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Principles of the Food and Nutrition Education Framework in school practice: analysis in a Brazilian capital

Princípios do Marco de Educação Alimentar e Nutricional na prática escolar: análise em uma capital brasileira

Abstract

In 2012, the Food and Nutrition Education Reference Framework for Public Policies (FNE Framework) presented a new conception and guiding principles for Food and Nutrition Education (FNE). The objective of this study was to analyze whether the Framework principles were included in FNE actions performed by schools. In this sense, 125 municipal public Early Childhood Education and Elementary Education schools in Florianópolis, state of Santa Catarina, were invited to participate in the study, designed as exploratory qualitative. To collect data, one used a semi-structured online questionnaire on the performance of FNE actions in 2019. Responses went through Thematic Analysis, and the similar ones were grouped into categories and subcategories in order to identify which FNE Framework principles were met. Ninety-four public schools participated in the study, and principals were the main respondents. Nine categories of FNE actions were identified: playful, musical, and storytelling activities; pedagogical activities; preparation of materials and practical activities; training, meetings, lectures, and newsletters; school garden; hands-on cooking classes; offer of school meals; cafeteria project, and visits to street markets. The principles met in all actions were: diversity of practice scenarios, intersectorality and planning, evaluation and monitoring. It was found that different principles were met in a single action. Professionals have to be trained continuously in the school environment to use the FNE Framework as a parameter for carrying out FNE actions.

Keywords: Food and Nutrition Education. School Feeding. Food and Nutrition Health Promotion.

Resumo

Em 2012, o "Marco de Referência de Educação Alimentar e Nutricional para Políticas Públicas" (Marco de EAN) apresentou uma nova concepção e princípios norteadores para a Educação Alimentar e Nutricional (EAN). O objetivo deste estudo foi analisar se o referencial proposto pelo Marco foi contemplado nas ações de Educação Alimentar e Nutricional (EAN) desenvolvidas por escolas. Realizou-se estudo qualitativo e exploratório, no qual foram convidadas a participar as 125 escolas públicas municipais de Educação Infantil e Ensino Fundamental I de Florianópolis, Santa Catarina. Para coleta de dados, foi utilizado questionário *on-line* semiestruturado sobre o desenvolvimento das ações de EAN em 2019. As respostas foram submetidas a análise temática, agrupando respostas semelhantes em categorias e subcategorias, para identificar quais princípios do Marco de EAN foram atendidos. Participaram 94 escolas públicas, sendo os diretores os principais respondentes. Identificaram-se nove categorias de ações de EAN: Atividades lúdicas, musicais e teatrais, contação de história e recursos audiovisuais; Atividades pedagógicas; Elaboração de materiais e

atividades práticas; Formação, reuniões, palestras e informativos; Horta Pedagógica; Oficinas culinárias; Oferta de alimentação escolar; Projeto refeitório; e Visitas a feiras agroecológicas. Os princípios atendidos em todas as ações foram: diversidade de cenários de prática, intersetorialidade e planejamento, avaliação e monitoramento. Constatou-se que, em uma única ação, diferentes princípios foram atendidos. É fundamental capacitar continuamente os profissionais do ambiente escolar para utilização do Marco de EAN como referência para realização das ações de EAN.

Palavras-chave: Educação Alimentar e Nutricional. Alimentação Escolar. Promoção da Saúde Alimentar e Nutricional

INTRODUCTION

Food and Nutritional Education (FNE) is a strategy for the Promotion of Adequate and Healthy Eating (PAHE), recognized worldwide.¹ In Brazil, it has been present in Nutrition Science since its creation, in the mid-1930s. However, this path is marked by numerous advances and limits, with different political interventions. For example, from the 1980s to 1990s, FNE was absent from public health programs.^{2,3}

With the historical and political developments of FNE in the country, its concept was shaped over the decades, aiming to involve the different dimensions of feeding and food, in accordance with scientific and popular knowledge.⁴ This conception was consolidated in 2012 in the document entitled “Food and Nutrition Education Reference Framework for Public Policies” (FNE Framework), which encompasses FNE in the context of realizing the Human Right to Adequate Food (HRAF), thus guaranteeing Food and Nutrition Security (FNS), and in stimulating voluntary and autonomous practices of healthy eating habits, continuously, permanently, through a multidisciplinary team and problematizing and active teaching methodologies that encourage dialogue between individuals.⁵

The FNE Framework defined a public agenda focused on professional training, studies and research, with the aim of articulating popular knowledge, traditional communities, and technical-scientific knowledge. The document presents nine organizational and doctrinal principles that can be used in different sectors, in connection with different specificities and realities.⁵

In this sense, there is a consensus that the school is a promising environment for carrying out actions aimed at PAHE.^{6,7} In the context of Brazilian public basic schools, these actions are articulated with the *Programa de Alimentação Escolar* (PNAE, National School Feeding Program), through provision of meals and the insertion of FNE in the teaching and learning process.⁸

FNE inclusion in the aforementioned program occurred through Law No. 11.947/2009.⁸ Throughout the 2010s, important advances were made to strengthen the FNE practice at schools. Highlights include the publication of the FNE Framework⁵ and of the Food Guide for the Brazilian Population,⁹ besides the identification of FNE as a transverse theme in the school curriculum through Law No. 13.666¹⁰ and the *Base Nacional Comum Curricular* (BNCC, National Common Curricular Base).¹¹ Resolution FNDE No. 6 /2020¹² recognizes these official documents as guiding the FNE promotion.

Despite the significant advances that have occurred in recent years to stimulate FNE practice, especially in the school environment, several authors have observed a gap between the theoretical bases and the practical FNE application.^{13,14}

At a national level, some recent studies have evaluated the consistency of content on FNE in textbooks^{15,16} and in Activity Booklets for Early Childhood Education and Elementary Education I and II.¹⁷ Recently, celebrating 10 years of the FNE Framework, one published the document “Laboratory of Innovation in FNE” (LIS-EAN), which presents reports on the FNE experiences in various sectors, such as health, education, and social assistance, and addresses the principles covered by these experiences.¹⁸ Nevertheless, there are still few studies that evaluate the adequacy of the practice in relation to the theoretical FNE foundations.

For this reason, this study aimed to analyze the FNE Framework principles included in the FNE actions performed by public Early Childhood and Elementary Education schools in the capital of the state of Santa Catarina (SC), Brazil.

METHODS

Exploratory qualitative study, in which all schools (n=125) of Early Childhood Education (n=89) and Elementary Education I (n=36) in the public network of the capital Florianópolis-SC were invited to participate. Early Childhood Education (daycare and preschool) serves children aged 0 to 5 years and 11 months, while Elementary Education I (initial years) covers students aged 6 to 10 years.¹⁹ The research took place from September 2019 to March 2020.

Collection of data on FNE actions took place through a semi-structured online questionnaire (Google Forms). The questionnaire was directed to public Early Childhood and Elementary Education schools in Florianópolis-SC and sent to school principals, pedagogical supervisors, and teachers, who received the access link via email. A 30-day deadline was established for schools to respond to the questionnaire, and they received a weekly deadline reminder. To ensure maximum number of responses, telephone and email contact was made with those who did not respond to the instrument. Therefore, schools that refused to participate and did not respond to contact via email and telephone after five attempts (on different days and times) were considered losses and/or failures. The Informed Consent Form (ICF) signed by the participants was adopted as inclusion criterion.

The online questionnaire used was previously validated by Soar et al.²⁰ and contains 25 items organized into four sections: 1) School identification – seven items; 2) FNE at school – 10 items; 3) Use of the school garden – five items, and 4) Interaction of professionals and family members by means of FNE actions – three items. The questionnaire was not adapted for this research. Sections 1 and 2 were used for accomplishment of the study objective. Section 2 contained an open-ended question, so that participants could describe in detail the FNE actions carried out at their schools in 2019. In the question header, there was guidance on how to complete it and the following pieces of information were requested: title, objective, methodology, periodicity, and person responsible for the FNE action performed. Schools could describe more than one action.

The data collected through the online questionnaire were organized in the Microsoft Office Excel 2010®. The responses regarding the performed FNE actions went through Thematic Analysis, which includes six stages: 1. Data familiarization; 2. Generation of initial codes; 3. Search by themes; 4. Review of themes; 5. Definition and naming of themes, and 6. Report production.²¹

Thus, firstly the school responses were organized to identify the actions performed, and those schools that did not fully respond to this question were excluded from the analysis. After this stage, from the title, objectives, and methods reading, similar actions were grouped into large categories and subcategories. For each FNE action, one analyzed the FNE Framework principles that were met by the schools. The analysis was carried out subjectively by a researcher, and reviewed by two researchers. Performing this part was based on the proposition of Rosenthal, Camargo & Das Neves,²² who carried out an analysis of methodological proposals for FNE actions performed in curricular nutrition internships in the city of Florianópolis-SC.

It is worth noting that the FNE Framework established nine principles. Nevertheless, this study used principles grouped into five major themes, according to the Principles and Practices for FNE,²³ presented in Table 1.

Chart 1. Grouping of Principles of the Food and Nutrition Education Reference Framework for Public Policies. SC, 2019.

Themes	FNE Framework Principles
1. Food system and its multiple dimensions based on the notion of sustainability.	I. Social, Environmental, and Economic Sustainability.
II. Approach to the Food System in its entirety.	
2. Meals, food and cookery as elements of reference and valuation of different knowledge and cultures	III. Valuation of local food culture and respect for the diversity of opinions and perspectives, considering the legitimacy of knowledge of different natures.
IV. Meals and food as references: Valuation of cookery as emancipatory practice.	
3. Educate for self-care, permanently, generating autonomy, critical and conscious participation	V. Promotion of self-care and autonomy.

Source: Adapted from “Principles and Practices for Food and Nutrition Education” (Brasil, 2018).

The study was approved by the Human Research Ethics Committee of the *Universidade Federal de Santa Catarina* [Federal University of Santa Catarina] (CEPSH/UFSC), under opinion number 3.344.858. The ICF was made available at the beginning of the form, and schools had the option to accept or not to participate in the research.

RESULTS AND DISCUSSION

Characterization of respondents, schools and FNE actions performed

This study had a 75.2% (n=94) participation rate of schools in the municipal public network of Florianópolis-SC, of which 67% (n=63) were for Early Childhood Education, 29.8% (n =28) for Elementary Education, and 3.2% (n=3) for both modalities. The majority of respondents were principals (67.0%; n=63), followed by teachers (13.8%; n=13), supervisors (9.6%; n=9), and other professionals (9.6% n=9), such as classroom assistants.

It was observed that only 5.3% (n=5) of the respondents did not carry out FNE actions in 2019, and such schools were excluded from the analysis. Although the reasons for not taking the actions have not been identified, previous studies, such as that by Silva et al.,²⁴ point out several reasons, such as the lack of nutritionists, lack of time, lack of interest from the school community, and insufficient human resources.

It is important to highlight that nutritionists linked to PNAE and the *Centros Colaboradores em Alimentação e Nutrição Escolar* (CECANE, Collaborating Centers for School Food and Nutrition) play a crucial role in training actors, in planning and monitoring actions and in developing teaching materials. Although encouraging the performance of PNAE activities, nutritionists face challenges such as work overload and lack of resources, which can hinder the implementation of FNE actions.^{25,26}

In order to expand the participation of school social actors in the FNE implementation, in 2022 the PNAE issued a technical note describing how it should be the action of managers, school

management teams, nutritionists, school cooks, educators, family farmers, parents and guardians of students, and members of the School Food Council (CAE).²⁷ Therefore, the responsibility for carrying out actions should not fall on a single social actor. Furthermore, the articulation of spaces for continued training can raise awareness and qualify actors to promote FNE in line with basic references,^{5,9} integrated into the school curriculum, and establish partnerships between different sectors and the community, which can contribute to guaranteeing significant resources to consolidate FNE.^{6,23}

From the Thematic Analysis, one identified nine categories referring to the actions performed in 2019, namely: 1. Playful, musical, theatrical and storytelling activities, and use of audiovisual resources; 2. Pedagogical activities inserted into subjects or areas of knowledge; 3. Preparation of materials and practical activities; 4. Training, meetings, lectures, and newsletters to school community; 5. School garden; 6. Hands-on cooking classes; 7. Offer of healthy school meals; 8. Cafeteria project; 9. Visits to street markets. The categories, subcategories, characteristics of FNE actions, and types of schools are presented in Table 2.

Chart 2. Categories, subcategories and definitions of Food and Nutrition Education Actions performed by public Early Childhood Education and Elementary Education schools in Florianópolis, SC, 2019.

Categories	Subcategories and definitions	Type of school
1. Playful, musical, theatrical and storytelling activities, and use of audiovisual resources.	<p>a. Storytelling and theatrical activities: dynamic presentations to encourage the consumption of fresh foods through narrative and theatrical staging.</p> <p>b. Cultural show: theater and dance concerning the culture and food of different countries.</p> <p>c. Playing territories: collective project that addressed different aspects of life through playing, one of them being food.</p> <p>d. Presentation of educative videos: regarding the fruit importance.</p>	Early Childhood Education
2. Pedagogical activities inserted into subjects or areas of knowledge	Insertion of FNE as a transverse theme in the Centers for pedagogical action in Early Childhood Education and in Elementary Education subjects, such as Science/Biology.	Early Childhood Education Elementary Education I
3. Preparation of materials and practical activities	<p>a. Working on textual genres: creation of signs for the school garden and creation of posters by students on the topic of fresh and processed foods</p> <p>b. Elaboration of recipe book: conduction of research on family recipes.</p> <p>c. Food nutritional composition: weigh the amount of sugar/salt in the food.</p>	Elementary Education I

Chart 2. Categories, subcategories and definitions of Food and Nutrition Education Actions performed by public Early Childhood Education and Elementary Education schools in Florianópolis, SC, 2019.(Continues)

<p>4. Training, meetings, lectures, and newsletters to school community</p>	<p>a. Organization of workshops: on the school garden, for family and the community</p> <p>b. Interdisciplinary coordination and planning: orientation meetings between nutritionists, school cooks, and teachers to carry out FNE actions.</p> <p>c. Interview between students, school cooks and nutritionist: resulted in the production of an informative newspaper about the actions carried out at the school.</p> <p>d. Dialogue with the nutritionist: visits to classrooms to discuss the importance of healthy eating and present the school food menu to students.</p>	<p>Elementary Education I</p>
<p>5. School garden</p>	<p>a. Research on the school garden cultivation: identification and learning about food to be cultivated, using online resources or books.</p> <p>b. Cultivation workshop: activity focused on the school garden care, covering planting, irrigation and harvesting techniques for cultivated food, including vegetable gardens suspended in PET bottles.</p> <p>c. Composting activities: comprises the reuse of organic waste to be processed in the compost bin, resulting in the production of fertilizer</p>	<p>Early Childhood Education</p> <p>Elementary Education I</p>
<p>6. Hands-on cooking classes</p>	<p>a. Preparation of food from the school garden: preparation of recipes with food grown in the school garden, with ingredients used in school meals and full use of the food.</p> <p>b. Classroom project: preparation of recipes in line with the content of the school curriculum.</p> <p>c. Cookery and culture: exploration of recipes to get acquainted with the Brazilian food culture and also with other countries' cultures</p> <p>d. Cooking in family: preparation of healthy foods or everyday dishes for students and their families.</p>	<p>Early Childhood Education</p> <p>Elementary Education I</p>
<p>7. Offer of healthy food</p>	<p>a. Birthday project: monthly celebration of students' birthday with fruit cake (watermelon, for instance).</p> <p>b. Trying food: recognizing and tasting new regional culture food.</p> <p>c. Picnic with fruit.</p>	<p>Early Childhood Education</p> <p>Elementary Education I</p>
<p>8. Cafeteria project</p>	<p>Organization of the dining space using buffets or platters to promote student autonomy when serving themselves.</p>	<p>Early Childhood Education</p>
<p>9. Visits to street markets.</p>	<p>Tour for students to learn about and select the foods available for sale.</p>	<p>Early Childhood Education</p> <p>Elementary Education I</p>

It is worth noting that a previous publication aimed to investigate, in a descriptive way and with a quantitative approach, the performance of FNE actions at municipal public schools in the capital of SC. It was found that of the 89 schools that promoted FNE, 95.5% (n=85) adopted pedagogical activities included in the school curriculum, that is, integrated into subjects or areas of knowledge. Furthermore, 71.9% (n=64) of schools adopted a school garden; 46.1% (n=41) conducted hands-on cooking classes; 28.1% (n=25) offered healthy food; 24.7% (n =22) developed cafeteria projects; 11.4% (n=10) performed playful, theatrical, and storytelling activities; 10.1% (n=9) held lectures and chats; 6.7% (n= 6) dedicated themselves to creating materials; another 6.7% (n=6) offered training to the school community, and 3.4% (n=3) carried out other activities, such as using videos and films, visiting street markets, and nutritional composition activities.²⁸

It is observed that, in this study, some categories were grouped differently because of the action similarities and in order for all of them to fall into categories. Furthermore, the descriptive study evaluated the actions performed in general, without specifying the teaching modality.²⁸

This study found that eight action categories covered the following theme of the FNE Framework principles: “Educate for self-care, permanently, generating autonomy, critical and conscious participation.” Furthermore, all actions covered the themes “Act in different scenarios, bringing together different actors, trajectories, sectors, and institutions” and “Planning, evaluation and monitoring.” This occurred mainly because schools mentioned planning actions before their performance (Table 3).

Chart 3. Principles of the Food and Nutrition Education Reference Framework for public policies covered by Food and Nutrition Education Actions performed by schools in the municipal public network of Florianópolis, SC, 2019

Themes	FNE actions performed (2019) Categories (subcategories)*
1. Food system and its multiple dimensions based on the notion of sustainability.	4. Training, meetings, lectures, and newsletters to school community (a) 5. School garden (a, b, c) 6. Hands-on cooking classes (a) 9. Visits to street markets
2. Meals, food and cookery as elements of reference and valuation of different knowledge and cultures	1. Playful, musical, theatrical and storytelling activities, and use of audiovisual resources (b) 3. Preparation of materials and practical activities (b) 6. Hands-on cooking classes (a, b, c, d) 7. Offer of healthy food (b) 8. Cafeteria project
3. Educate for self-care, permanently, generating autonomy, critical and conscious participation	1. Playful, musical, theatrical and storytelling activities, and use of audiovisual resources (a, b, c, d) 3. Preparation of materials and practical activities (a, b, c) 4. Training, meetings, lectures, and newsletters to school community (a, c, d) 5. School garden (a, b, c). 6. Hands-on cooking classes (a, b, c, d) 7. Offer of healthy food (a, b, c) 8. Cafeteria project. 9. Visits to street markets

Chart 3. Principles of the Food and Nutrition Education Reference Framework for public policies covered by Food and Nutrition Education Actions performed by schools in the municipal public network of Florianópolis, SC, 2019 (Continues)

Themes	FNE actions performed (2019) Categories (subcategories)*
4. Act in different scenarios, bringing together different actors, trajectories, sectors, and institutions	1. Playful, musical, theatrical and storytelling activities, and use of audiovisual resources (a, b, c) 2. Pedagogical FNE activities inserted into subjects or areas of knowledge 3. Preparation of materials and practical activities (a, b, c) 4. Training, meetings, lectures, and newsletters to school community (a, b, c) 5. School garden (a, b, c) 6. Hands-on cooking classes (a, b, c, d) 7. Offer of healthy food (a, b, c) 8. Cafeteria project 9. Visits to street markets
5. Planning, evaluation and monitoring.	All categories

*subcategories described in Table 2

In this sense, the document LIS-EAN highlights that the integration of principles III (Valuation of local culture and diversity of knowledge and perspectives), IV (Meals and food as references) and V (Promotion of self-care and autonomy) of the FNE framework, present in the FNE experiences described in the document, are better understood and have greater potential for application in the last decade. Adopting these principles can significantly contribute to improving the current food scenario.¹⁸

FNE actions in Early Childhood Education and the FNE Framework principles

This study identified actions performed exclusively in Early Childhood Education schools, such as the cafeteria project, and playful, musical, theatrical and storytelling activities, and the use of audiovisual resources (Table 2).

FNE actions at schools must be planned considering the different student stages, so that there will be adequate learning and promotion of student interaction with educators.²⁹

Early Childhood Education is recognized as a phase of oral, motor, emotional, and cognitive development. In general, children at this stage learn by pretend play. Exploring these play characteristics is essential for children’s socio-emotional development.^{17,30}

In this sense, the Cafeteria Project is characterized by organizing the distribution counters and decoration of the dining space, so that children have autonomy when serving themselves and have a pleasant moment during meals.³¹ The project included different themes of the FNE Framework principles, including food as a reference, educating for self-care/autonomy, and acting in different practice scenarios (Table 3). Furthermore, the Cafeteria Project seems to be in line with the recommendation of having a meal in company of others, present in the second edition of the Food Guide for the Brazilian Population.⁹

It is also worth highlighting that different authors consider that the provision of school meals based on the PNAE guidelines, especially the acquisition of food from family farming, in itself, is considered an FNE action, as it contributes to a greater diversity of fresh food and promotes healthy eating habits.^{32,33}

The schools in this study used different tools to carry out playful activities, such as theater, storytelling and music. In this category, the Playing Territories Project stands out, a methodological proposal from Florianópolis-SC. The project works on different types of knowledge through five cycles for three weeks, and activities about food are carried out between cycles.³⁴

Experience reports on FNE actions in the school environment in the states of Paraíba²⁹ and Mato Grosso³⁵ also used different playful tools. The use of playfulness in FNE actions has been shown to be effective in the pleasurable understanding of the content about food, contributing to child development and the promotion of practices that promote autonomy and more appropriate and healthy food choices.^{29,35}

On the other hand, the study by Santos & Carvalho¹⁴ on the PNAE nutritionists' perception of FNE found that, although playful activities are well accepted by school actors, professionals do not necessarily use them to promote dialogue. Instead, they apply content in a traditional way, perpetuating the paradigm of traditional education.

In addition to autonomy, the playful actions performed at schools and verified by this study also included the principles of valuing culture (Table 3). Performing FNE actions that involve the cultural food aspects is crucial to identify how multiple eating practices are in the different cultures of the Brazilian people. The focus of these actions is on the use of food as a pedagogical tool, a characteristic that can strengthen regional eating practices.¹⁷

However, in a study that analyzed the notions of culture in research on FNE at schools, it was identified that, although culture appears in the texts analyzed, the way in which it occurs is mistaken, taking the notion of culture to a behavioral sphere. Therefore, food culture is understood as beliefs, representations, and knowledge that are inherited from a person and inserted in certain social contexts.³⁶

FNE actions in Elementary Education and the FNE Framework principles

This study observed that some FNE actions were only carried out at Elementary Education schools, such as: preparation of materials and practical activities, and training, meetings, lectures and newsletters to the school community.

Students in the first phase of Elementary Education begin social interaction, the development of memory, language, and also of a better understanding of abstract knowledge. Activities that involve group work and research are interesting at this stage, as students are able to remain focused for longer, compared to younger children.^{17,37}

Accordingly, the preparation of materials enables student participation in the activity in a proactive manner, as well as being configured as a multidisciplinary practice, involving different aspects of food/nutrition, while promoting writing and language skills.^{5,37} In this sense, one found that the schools covered the themes of the principles: "Educate permanently, generating autonomy, critical and conscious participation," and "Act in different scenarios, bringing together different actors, trajectories, sectors, and institutions" (Table 3).

This study identified that the actions in this category covered the principles involving the food system and its multiple dimensions, since schools reported organizing school garden workshops with students'

families (Table 3). Other studies, such as that by Burkhart et al.,³⁸ which investigated perceptions of FNE in school feeding programs run by government health and education authorities in Pacific Island Countries, highlighted that the school garden is a great opportunity to bring families closer to school. Furthermore, in the descriptive part of the schools of this study, published in 2023, it was observed that approximately 55% of the schools that performed FNE actions (n=89) had family or guardian participation.³⁴

On the other hand, lectures are not the most recommended way to promote FNE, as they do not encourage active subject participation. This does not mean that lectures, especially the critical and dialogic ones, can never be employed. It should also be noted that this study did not advance in the sense of analyzing whether the lectures took place in a dialogical way. These, however, can be combined with other methods and thus create a continuous and effective practice. In recent years, a direction has been observed towards the search for innovative and problematizing teaching methods that provide comprehensive training.^{39,40} Even though lectures do not enable active subject participation, the content covered can promote the development of autonomy and self-care (Table 3), as it highlights the relationship between the body and food.¹⁷

Common FNE actions in Early Childhood and Elementary Education schools and the FNE Framework principles

Actions included in areas of knowledge or subjects, in the school garden and hands-on cooking classes, were common in Early Childhood Education and Elementary Education (Table 2).

In this study, FNE was articulated in areas of knowledge or subjects, mainly in Sciences and Biology. A previous publication with the same audience identified that in Early Childhood Education schools (n=64), 95.3% (n=61) promoted FNE in all Pedagogical Action Centers (Languages, Social and Cultural Relations, and Nature). In Elementary Education schools (n=28), 78.6% (n=22) included FNE in the Science and Biology subjects.³⁴

Corroborating the results found, research carried out in the Republic of Ireland by Darmody⁴¹ also identified the FNE focus on Biology and Health subjects. Through action research, the Irish study sought to expand the children's and teachers' capabilities in relation to food education and sustainability. Nonetheless, the authors noted that despite the connection between these themes, actions generally focused on health aspects, without exploring the impact of the modern food system on biodiversity. This similarity with the Brazilian context reinforces the need to expand the FNE approach beyond the perspective of biology, incorporating social, cultural, and environmental dimensions.

In this context, the Ministry of Education (MEC) established that Brazilian basic schools must include transverse or contemporary themes (environment, economy, health, citizenship/civics, multiculturalism, and science/technology) in the school curriculum. Transversality in the curriculum should not occur in one subject in isolation, that is, they should be taught in different areas of knowledge, favoring the integral student training.¹¹ In accordance with that, the PNAE published Resolution FNDE No. 6/2020, which clarifies the importance of performing FNE actions in different subjects, such as Geography, History, and Portuguese Language, among others.¹²

Studies carried out in Australia with parents of primary school students and teachers have shown that, for children to develop skills related to food, it is necessary to include FNE in subjects such as Science, Mathematics, and Languages. Furthermore, working transversely on FNE in the school curriculum can be an interesting way to integrate the theme into a "bursting" curriculum.^{7,42} In the same direction, in the study with

government health and education coordinators in Pacific Island Countries, the authors observed that the participants considered that combining FNE with the school garden can be an interesting way of working on subject intercommunication.³⁸ However, efforts from the health and education sectors are necessary for an effective FNE integration into the school curriculum, as well as providing professionals with continuous training and time so that they can perform FNE actions at schools.^{7,42}

Other studies that evaluated the textbook content and provided an overview on FNE actions in Brazil showed that the contents focus on biological aspects and food rationality.^{15,16,39,40} Therefore, it is necessary to review these contents, aiming to favor the promotion of FNE as recommended by the country's main theoretical and normative references.

Differently, Castro et al.³³ observed that, from 2016 to 2019, topics on food and nutrition were included on the back cover of textbooks distributed in Brazilian public schools. Furthermore, these books used the FNE Framework and the Food Guide for the Brazilian Population as a theoretical basis.

The schools in this study carried out FNE actions involving the principles of the food system and sustainability (Table 3), such as holding school garden workshops for the family/community, cultivation workshops with students, composting, conduction of hands-on cooking classes with food harvested from the school garden, and visits to street markets. According to the FNE Framework, these principles present a perspective that goes beyond the environmental dimension. Consequently, actions are understood through human, social, and economic relations determined in all stages involving the food system. In other words, it is essential to idealize FNE actions that address the food system in its entirety, from production to consumption.⁵

Similarly to this study, Maldonado et al.¹⁷ evaluated the FNE Framework principles met in the activities carried out in the Activity Booklets for Early Childhood Education and Elementary Education I and II of the Ministry of Education. The authors identified that the actions that addressed cultivation workshops; visits to street markets; changes in food depending on the processing, and food production and consumption in the environment covered the principles of the food system and sustainability.

The use of the school garden as an FNE pedagogical tool is recognized by different authors and government programs in Brazil and abroad.^{12,38-40,43-46} For example, in Brazil, in 2004, the Ministry of Education and Culture (MEC), together with the Food and Agriculture Organization of the United Nations (FAO), implemented the "Educating with School gardens" program, and in 2009 gastronomy was included in the project.⁴³ In Florianópolis-SC, in 2001, the Department of Education developed a project with school gardens for promotion of FNE and environmental education, and in 2009 it became part of the federal government project, which ended in 2017.^{47,48}

Therefore, performing FNE actions in the school garden and linking it with hand-ons cooking classes goes beyond contemplating the food system in its entirety. It also uses food as a reference, thus promoting the appreciation of regional culture and food practices.³⁹

Still on cookery, the second version of the Food Guide for the Brazilian Population⁹ brings in its recommendations the importance of developing or rescuing cookery skills, in order to promote the consumption of fresh and minimally processed foods. In this sense, cookery as a pedagogical resource allows working with the expanded concept of health and the social determinants of the health-disease process. More than that, it enhances the leading role of social actors involved in the educational process and favors the development of self-care skills.⁴⁹

Strengths and limitations

The main strength of this study was to explore FNE actions and their characteristics, analyzing whether they are in line with the FNE Framework principles. This process is important to demonstrate how possible it is to achieve the guidelines that direct FNE in the school space.

However, starting data collection close to the end of the year may have prevented greater participation from schools, which is a point to be analyzed for future research. Furthermore, this study does not allow analyzing in more detail aspects involving the performance of FNE actions at the schools studied, and it is necessary to carry out case studies or interviews. Nevertheless, giving school representatives the opportunity to describe the methodology of the activities was essential to identify the general aspects of FNE actions and thus verify compliance with the guiding documents.

CONCLUSION

Through this study, it was possible to observe that some FNE actions that involved playful activities were more common in Early Childhood Education, while activities that involved preparing materials and lectures occurred more in Elementary Education. The school garden and hands-on cooking classes were used as pedagogical tools in Early Childhood Education and Elementary Education schools.

It was also identified that the FNE Framework principles were partially or fully met by the actions performed at the schools. In this sense, all schools addressed the themes “Act in different scenarios, bringing together different actors, trajectories, sectors, and institutions” and “Planning, evaluation and monitoring,” highlighting the preparation of activity planning.

Although it is understood that a single FNE action can meet different FNE Framework principles, it is essential to provide continuous training to the several professionals in the school environment. This will enable the planning of actions according to the base references.

Evaluating the convergence of these actions with the theoretical framework is essential to implement the theoretical bases in the practice of schools and other sectors. Therefore, future studies that investigate the different social actors’ knowledge of FNE, as well as the references used to support the practice, can contribute to the FNE improvement

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