FOOD FOR COLLECTIVES

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DEMETRA Alimentação, Nutrição & Saúde

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Analysis of food and nutrition information in science textbooks for elementary public education

Análise dos conteúdos de alimentação e nutrição nos livros didáticos de Ciências do ensino fundamental da rede pública de ensino

Abstract

Objective: The food and nutrition content was analyze in science textbooks used the fifth, sixth, and seventh grades in Brazilian public elementary schools. ***Methods:*** We evaluated 100% of the texts (n = 39) approved by the Science Book Guides of the National Textbook Program for 2016 and 2017. The presence or absence of eight themes was identified in the books: Food and development; Eating habits and cultural and social influences; Food, nutrition, and health; Food systems; Nutritional labeling; Hygiene, conservation, and preparation of food; Media and health; and School feeding. The quality of texts and images was analyzed by parameters such as suitability for the grade; clarity; development and contextualization; and/or degree of relationship between text and illustration; and level of updating. Through points assigned, the contents were categorized as weak, fair, good, or excellent. ***Results:*** Most of the books contained little dietary and nutritional approach. The theme "Food and development" was in only 55.4% of books in the fifth year and not further explored later. Some themes presented texts classified as regular or good. No text was considered weak. A frequent approach to food pyramids was noted. Food hygiene was absence or poorly development. All copies presented texts and illustration suitable for the series. ***Conclusion:*** "Media and health", "School feeding", "Food, nutrition, and health" and "Nutritional labeling" are themes that are not often present in the books, but when addressed, they received an excellent rating. The other themes, although frequent, need improvements in the quality of the approach.

Keywords: Food and nutrition education. Elementary School. Students. Teaching materials. Food, diet, and nutrition.

Resumo

Objetivo: Analisar conteúdos de alimentação e nutrição nos livros didáticos de Ciências do 5º, 6º e 7º anos do ensino fundamental da rede pública. ***Método****:* Foram avaliados 100% dos exemplares (n=39) aprovados nos Guias dos Livros de Ciências do Programa Nacional do Livro Didático de 2016 e 2017. Identificou-se presença ou ausência de oito temas nos livros: Alimentação e desenvolvimento; Hábitos alimentares e influências culturais e sociais; Alimentação, nutrição e saúde; Sistemas alimentares; Rotulagem nutricional; Higiene, conservação e preparo dos alimentos; Mídia e saúde; e Alimentação escolar. Analisou-se a qualidade de textos e imagens por parâmetros como adequação à série, clareza, desenvolvimento e contextualização e/ou grau de relação textual e imagética e nível de atualização. Por meio de pontos atribuídos, os

conteúdos foram categorizados em fraco, regular, bom ou excelente. ***Resultados:*** A maioria dos livros obteve pouca abordagem alimentar e nutricional. O tema "Alimentação e desenvolvimento" esteve em apenas 55,4% dos livros do quinto ano, não sendo aprofundado posteriormente. Alguns temas apresentaram textos classificados como regulares ou bons. Nenhum texto foi considerado fraco. Notou-se frequente abordagem sobre pirâmides alimentares. Verificou-se ausência e/ou falta de desenvolvimento quanto à higienização dos alimentos. Todos os exemplares apresentaram textos e imagens adequados à série. ***Conclusão:*** "Mídia e saúde", "Alimentação escolar", "Alimentação, nutrição e saúde" e "Rotulagem nutricional" são temas pouco presentes nos livros, mas quando abordados, tiveram classificação excelente. Os demais temas, apesar de frequentes, precisam de aprimoramentos na qualidade da abordagem.

Palavras-chave: Educação alimentar e nutricional. Ensino fundamental. Estudantes. Materiais de ensino. Alimentos, alimentação e nutrição.

INTRODUCTION

The approach to healthy eating in the school environment is considered essential, as this period is critical to construct values and concepts among students.[1] Thus, food and nutrition contents in educational political projects are fundamental,[1-5] and health-related topics should be included in the *Parâmetros Curriculares Nacionais* (PCNs - National Curriculum Parameters).[6]

Due to the need for national regulation of broad coverage foreseen by the 1988 Constitution, the *Base Nacional Comum Curricular* (BNCC -Basic National Core Curriculum),[7] which resembles the objectives of the PCNs,[6] recently complied with the regulation of the *Lei de Diretrizes e Bases da Educação Nacional* National (Educational Core and Guidelines Law.)[8] The main difference between the documents is that the latter demonstrates the objectives to be achieved, while the PCNs set the path towards achieving the objectives. Such documents describe the contents, skills, and competences that the students of each academic year must know to perform the activities through the use of books.[7,9]

The *Programa do Livro Didático* (PNLD - Textbook Program) is a government initiative shared between the *Fundo Nacional de Desenvolvimento da Educação* (FNDE - National Education Development Fund) and the *Ministério da Educação* (MEC - Ministry of Education) that provides textbooks for all students in public elementary and high school for Basic Education. The themes of food and nutrition are found mostly in science textbooks, since this discipline promotes the insertion of content related to the transversal theme "Health", including connections with the science of Nutrition.[1]

Considering the scarcity of investigations on the subject, the present study sought to analyze the contents of food and nutrition in the science textbooks for the fifth, sixth, and seventh grade of elementary education in the public school system.

METHODS

This cross-sectional qualitative and quantitative descriptive study conducted examined science books of the fifth, sixth, and seventh years of elementary school. Considering that the themes related to food and nutrition education are primarily envisioned in this discipline and in the selected series, based on work already done with textbooks from other disciplines and series,[2,4,10] we found limited analysis of this theme.

In view of this finding, the object of this study is to focus and deepen the analysis of science textbooks, which most address the topic of food and nutrition in schools. Reading documents such as the *Parâmetros Curriculares Nacionais* (PCNs), the *Manual Operacional para Profissionais de Saúde e Educação - Promoção da Alimentação Saudável nas Escolas e a Base Nacional Comum Curricular* (BNCC - Operational Manual for Health and Education Professionals - Promotion of Healthy Eating in Schools and the Basic National Core Curriculum) helped to characterize and typify the school audience, age and content of food and nutrition foreseen in science books for schoolchildren in those years.[6,7,11]

We analyzed 39 science textbooks, 13 from each school year, which represent 100% of the copies approved by the PNLD in 2016[12] for the initial years and by the PNLD in 2017[13] for the final years of elementary school. The request for textbooks for the Guides was made directly to public schools in the Federal District, between February and March 2018.

Two instruments were developed to analyze the textbooks: the quantitative forms (Graph 1), to identify the presence or absence of themes related to food and nutrition in each book, and the qualitative forms (Graph 2), to analyze the quality of the information of texts and illustrations from books. The quantitative forms

included a list of the topics about food and nutrition considered relevant to the sciences textbooks. Each theme was considered "present" or "absent" in the copies. The themes were defined based on the Nutrition contents mentioned in PCN[6], BNCC[7], and in the *Manual Operacional para Profissionais de Saúde e Educação - Promoção da Alimentação Saudável nas Escolas*.[11] (Operational Manual for Health and Education Professionals - Promotion of Healthy Eating in Schools), which include:

1. "Food and development" focuses on the relevance of food to the growth and development of the organism.

2. "Food, nutrition, and health" advocates healthy eating for disease prevention.

3. "Eating habits and cultural and social influences" includes the appreciation of regional eating patterns, considering the emotional, cultural, and social aspects.

4. "Food systems" identifies knowledge of food production, processing, and distribution.

5. "Nutritional labeling" provides content on nutritional labels for processed products.

6. "Hygiene, preservation, and preparation of food" covers issues related to the handling of food including handling and hygiene practices, from acquisition to consumption.

7. "Media and Health" provides knowledge about the influences of advertisements on food choices.

8. "School food" contemplates the content of governmental actions on school feeding.

Chart1. Quantitative form for the evaluation the presence of themes in textbooks. Brazil, 2016-2017."

Grade	CURRICULAR CONTENT ASSOCIATED WITH PROPOSED TOPICS	P	A
5º, 6º e 7º	**THEME 1: Food and development**		
	Food chains		
	Nutrition and food processing in the body		
	Food groups: classifications, nutrients, calories, and needs		
	Healthy eating and behaviors		
	THEME 2: Eating habits and cultural and social influences		
	Cultural and educational aspects of eating habits		
	THEME 3: Food, nutrition, and health		
	Nutritional deficiencies and diseases related to diet		
	Body and self-esteem		
	THEME 4: Food systems		
	Extraction, production, and processing of food		
	Pesticides in food production		
	Consumerism and sustainability		
	THEME 5: Nutrition labeling		
	Nutrition labels and tables		
	THEME 6: Hygiene, preservation, and preparation of food		
	Food preservation		
	Comprehensive use of food		
	Hygienic-sanitary behaviors		
	THEME 7: Media and health		
	Media and consumer habits		
	THEME 8: School feeding		
	Gardens, cafeterias, and school lunches		

Legend: P = presente; M = missing

The qualitative forms were developed based on the methodology adopted in the studies by Vasconcelos & Souto[14] and Mohr,[15] which were references for the preparation of the qualitative forms for grading classifications and the defining parameters to be evaluated by the instrument.

The number of texts (continuous texts, complementary texts, diagram, and proposed activities) and illustrations (figures, charts, tables, and images) in the books for each of the eight themes were recorded. Then, a qualitative assessment was carried out for both the texts and the illustrations found.

The form for textual resources consisted of four evaluation parameters: suitability for the grade; textual clarity; development and contextualization; and level of textual update. In "suitability for the grade", we investigated if the content was expected for the school year. For "textual clarity", the full, partial presence, or absence of clear and concise texts was verified. "Development and contextualization" identified the resourcefulness of the texts in the context of the students, which tries to observe whether the content is in accordance with the interaction of the students, fit their experiences and skills; the language level, familiarity with the audience, and the presence of concrete examples of the food and nutrition theme in the students' daily lives were also evaluated. Finally, "update level" assessed whether the text covered current terms and information based on scientific evidence.

The illustrations resource sheet was composed of four other evaluation parameters: suitability for the grade; clarity of illustrations; degree of relationship with the text; and up to date illustrations. In "suitability for the grade", we noted the presence of illustrations provided for students' understanding; for "clarity of illustrations", the presence of full, partial, or absence of self-explanatory images was verified; in "degree of relationship with the text", the interaction between the text and the illustrations was evaluated; and in "up to date illustrations", the presence of a current images was analyzed.

In the qualitative sheets, for each parameter, one of the following classifications was attributed, with the respective score: "weak" - 1 point; "regular" - 2 points; "good" - 3 points; or "excellent" - 4 points. Finally, classification of textual and illustrative resources in relation to food and nutritional content defined as: "weak" for <4 points; "regular" 5–8 points; "good" 9–12 points, and "excellent" 13–16 points. At the end, all images and texts of each book per school year were added, according to the classification. Due to the low number of texts and illustrations classified as "weak" and to facilitate the interpretation of the data, the classifications "weak" and "regular" were grouped.

Chart 2. Qualitative form for the evaluation of texts and images. Brazil, 2016-2017.

Parameters	Classification			
	Week	Regular	Good	Excellent
TEXT CONTENT ANALYSIS				
Suitability for grade	Inadequate to what was predicted for the grade	-	-	Adequate with what was predicted for the grade
Textual clarity	Presence of wrong information	Presence of incomplete texts	Presence of correct texts	Presence of contextualized texts
Development and contextualization	No development and contextualization	General examples	National examples	Regional examples in the context of students
Level of textual update	Out of date	-	-	Updated

Chart 2. Qualitative form for the evaluation of texts and images. Brazil, 2016-2017. (Cont.)

Parameters	Classification			
	Week	Regular	Good	Excellent
ILLUSTRATIONS CONTENT ANALYSIS				
Suitability for grade	Inadequate to what was predicted for the grade		-	Adequate with what was predicted for the grade
Clarity of illustrations	Unclear image	Lack of clarity in caption or image	Self-explanatory image	Contextualized image (self-explanatory and related to reality)
Degree of relationship with the text	Not related	-	-	Related
Level illustration update	Out of date	-	-	Updated

To analyze the science textbooks, qualitative and quantitative approaches were adopted. The first followed the Content Analysis method, which looks at the meaning of the texts and illustrations that make up a document.[16] This analysis was done through the systematic reading of each copy, as shown below:

1. All science textbooks were listed in ascending order (books 1 to 13) for each school year.
2. Book summaries were read to check for the presence of units, chapters, or topics related to health.
3. Book summaries were read to check for the presence of units, chapters, or topics related to food and nutrition.
4. All the pages of the books were read, to verify possible relations between science subjects and food and nutrition contents, starting with the earlier grade in the increasing order by school year, that is, collections from the fifth year to the seventh year of elementary school.
5. All pages of science books were reassessed in decreasing order by the school year, that is, from the seventh year to the fifth year of elementary school.
6. All the contents of food and nutrition found in thematic blocks were described according to the proposed themes.
7. The contents were analyzed with the first instrument developed (quantitative forms). The fields in which the themes of food and nutrition were listed due to government documents were marked, to know which were present or absent, according to the systematic reading methodology.
8. The contents were analyzed using the second instrument (qualitative forms).

First, those related to the texts, considering PCNs, BNCC, and the Manual as content references, in addition to studies with content analysis methodology similar to that adopted in this study. A book that presented incomplete information was compared with the content of an "ideal" book from each grade in the collection, which as considered the "gold standard", that is, the science textbook that most resembled what is provided for by government documents and which obtained better results in the quantitative and qualitative forms, being thus considered an excellent book.

In the second approach, a descriptive analysis of the data obtained through the instruments in relation to the frequency (percentage) and mean and standard deviations was performed.

The theoretical references presented in the methodology dialog with the instruments prepared, through the search for understanding the quality of the themes about food and nutrition in the science books. Additionally, the methodology of this study includes a new form to evaluate, what contents are first listed based on a review of government documents and are evaluated through innovative systematic reading, unlike other studies already carried out on didactic books.

RESULTS

Through the quantitative form employed, we found that only 55.4% of the fifth-grade specimens have the theme "Food and development", and this content progressively reduced in the succeeding school years (graph 1). This theme highlights food chains; the importance and functions of water in the body; breast-feeding; digestive system; food related to the skeletal maintenance; and food pyramids. "Eating habits and cultural and social influences" had the opposite evolution over the school years, becoming present in 100% of the seventh-grade books, through content about Brazilian eating habits, indigenous culture, and traditional populations.

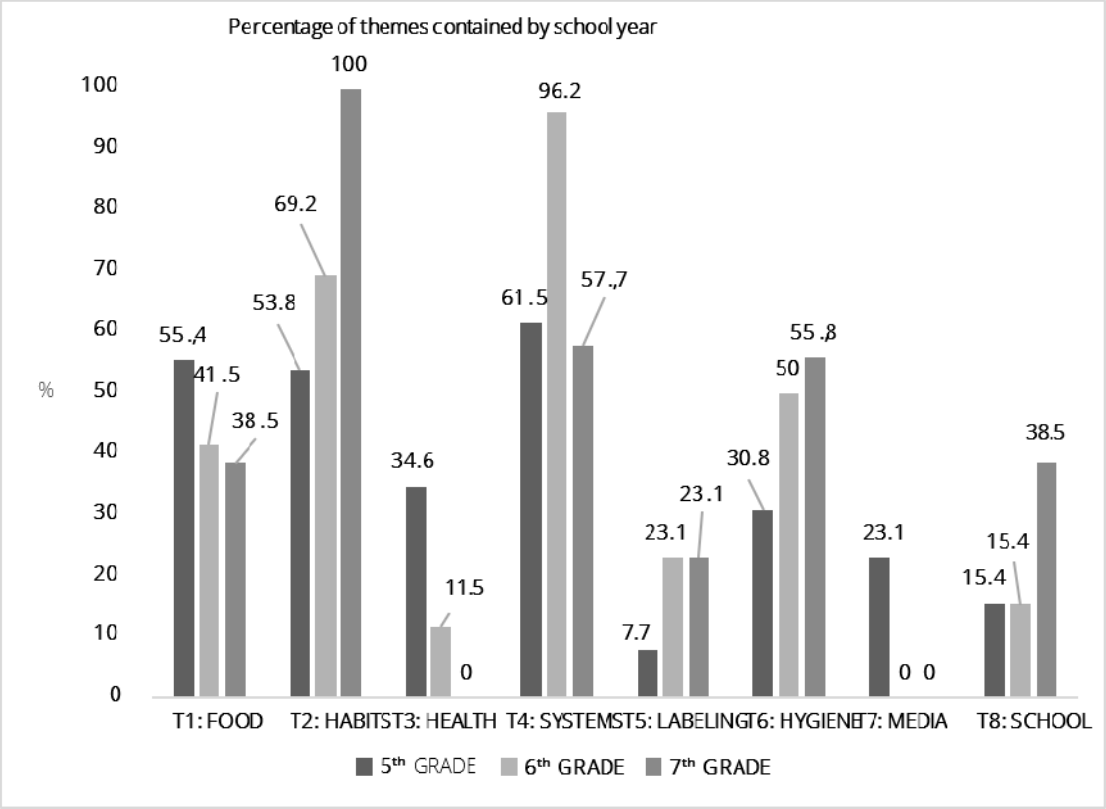
There was a great absence of the theme "Food, nutrition, and health" in the books of the three evaluated school years. Only 34.6% of fifth grade science textbooks include specific information on this theme about nutritional deficiencies in calcium and iron and diseases such as osteoporosis, diabetes, obesity, and malnutrition. However, the content decreases in the next school years, with complete absence in the seventh year (Graph 1).

"Food systems" was a theme commonly present in textbooks, mainly in the sixth year, reaching 96.2% of the books. The most discussed contents were the use of pesticides; transgenic or organic food systems; hydroponics; food production through bacterial and fungal action; and the processes for sugar production and sea salt extraction. The theme "Nutritional labeling" was found very little in the textbooks (graph 1).

The theme "Hygiene, conservation, and food preparation" was more present in sixth and seventh year examples (Graph 1), found in approximately half of the analyzed books, addressing specific contexts of diseases, such as cases of Teaniasis, giardiasis, and botulism, as well as conservation processes such as dehydration and vacuum packaging. Few books addressed the use of food and were seen mainly in the fifth year.

"Media and health" was found in 23.7% of fifth grade books, with content related to the influence of publicity and advertising on their food choices and the construction of beauty standards; however, the theme was not identified in the following years. The theme "School feeding" was present in only 15.4% of books in the fifth and sixth years, but by the seventh year, the presence increase with 38.5% of the books containing this theme, because the content could be related to ecosystems, botany, or Brazilian biomes (graphic 1).

Figure 1. Percentage distribution of the presence of food and nutrition themes in textbooks by school year. Brazil, 2018.



Legend: themes: T1 - Food and development; T2 - Eating habits and cultural and social influences; T3 - Food, nutrition, and health; T4 - Food systems; T5 - Nutritional labeling; T6 - Hygiene, conservation and preparation of food; T7 - Media and health; T8 - School feeding.

The theme with the highest average number of texts and images in the textbooks was "Food and development" (n = 7), as shown in Table 1, followed by the theme "Food Systems" (n = 6). Analysis by school grade found more texts and images on "Food and development" in the fifth year and on "Food systems" in the sixth and seventh year. The lowest averages of the number of texts and images were on "Media and health", "School food", "Nutritional labeling" and "Food, nutrition, and health" (table 1).

Table 1. Distribution of the number of texts and illustration about food and nutrition in textbooks according to themes and school years. Brazil, 2018.

Terms	5th grade Mean ± SD Texts and images	6th grade Mean ± SD Texts and images	7th grade Mean ± SD Texts and images	All grades analyzed Mean ± SD Texts and images
T1: Food	7.20 ± 3.64	3.81 ± 1.80	2.39 ± 1.31	4.47 ± 2.47
T2: Habits	2.54 ± 2.28	1.16 ± 0.11	5.43 ± 0.49	3.04 ± 2.18
T3: Health	0.85 ± 0.43	0.12 ± 0.16	0.04 ± 0.06	0.34 ± 0.45
T4: Systems	2.54 ± 0.98	6.23 ± 4.24	6.13 ± 3.85	4.97 ± 2.10
T5: Labeling	0.31 ± 0.22	0.08 ± 0.11	0.23 ± 0.11	0.20 ± 0.12
T6: Hygiene	0.58 ± 0.49	2.27 ± 1.68	2.77 ± 2.50	1.88 ± 0.15
T7: Media	0.35 ± 0.05	0.00 ± 0.00	0.00 ± 0.00	0.12 ± 0.20
T8: School	0.23 ± 0.00	0.12 ± 0.05	0.23 ± 0.23	0.19 ± 0.06

Legend: DP - Standard deviation; Themes: T1 - Food and development; T2 - Eating habits and cultural and social influences; T3 - Food, nutrition and health; T4 - Food systems; T5 - Nutritional labelling; T6 - Hygiene, conservation and preparation of food; T7 - Media and health; T8 - School feeding.

Although several contents are absent in textbooks, most of the analyzed texts and illustrations were classified in the category "Excellent" (table 2). The themes "Food, nutrition, and health", "Nutritional Labeling", "Media and health," and "School feeding" had all their texts and images with maximum scores in the four parameters analyzed. "Eating habits and cultural and social influences" was the theme that presented the most texts and illustrations with a weak/regular classification.

Table 2. Percentage distribution of the classification given to texts and illustrations in textbooks according to school themes and years. Brasil, 2018.

Themes	School year	Classification (%)		
		Weak/regular	Good	Excellent
T1: Foods	5º	2,1	9,6	88,2
	6º	3,4	1,7	94,9
	7º	5,1	0	94,9
T2: Habits	5º	26,7	0	73,3
	6º	0	0	100
	7º	4,1	0	95,9
T3: Health	5º	0	0	100
	6º	0	0	100
	7º	0	0	0
T4: Systems	5º	0	4	96
	6º	0	4,4	95,6
	7º	0	0,6	99,4
T5: Labels	5º	0	0	100
	6º	0	0	100
	7º	0	0	100
T6: Hygiene	5º	5,6	11,1	83,3
	6º	3,4	15,2	81,4
	7º	7,4	9,9	82,7
T7: Media	5º	0	0	100
	6º	0	0	0
	7º	0	0	0
T8: School	5º	0	0	100
	6º	0	0	100
	7º	0	0	100

Legend: Themes: T1 - Food and development; T2 - Eating habits and cultural and social influences; T3 - Food, nutrition, and health; T4 - Food systems; T5 - Nutritional labeling; T6 - Hygiene, conservation and preparation of food; T7 - Media and health; T8 - School feeding.

DISCUSSION

First, the innovative character of this study should be noted, given that little is published about the content of food and nutrition in PNLD science textbooks.[2,4,10] We sought, primarily, to identify the school years in which the theme was more present, through differentiated methodology, in addition to identifying the themes of food and nutrition in each of the selected school years, and investigating the quality of the information.

It is understood that the public of schoolchildren in the fifth, sixth, and seventh years of elementary school are at the age where they form and establishment of eating habits, [6,7,10] which reinforces the importance of properly addressing food and nutrition themes at school, either through the textbook or through different Food and Nutrition Education strategies.[1]

Although half of the copies present the theme "Food and development" in the fifth school textbooks, the samples from the subsequent years have shortage of content, a fact that contrasts with what is envisioned by

the PCN.[6] Teixeira et al.[2] also found that among nine high school textbook collections, 78% and 56% of the books did not address the content of food groups and breastfeeding, respectively, a fact that highlights the deficiency of content on healthy eating. Although they studied high school Biology textbooks, the contents of food and nutrition were evaluated with the same methodology of content analysis to construct a descriptive study. The present study differs from that of Teixeira et al.,[2] with a new form of analysis using an instrument that covers the evaluation of specific parameters and allows a ranking in the classification of textbooks, using a prepared instrument.

The theme "Eating habits and cultural and social influences" was identified in all seventh grade books, since during this period, according to the PCN and BNCC,[6,7] students study botany and regional vegetables. There was little discussion in the other school years, even though the two grades have contact with content related to national biomes. The data are similar to the discussion by Cardoso & Moreira,[5] who presented a descriptive study following the same methodological line of content analysis, differentiating how the books were evaluated, without the construction of a concrete instrument to analyze science textbooks. According to the study by Cardoso & Moreira,[5] the social and cultural dimension of eating habits is not widespread, making it difficult to understand food as a broader process than the supply of nutrients, corroborating the findings of this study.

The theme "Food, nutrition, and health" was almost entirely absent in the three school years evaluated, although the PCN[6] demonstrate that topics such as "Nutritional deficiencies and chronic diseases", "Public health policies", and "Body and self-esteem" are expected for the fifth school year. In addition, BNCC[7] also has the objective "Discussion of nutritional disorders", with the inclusion of this theme.

The same occurs for the sixth and seventh year. According to the PCN,[6] this school year should discuss "Nutritional deficiencies and hunger", and the National Core[7] includes the study objective "Programs and public health indicators". Such findings are similar to those of Teixeira et al.,[2] who found little information on the association between food and diseases. That survey identified obesity and diabetes issues in 33% of high school textbooks, anemia in 11%, and hypovitaminosis A in only 10%. The importance of discussing the topic is highlighted, considering that most nutritional disorders are caused by inadequate meals in essential nutrients, which may favor low performance and school absenteeism.[10]

The theme "Food systems" was present in most textbooks of the sixth school year, since this academic period includes contents related to agriculture and the processes involved in its development. The information corroborates the topics provided for in the PCN[6] in "Process for obtaining food", "Use of pesticides", and "Consumerism and sustainability". In the National Core[7], these could be seen in "Chemical transformation" and "Homogeneous and heterogeneous mixtures", in addition to the presence of the topic in the Operational Manual.[11]

The theme "Nutritional labeling" was rarely found in textbooks, although PCN[6] and BNCC[7] present the theme as a priority in the fifth year, in the topic "Reading labels". For the remaining years, the topic is found in the PCN[6] as "Labels for commercialized foods". However, it is known that many consumers are unable to interpret the information contained in the packaging of processed foods.[17] The inclusion of interpretive resources could improve individuals' perception of healthy eating.[18] Therefore, it is important to encourage learning to read labels in school settings.

The theme "Hygiene, conservation, and food preparation" was more present in sixth- and seventh-year samples, although these issues were not directly linked to preventive actions for good handling practices in the food and nutritional context. However, this content is clearly included in the PCN,[6] in "Food conservation and hygiene". The fifth year contained little information, although the PCN[6] includes the topics "Food and

personal hygiene" and "Comprehensive use of food" as expected subjects. The focus on manipulation practices in the places of production and supply of school meals is a topic expected in Ordinance MS/MEC nº 1010/2006,[19] that provides guidelines for the promotion of healthy eating in schools of all teaching categories.

The theme "Media and health" was rarely discussed in the books, which contradicts what was expected in PCN[6] on the topic with the same name. The data found are analogous to those of Cardoso and Moreira,[5] who observed in science textbooks the absence of content that directly express the theme, often presented in the form of suggestions for further research.

Another theme that was rarely found in textbooks was "School feeding". PCN[6] places this discussion to the topic of the fifth year in "Public policies in Health" and in the Core[7] in "Sustainability". In the sixth year, the content is envisioned by PCN[6] in "Planting gardens and orchards" and "Consumerism and sustainability". The seventh year had an increase in the discussion, within the topic of ecosystems and botany.

The findings corroborate Greenwood & Fonseca,[1] who carried out a study using the Depth Hermeneutics method, but also included the analysis of Basic Education textbooks. These authors found that the science examples do not describe government school feeding programs, such as school lunches, cafeterias, and vegetable gardens, although the contents refer to the teaching environment itself. Differences are noted in the methodology used by them in comparison with the present study, since our content analyses aim to understand what contents are present in the didactic resources and if they are considered good quality, while the methodology used by those authors intended to outline other variables that influence the provision of food and nutrition education in schools.

Although many contents are absent in textbooks, most books were classified as excellent. An example found of this classification was a fifth-year book that covered the theme "Nutritional labeling" through the exposure of food additives contained in processed products. The texts and images were in accordance with what was predicted for the age, according to government documents; the texts developed with the language used by this age and included a definition of food additives with practical explanation, teaching the student to be more critical about the subject, in addition to the theme being updated from the literature.

For "Food systems", the content considered good was thus categorized due to the loss of points in incomplete texts, with general examples or lack of context in the use of pesticides in food production. As an example, there was no emphasis on the damage to health, since when consumed through food, pesticides can contaminate the environment and present toxic potential, affecting animals and humans.[20]

For the theme "Food and development", in the fifth and sixth grade textbooks, texts and illustrations were found to be only good due to the outdating caused by the use of food pyramids, which advocates a quantitative view of food.[21,22] For example, some texts and images impair the clarity of information due to mere consideration of food consumption by portion, with no qualitative valuation of food individuality provided for in the current *Guia alimentar para população brasileira* (Food guide for the Brazilian population).[23]

Very few texts have addressed the concept of hygiene proposed by Resolution RDC nº 216, of September 15, 2004.[24] For "Eating habits and cultural and social influences", we found an expressive result of weak content, justified by the high quantity of merely illustrative figures, being compared with the study by Bianco,[4] using descriptive and content analysis methodology. He found a significant number of expendable images, as the illustrations of fruits and vegetables were randomly arranged in some texts in the books. Thus, they were presented without subtitles and were not considered self-explanatory, but decorative, not helping to enrich students' knowledge.

An important limitation of the present study is the fact that the evaluation was made by one only researcher, and thus is subject to subjective analysis. Future studies should include the participation of more evaluators, to minimize possible bias in interpretation.

CONCLUSION

This study identified that some themes are rarely present in science textbooks, with emphasis on "Food, nutrition, and health", "Nutritional labeling", "Media and Health" and "School feeding". However, texts and illustrations related to these themes, when addressed in books, were rated as excellent. The other themes, although more frequent in the analyzed books, presented some texts and images classified in the weak/regular or good categories.

The need is evident for both the inclusion of more food and nutrition themes, as well as the improvement of the approach adopted in science textbooks, as a way of instructing teachers for food and nutrition education in schools.

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