, were grouped and organized in order of similarity. Thus, to achieve the objectives of this research, the categories were pre-established, called: 1) *Scope; applicability and purpose of the curriculum*, in order to understand which context the BNCC and CRMG fit in from the curriculum theories; 2) *Implementation of the BNCC and the CRMG in the view of*

science pre-service and in-service teachers, and the 3) *Influence of the BNCC and CRMG on Science Teaching (CE)* for the analysis regarding the questionnaires applied to in-service and pre-service teachers and, finally, the category 4) *The characterization of the curriculum by the Supervised Practice in Science Teaching*, which presents the curricular vision by the undergraduates, based on the obligatory Science teaching practice reports.

4) *Metatext*: Based on the unitarization and categorization of the corpus, the basic structure of the analysis of the phenomenon is constructed in the form of metatexts. The metatexts, according to Moraes (2003, p. 202), “are made up of description and interpretation, representing the set of understanding and theorization of the investigated phenomena.” For this research, the metatexts of each category are present in *the Research Results and Discussion topic*. Thus, the phenomenon investigated emerged from the disassembly of the texts to establish relationships between what was said by the Science in-service and pre-service teachers, opening a multiplicity of meanings on the subject.

6 Research results and discussions

The metatexts presented below, based on the DTA, sought to analyze the categories referring to the BNCC and CRMG of ES II in terms of their scope in relation to curriculum theories, questionnaires, in the view of the ES II Science in-service and pre-service teachers and the reports of the subject Supervised Practice in Science Teaching. Thus, below, the analyses of the categories will be presented in the form of metatexts to represent “the set of understanding and theorization of the investigated phenomenon(s)” (MORAES, 2003, p. 202).

6.1 Scope, applicability, and purpose of the curriculum

Analyzing the characteristics of the BNCC of the ES II (BRASIL, 2017) and the CRMG of the ES II (MINAS GERAIS, 2018), we find controversies regarding their scope, applicability, and purpose.

According to the research participants (teachers and students), we note that although the BNCC and CRMG guide the need for strategies that help the student to participate, discover and experiment, this orientation is still a distant reality.

The participating teachers emphasize that they understand that Science

Teaching is the study that researches, deepens, and describes natural phenomena and countless other topics about life and nature. However, we also observe that even today, despite the changes, the traditional curriculum theory persists through attitudes, actions, and practices in the school, as in the statement of one of the teachers: “[Developing] meaningful classes, contextualization of teaching, adequacy of the curriculum, differentiated and diversified resources at school become words, ideas and memorization” (P3). In this context, there is some disillusionment on the part of the teacher, which is noticed in another teacher’s report: “It is not new that these documents fantasize a school reality, especially public education, which everyone is tired of knowing does not exist” (P7). According to Silva (2009, p. 78), “critical curriculum theories, in contrast, begin by calling into question precisely the assumptions of present social and educational arrangements.”

In turn, P1 emphasizes the importance of thinking about the curriculum critically: “I understand that it means giving a new look to teaching/learning, aiming at the formation of a society with new parameters of knowledge” (P1). However, for teacher P7, teaching Science critically is difficult since its teaching is also related to teachers’ working conditions. The teacher justifies: “I have deadlines, the school demands from us good grades in the assessments, the kids cannot do any playful activity because we are already considered ‘disruptive’ teachers, who do not control the class” (P7).

From the meaning units of educators P1 and P7, it appears that there is a need to rethink the curriculum in a way that does not keep the school in a space with excluding actions, “which teaches conformism, obedience, individualism” (SILVA, 2009, p. 78), but that offers an opportunity to include the student in actions that encourage them to learn for life.

What emerges, in general, from the units of meaning of pre-service and in-service teachers is the feeling that the BNCC of ES II (BRASIL, 2017), which should propose a deep debate on educational topics, following the critical and post-critical theories, was abandoned for political and religious pressure, mainly by obliterating the diversity topic, staying away from the school reality and closer to a traditional curriculum.

6.2 Implementation of the BNCC and the CRMG in the view of science pre-service and in-service teachers

This category aimed to understand how implementing the BNCC and CRMG occurred in the school context. In this sense, the investigated pre-service and in-service teachers understand that:

To standardize teaching so that a student who is transferred from the state of São Paulo to Minas Gerais has the same curriculum base that is studied here in our state. (P5)

The objective of the BNCC is that every child in the national territory, from Oiapoque to Chuí, from North to South, will have access to the same skills. The CRMG, on the other hand, is aimed at the MG scenario, where it addresses anticipated issues of the skills in the BNCC, interspersing with interdisciplinarity and regional issues typical of our state. (P13)

A document created for schools and teachers across the country to be based on, that is, a common document for all regions of Brazil to be in "harmony" regarding what is taught each year in schools. (L1)

The BNCC is a document created by the government to establish norms and guidelines for basic education. (L2)

From these examples of units of meaning for the participating in-service teachers and pre-service teachers, the document referring to the BNCC can be defined as a *prescribed curriculum* since it seeks to "[...] to promote the right of all students to learn" (BRASIL, 2017, p. 1).

At this first moment, the teachers' and the undergraduates' perception is that the BNCC is a standardization of education in regional terms. Young (2014) states that curriculum scholars need to find an answer to the following question: "What should all students know when they leave school?" In the author's view, the definition of a national curriculum is a political strategy that aims to ensure the right of all learners to what he calls "powerful knowledge." However, electing a set of knowledge as essential goes beyond a guideline, as the educational realities of the country are quite different.

For Lopes (2015),

each context implies the possibility of another reading, another context, another possibility. Knowledge, as proposed by the educational guideline, expresses a unique formula that, despite directing regional cultural guidelines as the responsibility of the common curricula of each state, still stands out, listing all schools in the country as equals, which is in line with reality. (p. 457).

In another moment, it seems that, for pre-service and in-service teachers, the BNCC offers, at the national level, education as a right and, therefore, the result of fierce struggles to promote educational rights, unlike *traditional curriculum*. For

example, for P8: *“In short, the BNCC seeks to guarantee the right to quality education, emphasizing the learning and full development of all students.”*

However, the standardization of a curriculum that promotes “educational rights” goes against the exercise of freedom and autonomy by schools, educators, and students. This is reinforced when, despite all the care taken to make difference (regional, of students’ or educators’ realities) a central element in the propositions of the guideline under discussion, the document does not respect the multiplicity of ways of living. In other words, the BNCC goes exactly opposite the understanding that facing inequalities (regional and of the actors in the educational process) goes through the path of respecting the difference and cultural diversity of the country (CARREIRA, 2019).

According to the teachers, the document implementation took place through periodic meetings without them knowing what the BNCC and CRMG were and how they would be executed. An example is P3’s unit of meaning: *“We participated in a meeting, the Regional had already sent the agendas, and we decided whether we agreed or not.”*

Regarding the participation of the school team in the information and interactions related to the implementation of the BNCC and the CRMG of ES II in the school context, most of the teachers surveyed said that the school had not yet brought the matter to the meeting agenda, as can be seen in the speeches of P8: *“During the time I worked at the school, I did not participate in such a discussion”* and P4: *“There has still been no discussion about whether it suits the PPP.”*

In this context, it is considered a worrying fact, since the teaching staffs and the community’s participation in the school decisions is a democratic action, as the decision-making is destined for the educational process and, therefore, all must participate, as highlighted by the *Lei de Diretrizes e Bases*, Law 9394/96 (BRASIL, 1996). Art. 14 of the law establishes that the principle of democratic management is the collective participation of the school and local community members in creating the Political Pedagogical Project and in participating in representative bodies of the school, such as school councils.

6.3 Influence of BNCC and CRMG on Science Teaching

Regarding the influence of curriculum documents to change Science Teaching,

we found that pre-service and in-service teachers believe that: *“The proposal itself is not bad”*(L15); however, they cite difficulties in its implementation and resources for the change is effective for basic education institutions, such as P7: *“ It makes no sense to continue with old methodologies since society asks for this evolution in teaching, but for that, resources need to be offered.”*

The importance of a curriculum document that changes the quality of Science Teaching and life processes to which school society is linked is unquestionable. However, working with Science Teaching as suggested by the BNCC and the EF CRMG goes far beyond teaching content through objects of knowledge and skills and producing results in exams. To change Science Teaching, one possibility is the development of Scientific Literacy, as exemplified by L19:

I believe that the solution for Science Teaching is scientific literacy and, also, working in the form of progression. These changes will be difficult, but taking into account that the world is changing every day, it makes no sense to continue with old methodologies since society asks for this evolution in teaching. (L19)

In the BNCC document for ES, the Natural Sciences area’s commitment to the “development of Scientific Literacy (SL)” is mentioned. The SL, in the BNCC, is defined as the student’s ability to engage with Science-related issues and the idea of Science, thus becoming a “reflective citizen” (BRASIL, 2017). However, the definition presented by the Base is limited and contains terms in which the meaning is unclear, such as the “idea of science,” which opens up numerous interpretations. However, the SL involves the ability to interpret and understand the world, natural and social, with a citizen education (SASSERON and CARVALHO, 2011), i.e., it makes it possible to transform it based on the theoretical and procedural subsidies that the Science Teacher and their acting in and on the world provide.

It is noteworthy that the BNCC brings as a footnote a source used by the reference matrix of the Programme for International Student Assessment (PISA), indicating that the SL aims at “explaining phenomena scientifically,” “evaluating and planning investigations scientifically,” “interpret data and evidence scientifically,” that is, it does not present the cultural and/or civic vision of the SL on reading, understanding, interpreting, or transforming the world (RANULFO; FERNANDES and ALLAIN, 2019).

These vague and confusing definitions that the guideline presents reflect directly

on the CRMG and on the performance of educators who, if they follow what the *Base* and the curriculum established, will not actually be working on Scientific Literacy. This is noticeable in the unit of meaning presented by L13: *“Science teaching has greater emphasis on scientific content focused on practice, which is very interesting since the content is always worked away from the student’s daily life.”*

According to Viecheneski and Carletto (2013, p. 214), the purpose of Science Teaching should be to encourage the student to “better understand the world, make conscious choices and intervene responsibly in the environment in which they live.” Thus, it is necessary that teachers assume the role of intervening in the teaching and learning process in science, as well as in other subjects.

6.4 The characterization of the curriculum by the Supervised Practice in Science Teaching

When analyzing the teaching practice reports, we observed that Science Teaching, developed by the teaching practice supervisor, is based on an *“annual plan and textbook”* (pre-service teacher 9). The trainee states:

Talking to the teacher and seeing the teaching plan, we see that it is done annually at school. According to the teacher, the annual Science plan is made by her alone and there are discussions in the module meetings. The teacher reported that, at the beginning of the year, there are specific meetings to discuss and elaborate the plan, and to do so, the Common Basic Curriculum (CBC) is used as a reference.⁵ In that year [2019], with the reformulation of elementary school, there was the use of the new BNCC for elementary school. When questioning the teacher if she uses the textbook to assist in the elaboration of the teaching plan, she reported that she uses it a lot, because it “is her north” in the classroom, because it contains the contents she will teach, so the teacher uses the book. (I9)

Also, according to pre-service teacher 9, the teaching plan used in the classroom is prepared by the teacher in charge of the classes, according to the textbook (TB) and reviewed in meetings with other teachers. It is also observed that a textbook is a guiding object of scientific education for most teachers because, according to I9, it is *“in it that the contents that she will address are included, therefore, the teacher uses the book.”* This finding also appears in the unit of meaning of I13, when he says that:

⁵The Common Basic Curriculum (CBC) refers to the curriculum proposal that came after the National Curriculum Parameters and that was implemented in state schools in the State of Minas Gerais. The CBC sought to establish the knowledge, skills and competences that would be acquired by students in Basic Education, as well as the goals to be achieved by the teacher each year.

The annual planning is based only on the textbook adopted, not having official documents as a reference, and the approach is conceptual. It is visible that the planning is quite superficial, not presenting the forms of evaluation and the skills it intends to develop in students with the given content. (I13)

Silva (2018, p. 3) defines that the importance of the textbook “is not based only on pedagogical aspects and student learning. In addition to the methodology of propagation of knowledge, the textbook contributes to the complete formation of the individual, involving political, cultural, and scientific aspects”. However, for authors such as Silva (2009) and Macedo (2019), textbooks cannot be considered the only teaching and learning tool in classroom practices, it needs to be an add-on.

In a second moment, we verify that the teaching performance in the classroom could be based on a *“thematic approach in their classes, because, from a central theme presented, the teacher performs a problematization and exposes concepts related to it”* (I10).

According to Delizoicov, Angotti, and Pernambuco (2011, p. 189), Science Teaching based on the Thematic Approach “is a curricular perspective whose organizational logic is structured based on themes, with which the teaching contents of the subjects are selected. In this approach, the scientific conceptualization of programming is subordinated to the theme.” What is seen in the BNCC and CRMG of the ES II is the organization of content into Thematic Units and Objects of Knowledge, which also privileges conceptual aspects to the detriment of contextual ones.

Thinking about the actions proposed by the teaching plan, it seems there is a tendency for the teacher to develop in Science classes the Thematic Approach, in which the scientific concept is used to understand something bigger, a significant theme for the student (DELIZOICOV; ANGOTTI, and PERNAMBUCO, 2011), in addition to the Thematic Units of BNCC and CRMG for ES II. However, we see a strong presence of the conceptual content approach. This is because, according to what was observed and reported: *“the content to be worked on is: algae, bryophytes, pteridophytes, gymnosperms, and angiosperms; if the approach were thematic as proposed by the CBC/BNCC, this content would fit into the theme ‘Environment and Life’ and the sub-theme ‘diversity of life in environments,’* as pointed out by the pre-service teacher I13.

According to Saujat (2004), the teaching activity is a “to weave” and to carry it out, the educator is guided by official prescriptive documents and educational policies.

In this way, the teacher becomes responsible, through their professional and individual experiences, for training their students to live in society. In addition, we noted in the research the teachers' attempt to adopt:

The dialogic expository class that is characterized by the exposition of contents with the active participation of the students, considering their previous knowledge, with the teacher being the mediator for the students to question, interpret, and discuss the object of study. (111)

Given the BNCC and CRMG proposals, and given practices aimed at student participation, the use of textbooks and teaching, from the conceptual approach, runs the risk of causing learning to be based on non-reflective memorization and positivists and unquestionable truths. On the other hand, as a tool to complement learning, the Thematic Approach and the use of different resources and strategies added to the textbook tend to become efficient instruments in the school context. However, their efficiency depends on the science teacher's adequate choice and use.

7 Final considerations

After the analyses to answer this research question, we concluded that the educational processes advance according to what the official educational documents proposed to put into practice the curriculum propositions. However, the approval of the BNCC of ES II (BRAZIL, 2017) shows that the proposed national policy imposes curriculum standardization, determining knowledge as to how to learn it. In the search for an understanding of this guideline, the strong influence of the traditional curriculum is perceived so that the techniques used bring reference to absolute and neutral truth, i.e., the subject becomes the object of a system that oppresses the rights established constitutionally but in an implied way.

Basic Education schools, when adapting to the curricular propositions, present difficulties in establishing connections of their students' learning with society and in forming the subjects in an integral way. The training of students, based on skills, determines what should be developed in schools in a vague way and which encompasses knowledge that facilitates increasingly mechanized learning with the intention that it responds to the evaluation parameters "expected" by the government.

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