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# Analysis of the implementation of Food and Nutrition Education actions in public schools in a capital city in southern Brazil

## *Análise da implementação de ações de Educação Alimentar e Nutricional em escolas públicas municipais de uma capital da região do Sul do Brasil*

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## ABSTRACT

### Objective
To analyze the insertion of Food and Nutrition Education actions in Early Childhood and Elementary Education units of the municipal public school system of Florianópolis, Santa Catarina, Brazil, in 2019.

### Methods
This analytical study applied an online questionnaire directed to the 125 Early Childhood and Elementary Education schools in Florianópolis.

### Results
Ninety-four schools (75.2%) participated in the study, among which 94.7% developed Nutritional Food Education actions in 2019. It was made evident that the insertion of Nutritional Food Education in the Pedagogical Political Project ($p$<0.001) and the planning of such actions ($p$<0.001) in schools has a significant association with their implementation. The participation of the professionals in training in food and nutrition showed no association with the implementation of the Nutritional Food Education actions. The actions developed most frequently were the pedagogical activities in the school curriculum (95.5%), the school garden (71.9%), and the hands-on cooking classes (46.1%).

**Conclusion**
The study identified a positive panorama in the capital of Santa Catarina, with actions included transversally in the school curriculum with a multiprofessional focus standing out. However, the need for studies that monitor and evaluate the actions is emphasized.

**Keywords**: Food and nutrition education. Nutrition programs and policies. School feeding. School health promotion.

***RESUMO***

***Objetivo***
*Analisar a inserção de ações de Educação Alimentar e Nutricional em unidades de Educação Infantil e Ensino Fundamental da rede pública municipal de Florianópolis, no ano de 2019.*

***Métodos***
*Trata-se de um estudo analítico, com aplicação de um questionário online direcionado às 125 escolas (Educação Infantil e Ensino Fundamental) de Florianópolis.*

***Resultados***
*Participaram do estudo 94 das 125 escolas de Educação Infantil e Ensino Fundamental de Florianópolis (75,2%). Dessas, 94,7% desenvolveram ações de Educação Alimentar Nutricional no ano de 2019. Evidenciou-se que a inserção da Educação Alimentar Nutricional no Projeto Político Pedagógico (p<0,001) e o planejamento dessas ações (p<0,001) nas escolas têm associação significativa com a sua realização. A participação dos profissionais em formação sobre alimentação e nutrição não mostrou associação com a realização das ações de Educação Alimentar Nutricional. As ações desenvolvidas com mais frequência foram a inclusão de atividades pedagógicas no currículo escolar (95,5%), a horta pedagógica (71,9%) e as oficinas culinárias (46,1%).*

***Conclusão***
*O estudo identificou um panorama positivo na capital catarinense, com destaque para ações incluídas transversalmente no currículo escolar, com enfoque multiprofissional. Ressalta-se, no entanto, a necessidade de desenvolvimento de estudos de monitoramento e avaliação das ações.*

***Palavras-chave**: Educação alimentar e nutricional. Programas e políticas de nutrição e alimentação. Alimentação escolar. Promoção da saúde escolar.*

## INTRODUCTION

In Brazil, Food and Nutrition Education (FNE) is understood as a strategy for the Promotion of Adequate and Healthy Eating (PAHE), the realization of the Human Right to Adequate Food (HRAF), and the guarantee of Food and Nutrition Security (FNS). This conception was consolidated in 2012 with the publication of the Food and Nutrition Education Reference Framework for Public Policies [1]. However, in Brazil and throughout the world, FNE has been strengthened as an important PAHE strategy in food and nutrition programs [2,3].

In the school context, in 2009, FNE became one of the axes of action of the *Programa Nacional de Alimentação Escolar* (PNAE, National School Feeding Program), aimed at all students in the public basic education system in Brazil [4]. Therefore, FNE is characterized as a set of formative actions that must be included transversally in the school curriculum continuously and permanently [5,6].

In general, around 85% of Brazilian municipalities carry out FNE actions [7]. Holding lectures every six months seems to be the most used FNE strategy for preschoolers and schoolchildren and for updating teachers, with a maximum duration of one hour [7-10]. There is also a report of the use of the lectures for family members of schoolchildren [11].

An integrative literature review identified eight studies that analyzed FNE interventions in schoolchildren aged six to 17 years and found strategies based on information transmission. Six

used the nutritional and food consumption assessment as an evaluative tool, finding no significant changes due to the short time between the action and the analysis performed [12].

Researchers have identified that, even after 2012, the FNE actions have not been continuous and are generally restricted to the biological aspects of food and eating [7-9,11]. The approach to food culture distances itself from the actual social dimension of food, which encompasses determinants of food choice, identities, or social relations, for example [13].

Developing actions in an expanded manner through problematizing strategies and active teaching methodologies that provide autonomy to individuals, value popular experiences and knowledge, and are based on dialogue remains a challenge in the field [12]. Such a perspective is based on the dialogical pedagogy of Paulo Freire, who viewed schools as environments conceived from ideas, solutions, debates, and reflections understood collectively [1,14].

Thus, despite the movement to strengthen FNE as a field of knowledge and practice, one notices the maintenance of a distance from what is proposed in documents and legislation. Among the main challenges are the following: addressing the social aspects of food in the process; involving different professionals, family members, and the community as a whole; expanding the understanding of school feeding as a right; and inserting or consolidating FNE in the curriculum as a transversal topic [8,11].

These challenges are not the same in all Brazilian regions. In this regard, it should be noted that the Southern Region and, especially, the state of Santa Catarina usually obtain national prominence in issues related to FNE, developing, for example, actions and expanded projects of school gardens and hands-on cooking classes. It also usually stands out in the percentage of acquisition of food from family farming for the PNAE [7,9]. Still, studies on FNE in the school setting are scarce, and the mechanisms for evaluating/monitoring the actions are incipient.

For this reason, this study aimed to analyze the insertion of FNE actions developed in early childhood and elementary schools of the municipal public school system of Florianópolis, the capital of the state of Santa Catarina (SC), Brazil.

## METHODS

This was a cross-sectional analytical study with all (n=125) schools of Early Childhood Education (ECE) (n=89) and Elementary Education (EE) (n=36) of the municipal public school system of Florianópolis (SC), Brazil. The schools were identified through a list available on the website of the Municipal Department of Education [15].

To collect the data, a semi-structured questionnaire was applied online (Google Forms) aimed at principals, school supervisors, teachers, and other professionals who participated in FNE actions at the schools. The questionnaire was sent to the school institutional email addresses along with the description of the study, with a thirty-day return period and weekly deadline reminder, with non-respondents contacted by phone. To increase awareness, there was the support of nutritionists who worked in school feeding in the municipality and had direct contact with schools.

The respondents signing the Informed Consent Form was adopted as the inclusion criterion. Schools that refused to participate were considered losses, and those that did not respond to contact via email and phone after five attempts (on different days and times) were deemed failures.

The semi-structured questionnaire used in data collection underwent a content validation process through a panel of experts with experience in the areas of health and education, including two teachers/researchers, two nutritionists working in school feeding in the public school system,

one nutritionist *Centro Colaborador em Alimentação e Nutrição do Escolar* (CECANE, Collaborating Center on Food and Nutrition of Schoolchildren), one municipal public manager of school feeding, one educator from the public school system, and one manager of an educational unit of the public school system [16]. Chart 1 shows the questionnaire sections, analyzed variables, and measurement units.

**Chart 1** – Sections of the semi-structured online questionnaire, variables, and units of measurement. Florianópolis, SC, Brazil, 2022.

| Questionnaire sections | Variables | Units of measurement/categories |
|---|---|---|
| I. Characterization of the schools and representatives | Position/function of the respondent | Principal; Pedagogical Coordination; Teacher; School Cooks; Others. |
| | Type of teaching of the school | Early Childhood Education (ECE); Elementary Education (EE). |
| II. Situation of the implementation of FNE actions in the PPP and school curriculum. | Inserted FNE actions into the PPP | Yes; No. |
| | Year when FNE actions were inserted into the PPP* | Before 2009; In/after 2009; |
| | Projects/actions inserted into the PPP | The actions/projects were grouped according to similarities. |
| | Professionals who participated in the discussions on the insertion of the FNE topic into the PPP | Education team (principals, supervisors, teachers); Food team (nutritionists and school cooks; Other professionals. |
| | The professionals participated in training in food and nutrition | Yes; No. |
| | Professionals who received training in food and nutrition | Education team (principals, supervisors, teachers); Food team (nutritionists and school cooks; Other professionals. |
| | Time (years) since the last training | Less than 1 year; 1 to 2 years; 3 to 4 years; ≥5 projects/actions. |
| | Planned FNE actions for 2019 | Yes; No. |
| | Number of actions planned in 2019 | 1 project/action; 2 to 4 projects/actions; ≥ 5 projects/actions. |
| | Carried out FNE actions in 2019 | Yes; No. |
| | How many actions were carried out | 1 project/action; 2 to 4 projects/actions; ≥ 5 projects/actions |
| | Persons responsible for the FNE actions carried out | Education team; Food team |
| II. Situation of the implementation of FNE actions in the PPP and school curriculum. | FNE actions implemented** | Playful, theatrical, and storytelling activities; Pedagogical activities inserted into the school curriculum; Preparation of materials; Training/Meetings/Newsletters for the school community; school garden; hands-on cooking classes; Offer of healthy food; Lectures/chats directed to students; Cafeteria project; Other actions |
| | The nutritionist guided/followed up on the actions carried out. | Yes; No. |
| | Family involvement in the actions carried out | Yes; No. |
| | How family involvement occurred. | The ways families were involved with the actions were grouped according to similarities. |
| | Areas of knowledge/School subjects in which FNE was inserted | ECE: Pedagogical Action Centers (PACs) – Languages, Social/cultural relations, Nature; No PACs. EE: Arts; Science and Biology; Physical Education; Geography; History; Foreign language; Portuguese; Mathematics; No school subjects. |
| | FNE action teaching methodology*** | Active methodology; Traditional methodology; Mixed methodology. |
| | Periodicity of the FNE actions**** | Permanent actions; One-off actions. |
| | FNE actions are evaluated | Yes; No. |
| | How they are evaluated | Institutional assessment instrument; Changes in food choices; Change of attitude in the classroom; Perception of school cooks and other professionals; Feedback from students; Feedback from parents; Pedagogical Meetings. |

Note: *To determine the categories, the year in which the FNE was inserted into the PNAE was considered [4]. **The construction of the categories was based on the study by Silva et al. [10]. ***Active methodology: when the activities proposed actions in which students actively participated in the teaching-learning process; Traditional methodology: actions in which students received information passively; Mixed methodology: when it contemplates both methodologies. ****Permanent actions: when they carried out activities daily/weekly/monthly; One-off actions: semiannually/annually.

The data were exported from Google Forms, organized into databases in Microsoft Office Excel 2010®, and transported to version 11.0 of the statistical program Stata (StataCorp LP). The descriptive analysis of the categorical variables was expressed in frequencies and percentages. The Shapiro-Wilk test was applied to evaluate the symmetry. Pearson's Chi-Square test verified an association between the variable "FNE actions carried out" and the variables "inserted FNE actions into the Pedagogical Political Project (PPP)", "planned FNE actions", and "professionals participated in training in food and nutrition". The value of $p<0.05$ was used for statistical decision-making.

The study was approved by the Human Research Ethics Committee of the *Universidade Federal de Santa Catarina* (Federal University of Santa Catarina). The Informed Consent Form was made available at the beginning of the form, and the respondents had the option to accept or refuse to participate in the study.

## RESULTS

Ninety-four schools participated in this study, with a 75.2% participation rate, 63 (67.0%) of which were ECE schools, 28 (29.8%) were EE schools, and three (3.2%) had both modalities of education (ECE/EE). The respondents were distributed as follows: 63 (67.0%) were principals, 13 (13.8%) were teachers, nine (9.6%) were supervisors, and nine (9.6%) were other professionals, *e.g.*, as classroom assistants. Among the reasons for non-participation, the impossibility of contact via email and phone and the unavailability of time on the part of the respondents stood out.

Most of the schools reported inserting FNE actions into their PPP (n=66, 70.2%). Among them, 38 (57.6%) did so after 2009. The professionals who most discussed FNE in the PPPs were principals, supervisors, and teachers (n=66, 100%) (Table 1).

Among the ways FNE was addressed in the PPP, 42 schools (63.6%) highlighted collective projects (which involved the entire school community), school gardens, and the cafeteria project (a municipal project consisting of organizing the cafeteria to ensure autonomy when serving); 10 (15.1%) reported one-off actions of awareness on healthy eating; 5 (7.6%) mentioned transversal actions included in the school subjects and/or areas of knowledge that sought to contemplate the different aspects of eating. Lastly, 9 (13.6%) were unable to answer.

Only 29 schools (30.8%) reported the participation of their professionals in training in food and nutrition, with emphasis on the education team (n=22, 75.9%). Regarding the time since the last training, 12 schools (41.4%) reported it had been less than one year prior (Table 1). It was identified that 70 schools (74.5%) planned the FNE actions. In general, two to four actions were structured (n=33, 47.1%), as shown in Table 1.

Of the participating schools, 89 (94.7%) carried out FNE actions (Table 2). However, only 67 participants (71.2%) really considered that they had carried them out. In other words, most of the schools did not answer "yes" in the question about implementing FNE actions, but they responded in other questions that they carried out FNE actions within the school subjects and in the vegetable garden. Regarding the number of actions, 73 of the schools (82.0%) carried out two to four. The main persons responsible for the actions were the education team (n=56, 62.9%). Most of the schools had the guidance and/or follow-up of nutritionists (n=75, 84.3%) and the involvement of student family members (n=49, 55.1%) (Table 1).

Family involvement occurred mainly through participation in collective projects, assistance in maintaining the vegetable garden or in hands-on cooking classes (n=20, 40.8%), and participation in training on the topic of food/nutrition or meetings with nutritionists (n=10, 20.5%). Only six schools (12.2%) did not answer how family involvement occurred.

**Table 1** – Situation of the implementation of Food and Nutrition Education actions in schools of the municipal public school system of Florianópolis, SC, Brazil, 2019.

| Variables | Frequency | |
|---|---|---|
| | n | % |
| Inserted FNE actions into the PPP (n=94) | | |
| Yes | 66 | 70.2 |
| No | 28 | 29.8 |
| Year when the FNE actions were inserted into the PPP* (n=66) | | |
| Before 2009 | 12 | 18.2 |
| In/after 2009 | 38 | 57.6 |
| Unable to answer | 16 | 24.2 |
| Professionals who participated in the discussions on the insertion of the FNE topic into the PPP* (n=66) | | |
| Education Team[1] | 66 | 100.0 |
| Food Team[2] | 63 | 95.5 |
| Other professionals[3] | 13 | 19.7 |
| The professionals participated in training in food and nutrition (n=94) | | |
| Yes | 29 | 30.8 |
| No | 65 | 69.3 |
| Professionals who received training in food and nutrition* (n=29) | | |
| Education Team[1] | 22 | 75.9 |
| Food Team[2] | 20 | 69.0 |
| Other (school board and the parent-teacher association) | 02 | 6.9 |
| Time (years) since the last training (n=29) | | |
| Less than 1 | 12 | 41.4 |
| 1 to 2 | 03 | 10.3 |
| 3 to 4 | 02 | 6.9 |
| Unable to answer | 12 | 41.4 |
| Planned FNE actions for 2019 (n=94) | | |
| Yes | 70 | 74.5 |
| No | 24 | 25.5 |
| Number of actions planned (n=70) | | |
| 1 action | 14 | 20.0 |
| 2 to 4 actions | 33 | 47.1 |
| ≥ 5 actions | 14 | 20.0 |
| Unable to answer | 09 | 12.9 |
| Carried out FNE actions in 2019 (n=94) | | |
| Yes | 89 | 94.7 |
| No | 5 | 5.3 |
| How many actions were carried out (n=89) | | |
| 1 action | 9 | 10.1 |
| 2 to 4 actions | 73 | 82.0 |
| ≥ 5 actions | 7 | 7.9 |
| Persons responsible for the FNE actions carried out* (n=89) | | |
| Education Team[1] | 56 | 62.9 |
| Food Team[2] | 25 | 28.1 |
| Others (retrained and cleaning professionals; family members and community) | 13 | 14.6 |
| Unable to answer | 31 | 34.8 |
| The nutritionist guided/followed up on the actions carried out (n=89) | | |
| Yes | 75 | 84.3 |
| No | 4 | 4.5 |
| Unable to answer | 10 | 11.2 |
| Family involvement in the actions carried out (n=89) | | |
| Yes | 49 | 55.1 |
| No | 40 | 44.9 |

Note: *The variable allowed choosing one or more options. [1]Principal, supervisor, and teacher/teaching assistant; [2]Nutritionist and school cooks; [3]General service assistants; parent-teacher association; interns; vegetable garden volunteers; professionals of the basic health unit. FNE: Food and Nutrition Education; PPP: Pedagogical Political Project.

A significant association was found between the insertion of FNE actions into the PPPs and their implementation ($p$=0.000), as well as between the planning and implementation of the

actions ($p$=0.000). No association was found between the holding of training in food/nutrition and the implementation of FNE ($p$=0.125). However, all schools where professionals underwent training carried out FNE actions in 2019 (Table 2).

**Table 2** – Association between the implementation of Food and Nutrition Education (FNE) actions, insertion of FNE actions into the Pedagogical Political Project (PPP), planning of FNE actions, and training in food and nutrition by schools of the municipal public school system of Florianópolis, SC, Brazil, 2019.

| Variables | Carried out FNE actions | | | | $p$-value* |
|---|---|---|---|---|---|
| | Yes | | No | | |
| | n | % | n | % | |
| Inserted FNE actions into the PPP | | | | | 0.000 |
| Yes | 66 | 74.2 | – | – | |
| No | 23 | 25.8 | 5 | 100.0 | |
| Planned FNE actions | | | | | 0.000 |
| Yes | 70 | 78.7 | – | – | |
| No | 19 | 21.3 | 5 | 100.0 | |
| The professionals participated in training in food and nutrition | | | | | 0.125 |
| Yes | 29 | 32.6 | – | – | |
| No | 60 | 67.4 | 5 | 100.0 | |

Note: *Test: Pearson's Chi-square.

Among the most developed FNE actions, 85 schools (95.5%) reported having developed actions in the school curriculum, 64 (71.9%) through the school garden, and 41 (46.1%) through hands-on cooking classes (Table 3).

Among the ECE schools (n=64), 61 (95.3%) carried out FNE actions in all Pedagogical Action Centers, namely Languages, Social and Cultural Relations, and Nature. In turn, among the 28 EE schools, 22 (78.6%) carried out FNE actions within the school subject of Science and Biology (Table 3).

Regarding the teaching methodology, the active methodology was more present in the FNE actions developed (n=66, 74.2%). Regarding the periodicity of the FNE actions, 46 (51.7%) were permanent (Table 3).

In addition, most of the schools evaluated the actions (n=71, 79.8%) basically through the perceptions of school cooks and other professionals of the students' eating (n=50, 70.4%), as one may observe in Table 3.

**Table 3** – Food and Nutrition Education actions developed, teaching methodologies, periodicity, and evaluation of these activities carried out by the schools of the municipal public school system of Florianópolis, SC, Brazil, 2019.

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| Variables | Frequency | |
|---|---|---|
| | n | % |
| FNE actions implemented* (n=89) | | |
| Playful, theatrical, and storytelling activities | 10 | 11.4 |
| Pedagogical activities inserted into the school curriculum** | 85 | 95.5 |
| Preparation of materials (recipe book and posters) | 6 | 6.7 |
| Training/Meetings/Newsletters to the school community | 6 | 6.7 |
| School garden | 64 | 71.9 |
| Hands-on cooking classes | 41 | 46.1 |
| Offer of healthy food | 25 | 28.1 |
| Lectures/Chats directed at students | 9 | 10.1 |
| Cafeteria project*** | 22 | 24.7 |
| Other actions (use of videos/movies, visit to the street market, and activities on the nutritional composition of food) | 3 | 3.4 |

**Table 3** – Food and Nutrition Education actions developed, teaching methodologies, periodicity, and evaluation of these activities carried out by the schools of the municipal public school system of Florianópolis, SC, Brazil, 2019.



| Variables | Frequency | |
|---|---|---|
| | n | % |
| Areas of knowledge/School subjects in which FNE was inserted* | | |
| Early childhood education (n=64) | | |
| All PACs*** (Languages, Social/Cultural Relations, and Nature) | 61 | 95.3 |
| PAC (Languages and Nature) | 2 | 3.2 |
| No PACs | 1 | 1.6 |
| Elementary Education (n=28) | | |
| Art | 6 | 21.4 |
| Science and Biology | 22 | 78.6 |
| Physical Education | 12 | 42.9 |
| Geography | 6 | 21.4 |
| History | 7 | 25.0 |
| Foreign Language | 9 | 32.1 |
| Portuguese | 13 | 46.4 |
| Mathematics | 12 | 42.9 |
| No school subjects | 5 | 17.9 |
| FNE action teaching methodology (n=89) | | |
| Active methodology | 66 | 74.2 |
| Mixed methodology (traditional and active) | 23 | 25.8 |
| Periodicity of the FNE actions (n=89) | | |
| Permanent actions | 46 | 51.7 |
| One-off actions | 14 | 15.7 |
| Unable to answer | 29 | 32.6 |
| FNE actions are evaluated (n=89) | | |
| Yes | 71 | 79.8 |
| No | 8 | 9.0 |
| Unable to answer | 10 | 11.2 |
| How they are evaluated* (n=71) | | |
| Institutional assessment tool | 3 | 4.2 |
| Change in food choices | 49 | 69.0 |
| Change of attitude in the classroom | 40 | 56.3 |
| Perception of school cooks and other professionals | 50 | 70.4 |
| Feedback from students | 5 | 7.0 |
| Feedback from parents | 43 | 60.6 |
| Pedagogical meetings | 6 | 8.4 |

Note: *The variable allowed choosing one or more options. **Activities inserted transversely into the school subjects/areas of knowledge and/or everyday actions planned by teachers. ***PAC – Pedagogical Action Centers are the areas of knowledge of early childhood education schools of the public school system of Florianópolis, SC, Brazil. FNE: Food and Nutrition Education; PPP: Pedagogical Political Project.

## DISCUSSION

This study presents a panorama of the FNE actions developed in Florianópolis (SC), Brazil. Among its findings, it brings important information and results about critical aspects of the implementation of FNE in the school environment, such as its insertion into the PPP, the participation of school actors in specific training, and the main teaching methodologies used, as well as the periodicity and form of evaluation of the actions.

The discussion about FNE in the school environment has been traveling a long way that gained strength from 2009 when FNE became the axis of action of the PNAE [1,6,8]. However, for its effectiveness in everyday school life, it is essential for the actions to be contemplated in the PPP [4,5,17]. The FNE Framework addresses this issue in its ninth principle, stating that planning is "[...]

*essential for the efficacy and effectiveness of the initiatives and the sustainability of the actions*" [1]. In this sense, the significant association between FNE in the PPPs and action planning demonstrated its importance for the consolidation of FNE in everyday life of the schools in this study.

In a survey on the FNE actions in the state of Goiás in 2012, most participants also reported that they were inserted into the PPP, although they could not say how [11]. In the present study, this occurred mainly through collective projects, school gardens, and the cafeteria project. Moreover, most of the schools began to include FNE in their PPP after 2009, which seems to be related to the implementation of FNE in the legal framework of the PNAE [4].

In this regard, it is important to mention that the Municipal Department of Education of the capital of Santa Catarina has already obtained national prominence multiple times for pioneering and innovation in the development of FNE actions within the scope of the PNAE, with emphasis on projects that have been encompassing the entire network for more than twenty years [7,18,19]. It should be noted that the committed work of the nutritionist who works in the management and execution of the PNAE seems to reflect positively on the insertion of the FNE into the PPP and on the planning and implementation of the actions, given that most schools have the guidance and/or follow-up of this professional. The positive effect between the presence of the nutritionist and the implementation of the FNE actions was also observed in another study developed in the municipalities of the state of Goiás in 2012 [11].

It should also be pointed out that, for proceeding with FNE with the school environment, the involvement of other school actors is necessary [1,6,20]. Following this understanding, the present study observed that the discussion of FNE in the PPP and the implementation of the actions were carried out mainly by the education team. In this sense, the joint work between the pedagogical team and the nutritionist is decisive, as it provides for the integration of different actors and the likely continuity of the proposed actions [21].

The participation of family members was also significant in the present study, especially in actions involving the maintenance of vegetable gardens and hands-on cooking classes. Family involvement may contribute to the continuity of FNE at home [8,22]. But not only that, the sustainment of these actions in other spaces depends on socioeconomic aspects, public policies, and food environments. It should be emphasized that, as a permanent and problematizing practice, FNE aims to empower individuals to claim their rights and develop skills for adequate and healthy eating as soon as they have sufficient resources for such [1].

In the present study, the participation of professionals in training in food and nutrition was relatively low. However, those who participated carried out FNE actions at their schools. Unlike this study, research with early childhood teachers in a municipality in the state of Minas Gerais found that most of the studied population underwent some training in the matter [10]. In general, such training is coordinated by intersectoral teams linked to the Department of Education, with emphasis on the participation of actors connected to the CECANE [22]. In this context, the strategic role of the different CECANE distributed throughout Brazil for the PAHE and the strengthening of the pedagogical function of the PNAE are highlighted. However, it is important to point out the financial difficulties that have been faced by these Collaborating Centers, which put at risk the qualified and permanent activity of actors with expertise in the topic.

Still on the training within the context of food and nutrition, it is a consensus in different studies that they have a fundamental role in raising awareness for the inclusion of FNE in the school curriculum and, later, in the implementation of actions [12,21,23]. However, researchers have warned

that it is necessary to ensure permanent training continuously since awareness may be affected by everyday school life [21]. Thus, training aimed at ensuring the HRAF and FNS is important to promote the autonomy of schoolchildren and enable sustainable environments from environmental, social, and economic points of view [1,4,5,8]. In addition, those involved must have time to plan and carry out these activities [1,2,8,22].

It should be noted that the participation of the nutritionist in permanent and continuing education may enhance this space of collective construction. Their role is to translate the relationship between FNE, HRAF, and FNS to the other professionals in the school environment [1,7,8]. Hence, the knowledge may be passed through popular know-how, the sharing of family recipes, the insertion of traditional foods, the rescue of what the ancestors ate, and discussions that address the food items produced in the region. These are ways of keeping cultural and affective memories alive, giving centrality to food, and addressing issues that may be distant from the knowledge of education professionals but are actually part of everyday life [1,9].

Most of the schools that participated in this study carried out FNE actions in 2019. However, not all schools considered the actions developed within the school subjects and/or in their vegetable gardens specific to FNE. This shows that there is a mistaken knowledge about FNE that seems to be related to the inadequate training of these school actors.

Among the most frequent actions found were pedagogical activities inserted into the school curriculum, suggesting that the practice of FNE in the investigated schools was transversely inserted into the curriculum, as recommended by the competent bodies [4,5,6, 24,25].

Studies developed from 2019 to 2021 about the perceptions of teachers on FNE identified that the actions should be treated as transversal content in schools and not as a specific subject [10,22]. Despite this, it has been observed that, most of the time, FNE is addressed predominantly in the school subject of Science/Biology [7,8,10,11,22], a fact corroborated by the present study.

The predominance of FNE in the school subject of science/biology may be understood by the fact that the National Curricular Parameters recommend that textbooks address this field in this section [26,27]. For example, a study showed the presence of content on the Food Guide for the Brazilian Population in elementary school science books. However, the authors highlighted the predominance of the conception of nutritional rationality [28,29]. This point deserves attention, given that the initiatives to carry out FNE usually start from textbooks [8]. To this end, it is important to review how the theme is incorporated into textbooks to ensure the expanded concept of FNE presented by the FNE Framework. Moreover, it is essential that the topic be involved in different school subjects such as arts, history, and geography, among others [1,22,29].

The school garden and the hands-on cooking classes were also frequent FNE practices in the present study. Although not expressive, other studies have found the use of school gardens as a pedagogical tool for developing FNE [7,9,11,30,31]. In Brazil, using vegetable gardens as FNE instruments has been advocated since 2004 through the project "*Educando com a horta*" ("Educating with the vegetable garden") of the *Fundo Nacional de Desenvolvimento Escolar* (FNDE, National Fund for School Development) of the Ministry of Education in conjunction with the Food and Agriculture Organization of the United Nations. In 2009, the project was reformulated and included the gastronomy axis [32]. The municipality of Florianópolis (SC), participated in the project, and, according to the *Centro de Estudos e Promoção da Agricultura do Grupo* (Center for Studies and Promotion of Agriculture of the Group), from 2010 to 2013, they carried out the consulting, implementations, and management of 84 vegetable gardens in ECE and EE schools of the municipal public school system. However, the participation of the municipality in the project took place up to 2017 [33].

In this sense, integrating the vegetable garden with cuisine allows for using the food as a reference, values the regional/local food consumption, and incorporates playfulness [7]. In addition, the pedagogical potential provided by vegetable gardens goes beyond the concept of healthy eating. It involves expanding knowledge related to food and nutrition by students and professionals in the school environment [34,35]. In the United States, a set of strategies called "*Farm to School*" relies on the development of vegetable gardens in the school environment and highlights benefits in staff motivation, increased knowledge and interest in the preparation of local foods and seasonal recipes, and interactions that strengthen the classroom and the cafeteria [36]. A study conducted in American schools in 2019 showed that children develop social and academic skills, *e.g.*, vocabulary expansion, after having contact with vegetable gardens [35].

The present study identified that the FNE actions were developed predominantly through active teaching methodologies. This result differs from studies conducted from 2011 to 2014, which found the hegemony of traditional and passive teaching methods in the practice of FNE, with lectures being the most reported format [7,9,11,12,21]. Active methodologies are pointed out as a propitious teaching model for placing students at the center of the learning process and, thus, developing the autonomy and active participation of such actors, stemming from real problems and situations [37]. Thus, researchers have pointed out that developing vegetable gardens, hands-on cooking classes, and playful interactive activities and integrating the school with the family are timely and strategic ways to implement the actions [9].

Regarding the periodicity of the actions, a good part of the schools developed permanent actions in 2019, suggesting alignment with the FNE Framework and the PNAE [1,4]. An evolution of this aspect was observed, given that some previous evidence suggested that, although FNE actions are increasingly present in the school environment, they still do not occur continuously and permanently [7,8,11].

The schools of the present study reported evaluating the FNE actions mainly through the perception of school cooks and other professionals of the change in food choices, the feedback from parents, and the change in attitude in the classroom. However, it was not mentioned whether these evaluations are documented and whether they are taken into account to reformulate the actions carried out or to consider them during planning. However, it is understood that the FNE in the school environment will be effective when it gives the students the opportunity to build knowledge that allows them to make choices, especially in seizing the HRAF, to be critical of the information transmitted by the media, and to be autonomous in the face of so many options that are presented in its context [17]. Thus, developing evaluation instruments for FNE actions that address these potentialities becomes crucial.

This study did not advance to the analysis of some important aspects of the development of the actions, with emphasis on methodological and procedural issues. However, this is a characteristic of online and, especially, self-applicable instruments, which are usually more objective and do not depend on an interviewer [38]. To advance, conducting complementary investigations such as case studies is suggested. In addition, the beginning of data collection at the end of the year may have hindered greater adherence and needs to be better agreed upon in future applications.

## CONCLUSION

Through this study, we found a panorama of the implementation of FNE in ECE and EE schools of the municipal public school system of Florianópolis (SC), Brazil. It stood out that these

actions were included in the PPP, planned, and transversally inserted into the school curriculum with a multiprofessional focus and family involvement. However, it is considered elementary that strengthening FNE is a continuous process. For such, public policies are significant pieces in stimulating the insertion of these actions in the school environment. It is essential that the professionals involved in the process constantly participate in training and have time to plan, execute, and evaluate the actions carried out.

Therefore, it is considered necessary to investigate the topic from other perspectives to deepen the research on the participation of other school actors in the FNE actions, *e.g.*, school cooks. In addition, it is crucial to investigate how the training and permanent education of the different actors involved with the FNE take place. The knowledge of the current FNE panorama in other municipalities, states, and countrywide is also made evident as fundamental.

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