The common curricular base and the systematic gap: an evaluation of the contents of the 6th grade mathematics textbooks of the public schools of Santarém-PA, Brazil

A base curricular comum e a defasagem sistemática: uma avaliação dos conteúdos dos livros didáticos de matemática da 6ª série das escolas públicas de Santarém-PA, Brasil

DOI: 10.55905/revconv.17n.1-341

Recebimento dos originais: 22/12/2023
Aceitação para publicação: 24/01/2024

Cleidison da Silva Santos
PhD in Education by Universidad Nacional de Rosario (UNR)
Institution: Instituto Federal de Educação Ciência e Tecnologia do Pará (IFPA)
Address: Santarém – Pará, Brasil
E-mail: cleidison.santos@ifpa.edu.br

Alesandra Lopes Cardoso
Master's student in Education and Technology by Must University
Institution: Secretaria Municipal de Educação de Santarém (SEMED)
Address: Av. Dr. Anísio Chaves - Aeroporto Velho, Santarém – Pará, Brasil
E-mail: alesandrakanteleidison@gmail.com

Edevaldo Maximo da Silva
Master's student in Professional Education by Instituto Federal de Mato Grosso (IFMT)
Institution: Secretaria Estadual de Educação do Mato Grosso (SEDUC - MT)
Address: Cuiabá - Mato Grosso, Brasil
E-mail: needmaximo@yahoo.com.br

Lauro Leocadio da Rosa
PhD in Environmental Physics by Universidade Federal de Mato Grosso (UFMT)
Institution: Instituto Federal de Mato Grosso (IFMT)
Address: Cuiabá - Mato Grosso, Brasil
E-mail: lauro.rosa@ifmt.edu.br

ABSTRACT
The implementation of the National Common Curriculum Base (NCCB) had a significant impact on the content and pedagogy of mathematics textbooks in primary and secondary schools. These skills and competencies emerge vertically as goals in a content proposal common to all Brazilian schools. Specifically, in the teaching of mathematics, the lack of a referent that incorporates a priori forms (mathematical symbols) transforms the act of teaching-learning into a dynamic of transmission of systematically empty contents, devoid of real and applicable meaning. This absence of real-world, culturally relevant examples in textbooks affects students' learning experiences. Therefore, this study analyzes two mathematics textbooks for the 6th grade of
primary school and assesses their alignment with the new NCCB guidelines. We chose the *Fraction and Numerical Expression* content for comparison. We cut out and describe the relationship between the skills and competencies of the new NCCB and the exercise proposals of each book from the perspective of the contents. The analysis reveals a dissociation between content and reality in the book Taláris (mathematics for primary school – last years) promoted by a systematic void derived from the absence of examples that relate to real-life situations. Finally, it is pointed out that the responsibility of adapting the contents to the multiple realities and demystifying the values lies with the teachers. This highlights the need for teacher training and qualification in the face of new challenges in schools in Santarém – PA, Brazil.

**Keywords:** curriculum, mathematics, textbook, content.

**RESUMO**
A implementação da Base Nacional Comum Curricular (BNCC) teve um impacto significativo sobre o conteúdo e a pedagogia dos livros didáticos de matemática no ensino fundamental e médio. Essas habilidades e competências emergem verticalmente como objetivos em uma proposta de conteúdo comum a todas as escolas brasileiras. Especificamente, no ensino da matemática, a falta de um referente que incorpore formas a priori (símbolos matemáticos) transforma o ato de ensinar-aprender em uma dinâmica de transmissão de conteúdos sistematicamente vazios, desprovidos de significado real e aplicável. Essa ausência de exemplos do mundo real e culturalmente relevantes nos livros didáticos afeta as experiências de aprendizado dos alunos. Portanto, este estudo analisa dois livros didáticos de matemática para a 6ª série do ensino fundamental e avalia seu alinhamento com as novas diretrizes do NCCB. Escolhemos o conteúdo de Fração e Expressão Numérica para comparação. Recortamos e descrevemos a relação entre as habilidades e competências das novas NCCB e as propostas de exercícios de cada livro sob a perspectiva dos conteúdos. A análise revela uma dissociação entre conteúdo e realidade no livro Taláris (matemática para o ensino fundamental - últimos anos) promovida por um vazio sistemático derivado da ausência de exemplos que se relacionem com situações da vida real. Por fim, destaca-se que a responsabilidade de adaptar os conteúdos às múltiplas realidades e desmistificar os valores é dos professores. Isso evidencia a necessidade de formação e qualificação de professores diante dos novos desafios nas escolas de Santarém - PA, Brasil.

**Palavras-chave:** currículo, matemática, livro didático, conteúdo.

**1 INTRODUCTION**
Education is a fundamental aspect of any society and the materials used to educate people have a significant impact on their learning experience. In line with this, D'Ambrosio (1996) and recent studies by Santos (2023) recognize that the teaching-learning process of mathematics can be affected by cultural diversity. These concerns are linked to the systematic vacuum that pervades mathematical activities (exercises) in the classroom. The new NCCB also brings to its scope concerns about this systematic gap (the absence of a relationship between content and
On the other hand, it is lucid and factual that these concerns are not linked to textbooks, but to teaching practices on the new perspective of teaching in the school environment.

For this reason, this research aims to analyze and evaluate the extent of the relationship between the common curricular contents of basic mathematics for the 6th grade of primary school – last year and textbooks. The article will explore the contents and mathematical exercises proposed in the didactic materials, in the light of the guidelines of the new NCCB: skills and competencies.

These skills and competencies, in the new National Common Curriculum Base, emerge vertically as goals in a common content proposal for all Brazilian schools. A curriculum that singles out the objects of knowledge for each school year. At the same time, as a teaching tool, textbooks need to resonate with this content. It is worth mentioning that the problem is not linked to the singularity or unification of the contents, but to how they interact or relate to the multiple cultural realities that emerge from the different Brazilian territories.

In the teaching of mathematics, the lack of a referent that incorporates a priori forms (mathematical symbols) transforms the act of teaching-learning into a dynamic of transmission of systematically empty contents, devoid of real and applicable meaning. As if that were not enough, some textbooks bring obtuse examples (images, texts, and contexts) that only contribute to the defragmentation of identities and, consequently, feed disinterest in the discipline, as Santos (2020) demonstrates in his studies.

To this end, inspired by these studies, samples were taken from two mathematics textbooks from the 6th year of primary school – last years: Taláris Ensino Fundamental – Final Years by Luiz Roberto, published in 2018 and Mathematics: Reality and Technologies by Joamir Souza, published in 2018. Both are teacher's manuals. They are indicated by the Department of Education – SEMED and used in the public schools of Santarém, PA. We chose the Fraction and Numerical Expression content for comparison. We cut out and describe the relationship between the skills and competencies of the new BNCC and the exercise proposals of each book from the perspective of the contents.

It was observed that, despite the fact that both books were published in the same year (2018) and indicated for the same audience (6th grade of primary school – last years), there is a
dissociation between content and reality in the book TALÁRIS, promoted by a systematic void (absence of examples that link reality) and/or by the obtuseness of the examples presented.

Building textbooks on the horizontality of a common basis that incorporate different cultural values is not an easy task. Regarding this dichotomy, it is also observed that this task has become a responsibility imposed on the teacher: to adapt the contents to the multiple realities and at the same time to demystify the values materialized with truths in the textbooks. This would explain and justify the great concern of the MEC, after the enactment of the new NCCB, in terms of teacher training and qualification in the face of the new challenges of Brazilian schools.

2 HOW DID THE IMPLEMENTATION OF THE NCCB AFFECT THE CONTENT AND PEDAGOGY OF MATHEMATICS TEXTBOOKS IN PRIMARY AND SECONDARY EDUCATION?

The Common National Curriculum Base (BNCC) represents a significant change in the way mathematics is taught in primary and secondary schools. The implementation of the BNCC impacted the content and pedagogy of mathematics textbooks in a number of ways. For Morony (2023) in several countries, it is evident that mathematics curriculum reforms lack coherence, which poses challenges for both students and teachers. For Janine T. Remillard (2005), mathematics has long been associated with textbooks and curriculum materials. In this regard, and the implementation of the BNCC guidelines in Brazil required preschool, primary, and secondary schools to modify their curricula accordingly. These changes have had effects on the content and pedagogy of mathematics textbooks in a variety of ways, including the use of e-books, teacher support, and curricular modifications.

2.1 WHAT ARE THE MAIN CHANGES TO THE MATHEMATICS CURRICULUM AS A RESULT OF THE IMPLEMENTATION OF THE NCCB?

According to Jelin (2022), Brazil’s National Common Curriculum Base (NCCB) has made some significant changes to the mathematics curriculum. One of the most notable changes is the teaching material linked to a specific skill dictated by the NCCB. However, it is unclear what impact the NCCB’s silence had on public policies related to the circulation of textbooks. The attitude toward mathematics was one of the most drastic changes in the new curriculum. In addition, it is seen in the scope of the new guideline, as a plausible justification, that the absence
of a common Curricular Base had been affecting the learning of the groups in the development of mathematics, giving rise to unequal results. However, regarding the new implementation of the new NCCB, Alves (2022) draws attention to three significant consequences of this, including the production of books and teaching materials in subjects such as Portuguese, mathematics or foreign language. In addition, the BNCC presents financial mathematics in a way that is linked to income distribution and the effects of wealth.

The inadequacy of Mathematics textbooks for high school students was also found in a study that looked at the editing techniques used to ensure that aspects of Statistics in the BNCC and textbooks were not affected. In addition, it was found that 10% of students never read a book to the end, and this resulted in some changes in courses including history, writing, literature, science, math, and world languages. Finally, the NCCB had an impact on academic curricula through the selection of textbooks. Overall, these changes have had a significant impact on mathematics education and will continue to do so in the future.

3 DATA AND ANALYSIS

For the analysis, two mathematics textbooks were used: Taláris Ensino Fundamental – Final Years by Luiz Roberto, published in 2018 and Mathematics: reality and Technologies by Joamir Souza, published in 2018. Both books are suitable for 6th grade elementary school. By way of comparison, identification and analysis, samples of content proposals and exercises were taken from each book. The object of analysis is the relationship between content, curriculum and reality in the light of the new curricular proposal envisaged in the NCCB.
Malba Tahan e a herança dos camelos

No livro *O homem que calculava*, o professor Júlio César de Melo e Sousa, conhecido pelo codinome Malba Tahan, propõe um interessante problema envolvendo frações.

Um matemático chamado Beremiz viajava pelo Oriente quando encontrou 3 irmãos em uma aldeia disputando sobre a partilha de uma herança de 35 camelos. Eles fizeram os cálculos, mas não chegaram a um acordo, pois, de acordo com o testamento, o mais velho deveria receber a metade, o segundo, a terceira parte, e o menor, 1/10 do total, isto é, 11 camelos mais 2/3 de um camelo. E, finalmente, o irmão mais novo deveria receber 1/9 do total, o que corresponde a apenas 3 camelos mais 8/9 de um camelo. Nenhum dos irmãos estava feliz com a partilha, pois todos tinham de receber “pedaços” de camelo.

O que fez Beremiz? Emprestou o camelo dele para juntar aos camelos dos irmãos e, então, fizeram 36 camelos no total. Então, ao primeiro irmão coube 1/2 de 36, que são 18 camelos, ao segundo, 1/3 de 36, ou seja, 12 animais, e ao terceiro, 4 camelos, o que vira a 1/9 de 36. Os irmãos ficaram felizes e Beremiz mais ainda, pois 18 + 12 + 4 = 34 e, então, ele pegou o camelo de volta e mais 1 camelo como pagamento pela ajuda que deu.


The sample comes from Luiz Roberto’s Taláris mathematics book, used in public schools in the western region of Pará, Santarém. At this point, objectivity is the teaching of fractions. The content is for 6th grade, primary – last years. It should be noted that, even published in 2018 in which the new NCCB was enacted, there is a resonance in predictability between the objects of knowledge, the skills that guide the document (new curriculum) and the textbook.

Mathematical knowledge objective for 6th year of primary school – last years:

Fractions: meanings (part/whole, quotient), equivalence, comparison, addition and subtraction; Calculation of the fraction of a natural number, addition and subtraction of fractions. (MEC, Nova NCCB, 2018).

Expected Content Skills:

(EF06MA09) Solve and elaborate problems that involve the calculation of the fraction of a quantity and whose result is a natural number, with and without the use of a calculator. (MEC, Nova NCCB, 2018).
However, we could not fail to observe: the symbolic structures incorporated in the example (camels, deserts and others), as visualized in the figure (texts), refer to a distant reality. In this case, the representations of fractions (mathematics) are not formed as empty, but as a foreign body. The fact is that the representations taken as elements in the book as symbolic values, in terms of the tangibility between spirit (a priori structure of mathematics) and things (socio-cognitive relationship), are not experiences close to the reality of the students of the public schools of Santarém-PA.

Figure 2: Exercises on Numerical Expressions


The second image is another sample from the same Talaris book. This is a proposal for an exercise on numerical expressions. As for Object of Knowledge for 6th grade, the new BNCC does not bring numerical expressions as curricular content. In light of the BNCC above, the book provides the following guidance:
The author’s suggestion is that the teacher exemplifies with the students’ everyday situations. The skill envisaged in the new BNCC does not refer specifically to the use of numerical expressions, as it does not predict this curricular content as an object of knowledge for the 6th year of primary school. However, in terms of skill, the BNCC’s new guidelines:

(EF06MA03) Solve and elaborate problems that involve calculations (mental or written, exact or approximate) with natural numbers, through various strategies, with understanding of the processes involved in them with and without the use of a calculator. (BRAZIL, MINISTRY OF EDUCATION, NOVA BNCC, 2018, our translation).

Well, in the proposed exercise on numerical expressions, an image discussed above, there is a systematic gap. A certain hypothesis is consolidated in the author’s own guidelines for leaving this task to the teacher. For Santos (2020), this gap is the absence of concrete examples. Mathematical symbols themselves are a priori forms that need correlation with the world.
The following samples were taken from the book Mathematics: Reality and Technologies by Joamir Souza. The Book is a proposal for teaching mathematics for 6th grade of primary school - last years published in 2018.

Figure 4: Numerical Expressions Exercise (Mathematics and Technologies).

![Exercise Image]

1. Copy the expressions in the notebook and complete the calculations.

\[ \frac{8 \cdot 34}{25 - 8} = \frac{272}{17} = 16 \]

2. Join a colleague to read the following problem.

Rodrigo makes artisanal coconut and nut chocolates to sell. Observe the boxes in which he packs these chocolates.

Para atender a uma encomenda, ele preparou 4 caixas de bombons de coco e 3 caixas de bombons de nozes. Ao todo, quantos bombons Rodrigo preparou?

a) Which numerical expressions can be solved to solve this problem?

\[ (3 \cdot 20) + (4 \cdot 15) \quad \quad (20 + 4) - (3 + 15) \]

\[ (4 \cdot 20) + (3 \cdot 15) \quad (4 \cdot 20) + (3 \cdot 15) \]


Content is also a numerical expression. It is possible to perceive an attempt on the part of the author to give meaning to the exercise (curricular content) with examples of artisanal chocolates.
Figure 5: Fraction exercise (Mathematics and technologies).


I. II. III.

a) Que fração do recipiente:
- \( \frac{2}{5} \) está com tinta?
- \( \frac{3}{6} \) ou \( \frac{1}{2} \) está com tinta?

b) Otávio vai despejar toda a tinta dos recipientes I e II no recipiente III.
- Que fração do recipiente III vai ficar com tinta? \( \frac{27}{30} \) ou \( \frac{9}{10} \).
- Indique a letra correspondente ao nível que a tinta vai atingir no recipiente III. A.


The image shows an exercise on fractions. A concrete example is given that will be derived from everyday experience. To the extent that they do not incorporate cultural situations derived from the region, for example, açaí cans could be used (measures used in the daily life of many students in the municipality of Santarém PA, although the a priori structures of mathematics (symbols) gain tangibility in the exercise.

3.1 DISCURSIVE ANALYSIS

With new changes in curriculum and pedagogy, math teachers have had to adapt their teaching methods to align with the new standards. An important component of this is the use of textbooks and other teaching materials aligned with the new curriculum. The guidelines foreseen in the new NCCB for the teaching of mathematics, in the last years of the primary school circle, is that the knowledge of the students, in reality, should serve as a contribution to teaching and learning in the classroom.
In this sense, the textbook samples showed disparities, variations in the way their curricular content was presented. Although both reflect the objectivity of the contents from the perspective of a Common Curriculum Base of mathematics for the 6th grade, the last years of primary school, the way of ordering the exercises interrelated with reality is different. The textbook Mathematics: Reality and Technology by Joamir Souza, brings at its core, even published in 2018, the year of the enactment of the new NCCB, the new guidelines: competencies and skills that link the curricular content with the reality of the students through practical examples in the exercises.

In this sense, student experiences as a categorical imperative in the classroom are not new. Dewey (1899) already pointed out that these experiences must come from the multiple realities of students. In consonance, Santos' (2019) analysis of the model proposed by Dewey and Bruner's constructivism points out that both proposals, indisputably, in order to be effective, we must consider the principle of symbolic structures. The author asserts that the proposed teaching-learning, a meaningful teaching, a socio-cognitive principle, is inseparable from religion, language, myth, art, and science.

In this sense, in the praxis of meaningful teaching-learning of mathematics, which values and interrelates with reality, there are two points that are directly linked to the curriculum that we must highlight: teaching practice and textbooks. The first is related to training. One of the main concerns of the Brazilian Ministry Education - MEC, following the enactment of the new NCCB in 2018. The second, which is the object of analysis in this research, is more complex. The different regions of Brazil have multiple cultural faces. Given the values, it is guaranteed by Article 2010 of the Federal Constitution of 1988 and then by the Basic Education Guidance Act of 1996. Thus, the dialysis books of each region must bring closer in their central expressions the realities that singularize the daily life of students.

On the basis of this rationale, it is clear that it is not a question of eliminating the reference to a common curricular base. This difference should be obvious: the difference between the common core curriculum for the entire territory, the contents and how they relate to the teaching-learning process in a meaningful way. The fact is that the curriculum conformed to contents that singularize on a common basis, in its applicability, can become empty or, as Santos (2023) explains, an agent that promotes antinomian processes in the school space. The content of the mathematics curriculum, in order not to be singled out in a systematic vacuum that triggers a
teaching absent of sociocognition, must make sense in teaching practice and in the examples materialized in textbooks.

It's compressible. And, once again, we reiterate that if the new NCCB brings as its prerogative these two bases (Federal Constitution of 1988, article 2010 and Law of Basic Guidelines of Education of 1996), mathematics textbooks, in light of the new NCCB, must include the expressions of each region as a scope of configuration of the relationship between systematic contents, realities and teaching. Regarding this relationship, the experiences of Santos (2020), in addition to emphasizing cognitive values based on learning, also reveal two more important points: will and intellect:

A classroom with 30 students (the number is only speculative, with no value of judgment, for example) and the teacher decides to use maieutics to explain something as simple as the sum of numerical elements. In principle of methodological applicability, the teacher must understand that there is [...] a reciprocal action between the will and the intellect. This condition that moves the subjects of the process, the will, manifests itself as an impulse to the externalization of the symbolic forms that constitute the conjuncture of each individuality. When inserting the first question to the students, 2 + 2 = ? Because of the need to represent or have a form (symbol and sign) attached to it, the student looks to his own intellect for a mechanism of association. By inducing the relation of mathematical symbols /2/ to two objects arising from the student's (symbolic) experiences, whether constructed by his Ego or another category he represents; The symbols and signs of objects already have a meaning that, when associated with the mathematical representative symbol /2/, is internalized and shaped. Every process, the teacher in the role of "midwife of ideas", leads the student to his or her own conclusions. (SANTOS, 2020. our translation).

The author refers to the systematic void that arises from the non-representativeness of mathematical symbols. At this point, the will (in allusion to Schopenhauer) is indispensable in the process that refers to the principle of correction between the object (experiences derived from its socio-cultural condition) and the intellect of the individual. Thus, each one has a peculiar way of cutting out reality. This shows us that the content (activities and examples) used for math textbooks should reflect the experiences of the community as closely as possible. On the contrary, the systematization of teaching and learning is singled out only in empty manifestations, a priori forms that do not conform to reality. In some ways, and far from the predictability of the BNCC guidelines, students are unable to make any connection between the content and the real world.
4 CONSIDERATIONS

The implementation of the Common National Curriculum Base (NCCB) has had a significant impact on the content and pedagogy of mathematics textbooks in primary and secondary schools. The changes introduced by the BNCC led to the development of new advanced mathematics textbooks that integrate the teaching of mathematical content with the broader research and theoretical foundations of mathematics education. It is crucial that education reforms address teachers' deep-held beliefs about mathematics and its teaching and learning. Thus, the analyses that led to this research consolidated the objectivities, since we pointed out biographically and through the comparative demonstration of the samples the dissonance between the textbook proposals. We do not refer to inferences in terms of content (which began to be unified with the new BNCC), but in the form of their presentation, materialized in mathematics textbooks, to students. In addition to the obtuse gap between realities (book and reality in the municipality where the book was adopted), we find a systematic gap in the proposal of exercises in the book Taláris by Luiz Roberto Dante. Thus, it points out the urgent need to think about didactic materials that configure and incorporate the values closest to the reality of each region, aligned with the proposals for teacher training and qualification.
REFERENCES


