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Implementation of educational gardens in municipal schools in São Paulo

Implantação de hortas pedagógicas em escolas municipais de São Paulo

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Abstract

Educational school garden projects have been recognized as a strategy for health promotion and effective education that enable significant learning on topics such as food systems, healthy eating, ecology and regional culture. In the city of São Paulo, the use of educational school gardens is embedded in the "Plan for the Progressive Introduction of Organic or Agro-ecological Based Foods in the School Feeding Program (PAE) of the Municipality of São Paulo" as an instrument to be implemented, which establishes the undertaking of courses on school gardens for public schools. This study aimed to monitor and describe the process of implementation of educational gardens in the public schools of São Paulo city where the course "Educational Gardens - More Organic Schools" was taken in 2016. Data were collected through two electronic questionnaires sent to the schools and to the participants of the course. A higher frequency of active gardens was found in relation to the rest of the schools in the city and, in these places, the garden usually had a pedagogical use as well. Lack of inputs, of adequate space, of involvement of the school staff and of time in the working day were described as the main challenges for the implementation and maintenance of educational gardens. For the success of the project, the involvement of the whole school community, the introduction of the garden theme in the curricular discussions and the undertaking of courses in the schools have shown to be of great importance.

Keywords: School Gardens. School Feeding. Sustainable Education. São Paulo.

Resumo

Hortas escolares pedagógicas têm sido reconhecidas como uma estratégia de promoção da saúde e da educação efetiva que possibilitam um aprendizado significativo sobre temas como sistemas alimentares, alimentação saudável, ecologia e cultura regional. No município de São Paulo, a utilização das hortas escolares pedagógicas aparece inserida no "Plano de Introdução Progressiva dos Alimentos Orgânicos ou de base Agroecológica no Programa de Alimentação Escolar (PAE) do Município de São Paulo" como instrumento a ser implementado, sendo prevista a realização de formações, dentro da temática, para as escolas públicas. O objetivo deste trabalho foi monitorar e descrever o processo de implantação de hortas pedagógicas nas escolas públicas da cidade de São Paulo que receberam o curso de "Hortas Pedagógicas - Escolas Mais Orgânicas" no ano de 2016. Os dados foram coletados por meio de dois questionários eletrônicos enviados para as escolas e para os participantes do curso. Foi encontrada maior frequência de hortas ativas em relação ao restante das escolas do município, sendo que nestes locais a horta geralmente também tinha uma utilização pedagógica. A falta de insumos, espaço adequado e envolvimento da equipe escolar foram descritos como os principais desafios para a implantação e manutenção das hortas pedagógicas. Para o sucesso do projeto, foi observada significativa importância do envolvimento de toda a comunidade escolar, da presença do tema das hortas dentro de discussões curriculares e a realização de formações nas escolas.

Palavras-chave: Hortas Escolares. Alimentação Escolar. Educação Sustentável. São Paulo.

Introduction

In the current National Food and Nutrition Security Plan,[1] Food and Nutrition Education (EAN) is included among the strategies to be used to promote and protect the adequate and healthy eating of the Brazilian population. According to the Food and Nutrition Education Framework for Public Policies,[2] EAN is "um campo de conhecimento e de prática contínua e permanente, transdisciplinar, intersetorial e multiprofissional".

The school environment is already consolidated as an important space to promote healthy eating and to perform EAN activities. School is an important socialization scenario, greatly impacting, according to Yokota et al.,[3] on the formation of behavioral practices and eating habits.

In this space, health promotion actions are enhanced by the ability to influence all members of the school community: students, educators, parents, school's cooks and other employees of the unit.[4]

Within the scope of the National School Feeding Program (PNAE), Resolution No. 26 of June 17, 2013, provides the inclusion of EAN in the school curriculum with the objective of "estimular a adoção voluntária de práticas e escolhas alimentares saudáveis que colaborem para a aprendizagem, o estado de saúde do escolar e a qualidade de vida do indivíduo".[5] Among the possible actions of EAN, the resolution cites actions that promote innovative methodologies and that stimulate the consumption of organic and/or agro-ecological products and socio-biodiversity. In addition, in Inter-ministerial Ordinance No. 1,010, of May 8, 2006, which establishes the guidelines for the promotion of healthy eating in schools, the stimulation of the production of school gardens is among the priorities.[6]

Thus, according to these national guidelines, the development and implementation of educational gardens in schools is a possible EAN action to be carried out aimed at healthier school communities. Educational school gardens have been reported by several authors as a strategy to promote effective health and enable meaningful learning on topics such as food systems, healthy eating, ecology and regional culture, and are in line with the principle of Food and Nutrition Security (FNS) with sovereignty, of the National Food and Nutrition Policy.[7,8]

Gardens are important spaces for interpersonal exchanges and enable the implementation of more dynamic school curricula, with a conscientious and meaningful learning by students, through the concrete experience of situations, such as: observing the origin of food, manipulating the land, exploring food, experiencing different textures, smells and tastes, besides making possible the learning of the curricular subjects, such as Mathematics, Science, Biology, Portuguese and Arts, in a practical and participative way.[9-12] The experience in school gardens also allows the construction of a deeper bond with food and with the regional food culture, stimulating the experimentation, the appreciation and the greater consumption of food produced in the garden, with less waste of food.[13-21]

The approximation with what is produced in the garden follows the principles of the *New Dietary Guidelines for the Brazilian Population*,[22] by building a closer relationship with *in natura* foods. The Guidelines argue that *in natura* foods should be the basis of eating, for they allow a nutritional, cultural, social and environmentally healthy and balanced nutrition.

The approach of environmental education in an integrated and continuous way in the school curriculum through educational gardens allows the student and the whole school community to recognize the reality in which it is inserted. Actions that value a sustainable food system, with better use of food, adequate disposal of waste and preservation of water stimulate the construction of principles of responsibility and commitment of students in relation to the school environment

and nature.[23] Direct contact with nature enables a positive relationship with the environment and is associated with reduced stress and anxiety, the increase of quality of life, of self-care and of self-esteem, of the sense of belonging and of community.[24,25] In this sense, the garden becomes an approximation space with nature, with people and with eating.[10]

Justification

In the context of the municipality of São Paulo, Law No. 16,140 was established in 2015, which made provision for the compulsory inclusion of organic or agro-ecological based food in school feeding in municipal schools.[26] In Decree No. 56,913, of April 5, 2016, which regulates this law, the use of educational gardens appears in the "Plan for the Progressive Introduction of Organic or Agro-ecological Based Foods in the School Feeding Program (PAE) of the Municipality of São Paulo" as an instrument of Education in FNS and of Environmental Education to be implemented.[27]

For the implementation of educational gardens, the Plan also foresees the undertaking of courses by the School Units of the municipality. Thus, the Course "Educational Gardens - More Organic Schools" was offered during the second semester of 2016, through a partnership among the Secretaria Municipal da Educação (SME - Municipal Secretariat of Education), the Secretaria Municipal do Verde e do Meio Ambiente (SVMA- Municipal Secretariat of Green and the Environment) and the Secretaria Municipal do Desenvolvimento, Trabalho e Empreendedorismo (SDTE - Municipal Secretariat of Development, Labor and Entrepreneurship). The purpose of this course was to provide technical training to: subsidize the implementation and maintenance of school gardens based on the agro-ecological system; enable people's interest and connection with the environment; enable the reflection within the school community on organic food, food security and healthy eating; and stimulate the reflection on water, waste and other environmental issues. There were five meetings with lectures and practices, with a total duration of 25 hours.

At the end of the course, each educational unit was visited by an agronomist from the Coordenadoria de Alimentação Escolar (CODAE - School Feeding Coordination) or SVMA to verify the conditions and space in the unit to make the garden viable. Finally, the units presented a Work Plan, describing the step by step necessary for the implementation and pedagogical use of the garden, adapted to the reality of their unit, pointing out the actors involved, deadlines and methodologies.

This study was necessary because, since its undertaking, it was not possible to monitor, by any of the involved organs, the process of implementation of the gardens in the units that received the course "Educational Gardens - More Organic Schools" and how their pedagogical use and maintenance are being carried out.

The study aimed to verify and to describe the process of implementation of educational gardens in the public schools of the city of São Paulo that received the course "Educational Gardens" in 2016.

Methodology

Venue and participants

The municipality of São Paulo has about 970,000 students enrolled in 3,205 municipal schools, divided into 13 Diretorias Regionais de Educação (DREs - Regional Directorates of Education). The present study was carried out with 55 schools of the municipality that undertook the course "Educational Gardens" in 2016, ministered by the SME in partnership with SVMA and SDTE.

These schools are distributed in the 13 DREs of the municipality, being 11 (20%) in the West Region, 13 (23.6%) in the North Region, 10 (18.2%) in the Central Region, 12 (21.8%) in the East Region and nine (16.4%) in the South Region. Among them, 15 (27.3%) are Early Childhood Education Centers (CEIs), 24 (43.6%) are Municipal Schools of Early Childhood Education (EMEIs) and 16 (29.1%) are Municipal Elementary Schools (EMEFs).

The population of this study is composed of the 165 representatives of the schools that undertook the course, and for each school, three positions were made available: one for management (director, assistant director or pedagogical coordinator), one for educator and one for technical assistant of education (TAE).

Instruments and data collection

Each year, CODAE sends the electronic form "Knowing the Educational Gardens" to all the schools in the network to follow the educational gardens implemented in the municipality. The questionnaire consists of 16 questions that include topics related to the existence of an educational garden, characteristics of the garden and pedagogical activities carried out. In order to obtain the initial data of the studied schools, we used what had been collected since the last submission (April to June 2017) of the aforementioned questionnaire.

Other more specific data of the units that undertook the course were collected through a second electronic form, developed for this purpose. In this second stage, the questionnaire was sent to the three participants of each school that took the course: board member, educator and TAE. From the instrument, questions were presented regarding the process of implementation of the garden and carrying out pedagogical activities after the course, as well as possible difficulties and potentialities found in its maintenance and use.

Data processing and analysis

The data collected through the two forms were grouped into a single database, and the open answers were categorized. Subsequently, analyses were performed using the statistical package STATA version 14, of frequency distribution and association: Chi-squared test, in this study identified as p^a, and Fisher's exact test, here identified as p^b. Statistical significance was considered for $p<0.05$.

Ethical Aspects

According to Resolution No. 466 of December 12, 2012, which regulates ethics in research in the country, this study did not need to go through consideration by the responsible Ethics Committee, because the object of the study are not individuals, instead they are educational gardens. In addition, this paper is supported by the Cooperation Agreement between FSP/USP and CODAE.

Results

Gardens in the Units

The data allowed to establish an overview of the situation of the gardens in the 55 respondent schools that took the course in 2016. Among these, it was possible to observe that 28 had active gardens at the time of collection, representing a little more than 50% of the places in this situation. There were also nine schools that affirmed still being in the process of construction of the garden; 14 units that had already had a garden, however, for some reason, were discontinued and only four units that have never had a garden or started the implementation process.

Regarding the presence of the theme "Gardens" in the Political Pedagogical Project (PPP) of the units, an important tool for planning the pedagogical actions to be carried out during the school year, it was possible to observe that only 13 (23.6%) did not have the theme within their PPP, a smaller number than those with inactive gardens.

The schools without an active garden, considered in this study as non-operational from a structural point of view, reported that the main obstacle to the implementation or maintenance of the garden at the site was the lack of inputs. Other reasons more frequently reported were the lack of a caretaker, of technical support/guidance and of adequate space.

Table 1. Characterization of school gardens according to their situation at the time of data collection and presence of the theme "Gardens" in the PPP. São Paulo, SP, 2017.

School Gardens		
Situation	n	%
Active	28	50.91
Under construction	9	16.36
Discontinued	14	25.45
Never had	4	7.27
Total	55	100.00
Garden Theme in the PPP		
No	13	23.64
Yes	42	76.36
Total	55	100.00

Table 2 shows that among the units that have active gardens, the majority (53.6%) have already had the garden for more than a year. Another 25% of schools have already had the garden for at least six months, which indicates the presence of already consolidated gardens among a large portion. In addition, it was possible to verify that the most used form of cultivation is in garden beds, with some units using more than one form of cultivation and also performing cultivation in tiles, PET bottles, pots and only one in a tire.

However, 27.3% of the units with active gardens still did not perform any kind of composting. The highest frequency found was the use of only soil compost (40.9%), using conjunctly the compost and the vermicompost in 27.3% of the active sites, and only the vermicompost in 4.5%.

Table 2. Characterization of schools with an active garden according to the duration of the garden on the site and the form of cultivation. São Paulo, SP, 2017.

Schools with Active Garden		
	n	%
Duration		
Less than 3 months	3	10.71
3 to 6 months	2	7.14
6 months to 1 year	7	25.00
More than 1 year	15	53.57
No answers	1	3.57
Total	28	100.00
Form of Cultivation		
Garden Bed	20	60.61
Tile	5	15.15
PET Bottle	4	12.12
Pot	3	9.09
Tire	1	3.03
Total	33	100.00

Involvement of the Schools

The second form was sent to the three participants of the schools, and answers were obtained from 25 Managers, 21 Educators and 24 TAEs. This questionnaire allowed to evaluate other aspects related to the process of carrying out the garden projects, according to each one of the participants.

Table 3. Characterization of the involvement in the schools with the subject of gardens according to the presence in JEIF and the number of educators and professionals involved. São Paulo, SP, 2017.

Involvement in the School				
	Manager		Educator	
	n	%	n	%
Gardens Theme in JEIF				
No	7	28.00	6	28.57
Yes	18	72.00	15	71.43
Total	25	100	21	100
No. of Educators Involved				
None	1	4.00	1	4.76
1 to 5	11	44.00	9	42.86
6 to 10	5	20.00	4	19.05
Above 11	8	32.00	7	33.33
Total	25	100.00	21	100.00
No. of Total Professionals Involved				
None	2	8.00	1	4.76
1 to 5	5	20.00	7	33.33
6 to 10	12	48.00	5	23.81
Above 11	6	24.00	8	38.10
Total	25	100.00	21	100.00

In the schools, Integral Special Training Conference (JEIF) meetings are held, which allow the discussion between managers and educators of the work that was carried out. It was reported by approximately 70% of both groups that the garden theme was present at these meetings (table 3). It was also observed that when the subject was present at JEIF meetings, the probability of the school having an active garden was higher (p^b=0.014): 86.7% of the places in which the educator stated that the theme was included had active gardens, while 80% of the places in which they said they did not discuss the subject had inactive gardens.

Similarly, there was an association between the number of educators involved in the project and the situation of the school garden ($p^b<0.05$): 90.9% of the educators who stated that more than six of them were involved in the school project were in units with active gardens; on the other hand, 55.6% of the educators who said there were less than five of them in the project were in units with inactive gardens.

In addition, an association was found between the number of school professionals (educators, management staff, TAEs, cleaning staff, school's cooks) involved in the project and the situation of the gardens ($p^b<0.01$): 92.3% of the educators who claimed that more than six professionals were involved in the school project were in units with active gardens, while 71.4% of the educators who claimed to have less than five professionals in the project were in schools with inactive gardens.

Regarding the involvement of the students' families in the garden project, most managers (64%) reported that their families were not involved, while the majority of educators (52%) and of TAEs (55%) reported that there was involvement. This was another issue in which an association with the situation of the gardens in the units ($p^b<0.05$) was found: 90.9% of the educators who stated that family members were involved were in schools with active gardens and 55.6% of educators of units who claimed they did not participate were in schools with inactive gardens.

Concerning the form of involvement of the students' families, the most cited by the professionals of the units was the contribution with inputs, followed by the aid in joint efforts. Other reported contributions were: assistance in care during weekends, holidays and school vacations; participation in pedagogical activities; encouraging their children to participate in the activities and creating crops in their homes; and sharing personal experiences and techniques.

Implementation process

The main challenge in the process of implementation of the gardens cited by the participants was the lack of inputs for their initial construction. Many managers and TAEs also reported difficulties related to space, such as lack of it, inadequate land or of difficult maintenance and distant location. However, only managers cited routine and daily care as a difficulty, whereas among educators and TAEs, a lack of technical knowledge was reported. On the other hand, it was possible to identify some potentialities in the process of implementing gardens, such as the interest and involvement of the students and the involvement of the educators of the unit (table 4).

Regarding the recognition of the role of each employee during the implementation process among the managers, the most frequent collaborations were the encouragement to the school staff and training, the viability of financial resources and inputs and the planning and organization of the actions to be carried out; among the group of educators, it was reported as contribution the

participation with technical knowledge, in the initial manual work of the garden, in the planning and organization of actions and in the care and maintenance; for the TAEs, their role was more related to initial manual work, care and maintenance, and to composting.

Nevertheless, when asked about who was responsible for the care and maintenance of the school garden, the most frequent response among managers (29.2%) and educators (23.8%) was that it was the responsibility of one or more educators of the unity. For the TAEs (33.3%), it was the role of the pedagogical coordinator of the place.

Table 4. Characterization of the implementation process of the garden according to the Work Plan, challenges and potentialities found and contributions of the participants. São Paulo, SP, 2017.

Implementation of the Gardens						
	Manager		Educator		TAE	
	n	%	n	%	n	%
Work Plan						
Not carried out	4	16.67	4	19.05	4	16.67
Carried out	6	25.00	8	38.10	10	41.67
Partially carried out	14	58.33	9	42.86	10	41.67
Total	24	100	21	100	24	100
Difficulties						
Inputs	13	32.50	9	40.91	11	29.73
Space	10	25.00	3	13.64	11	29.73
Routine	5	12.50	0	0.00	0	0.00
Lack of knowledge	0	0.00	3	13.64	4	10.81
Involvement	4	10.00	3	13.64	4	10.81
Other	8	20.00	4	18.18	7	18.92
Total	40	100	22	100	37	100

to be continued

Potentialities						
Interest of students	9	29.03	6	24.00	5	15.63
Involvement of educators	9	29.03	5	20.00	6	18.75
Involvement of management	3	9.68	2	8.00	4	12.50
Involvement of employees	1	3.23	3	12.00	4	12.50
Involvement of families	1	3.23	1	4.00	3	9.38
Space	3	9.68	5	20.00	3	9.38
Garden Course	3	9.68	2	8.00	3	9.38
Other	2	6.45	1	4.00	4	12.50
Total	31	100	25	100	32	100
Contribution						
Resources	9	24.32	0	0.00	1	3.57
Planning	7	18.92	4	16.67	3	10.71
Incentive of the team	10	27.03	2	8.33	0	0.00
Manual Labor	5	13.51	5	20.83	8	28.57
Care	0	0.00	4	16.67	7	25.00
Knowledge	1	2.70	5	20.83	3	10.71
Composting	1	2.70	1	4.17	4	14.29
Multiplication of the Course	3	8.11	1	4.17	2	7.14
Seeks Partners	1	2.70	2	8.33	0	0.00
Total	37	100	24	100	28	100

Carrying out pedagogical activities

The data show that: only one of the schools with an active garden did not carry out pedagogical activities involving the garden. In the units with a garden under construction, four reported that are already carrying them out. The report of the managers and educators are exemplified in some of the excerpts highlighted in Table 5.

Through the reports, the pedagogical activities that were carried out could be categorized. It was possible to observe (Table 6) that, among the described activities, all included the implementation of the care and maintenance of the garden with the students. In the reports of a part of the participants, actions were also described which included tastings and/or discussions on the topic of healthy eating and the use of the garden inserted in the curricular subjects.

Table 5. Excerpts from the participants' reports on the pedagogical activities carried out. São Paulo, SP, 2017.

Categories	Participant Speeches
Care of the Garden	"*In the garden space, the children have contact with land preparation, planting of seedlings, watering, cleaning garden beds and composting [...] taking and covering with foliage the remains of food preparation and of feeding.*"
Healthy Eating	"*Healthy eating is stimulated through knowledge of the cultivation process and its consumption. Children are encouraged to take care of the garden and to participate in the harvest and also in the consumption, producing recipes and consuming.*" "*The children planted, took care of the garden [...] and then the families were called to harvest with their children and then they cooked.*"
Inclusion in the subjects	"*All the subjects have been developed in this project. Mathematics: measurement, spacing for the replant, depth, problem-situations involving calculations, perimeter and geometric shapes. Portuguese: record of individual and collective activities, research, project development report. Nature and Society: Cycle and development of the plant, the action of man and of nature and its transformations; process of composting, observation of fungi and living organisms [...]. Brazilian culture: rescuing the planting in the interior habits, through reports and suggestions of family members with tips and recipes of habits. English: in writing the products in popular and scientific form.*" "*We use different languages, verbal, mathematical, graphic and corporal, as a means to produce, express and communicate their ideas [...] For example: drawings, dramatization, declamation of poetry, songs, quantities, distance from seedlings, hygiene habits etc.*"

Table 6. Characterization of the pedagogical activities carried out and the process of carrying out pedagogical activities in the schools, according to the challenges and potentialities found and contributions of the participants. São Paulo, SP, 2017.

Pedagogical Activities with the Gardens						
	Manager		Educator		TAE	
	n	%	n	%	n	%
Activities Carried out						
Care	4	21.05	5	29.41	-	-
Care and Eating	6	31.58	5	29.41	-	-
Care and Subjects	4	21.05	3	17.65	-	-
Care, Eating and Subjects	5	26.32	4	23.53	-	-
Total	19	100	17	100	-	-
Difficulties						
Inputs	5	25.00	5	26.32	3	15.00
Space and Climate	4	20.00	2	10.53	3	15.00
Time	0	0.00	3	15.79	4	20.00
Lack of knowledge	2	10.00	0	0.00	3	15.00
Involvement of the team	5	25.00	5	26.32	2	10.00
Other	4	20.00	4	21.05	5	25.00
Total	20	100	19	100	20	100
Potentialities						
Interest of students	13	44.83	4	26.67	5	23.81
Involvement of educators	4	13.79	2	13.33	2	9.52
Involvement of the team	6	20.69	4	26.67	6	28.57
Involvement of families	1	3.45	0	0.00	2	9.52
Other	5	17.24	5	33.33	6	28.57
Total	29	100	15	100	21	100

to be continued

Contribution						
Resources	3	9.38	0	0.00	1	3.85
Planning	12	37.50	6	21.43	2	7.69
Participation in PEA/JEIF	6	18.75	6	21.43	0	0.00
Carrying out	3	9.38	7	25.00	0	0.00
Support for Carrying out	0	0.00	0	0.00	6	23.08
Care	1	3.13	1	3.57	4	15.38
Knowledge	2	6.25	3	10.71	7	26.92
Multiplication of the Course	2	6.25	2	7.14	2	7.69
Other	3	9.38	3	10.71	4	15.38
Total	32	100	28	100	26	100

According to the managers and educators, the main difficulties for carrying out the pedagogical activities were, once more, the lack of inputs and materials and of involvement of the school staff. For the TAEs, the greatest difficulty was found in the lack of time within the working day. Other problems reported were the lack of space for carrying out activities with all students in the garden, difficulties with the climate and personal difficulty in transmitting knowledge, by TAEs. On the other hand, the greatest potentialities for carrying out the activities were the interest and involvement of the students and the involvement of all the school staff of the unit.

In addition, it was possible to observe an association between the discussion of the garden theme in the JEIF meetings in the units and carrying out pedagogical activities with the insertion of the garden in the curricular subjects ($p^b<0.01$). In units where the subject was not discussed in JEIF, there was not the use in curricular subjects; on the other hand, among the units where the theme was in the meetings, 50% carried out activities related to the subjects.

For the managers, their greatest contribution to the pedagogical use was in the planning and organization of activities and during discussions at the Special Projects of Action (PEA) and JEIF meetings. Among the educators, their greatest contribution was in carrying out the activities with the students, in the planning and organization of the activities, and also during discussions at the PEA and JEIF meetings. In the group of TAEs, they claimed that they collaborated more with technical knowledge and supported the educators during the accomplishment of the activities.

Discussion

Educational gardens have been consolidated as an important instrument of education in FNS and of Environmental Education in the school environment. However, its process of implementation, maintenance and pedagogical use is still poorly monitored and evaluated so that it could be stimulated more effectively.[28]

In the implementation of the project of educational gardens among the studied school units, the different occupations of the participants of the course were evident, according to their positions. Among the managers, administrative, actions planning and incentive activities of the rest of the school staff were described through training and inclusion of the theme in the PEA and JEIF meetings. The educators also reported their participation in planning and discussing the subject with the school staff, as well as contributing with technical knowledge and practical actions, such as the manual work in the garden, its care and execution of pedagogical activities with the students. The TAEs reported being very involved with the practical part of the implementation and maintenance of the space, with the accomplishment of the composting and with the support to the educators to carry out the activities.

It is interesting to note that, although the TAEs have shown to be the members with the greatest participation in the care and maintenance of the gardens in the units, they were not designated as those responsible for the care by the majority of the interviewees. This role would be of one or more educators, according to the greater part of the managers and educators, or of the pedagogical coordinator, according to the TAEs. This issue could indicate that, although they often perform the function "in practice", they do not feel, in fact, as the major responsibles for the space or have less appreciation of their work. Similarly, in a study conducted in the Federal District,[29] it was described that teachers were the most involved ones with the care and maintenance of school gardens.

Bernardon et al.[29] observed that, in their population, 31% of the schools have had their gardens discontinued at some stage, listing as main challenges the lack of resources, labor and the lack of time of the teachers to deal with the subject within the curriculum. Other authors also reported a lack of resources, of involvement of the teacher, of time, and maintenance as challenges for educational gardens.[18,28,30,31] Similarly, as observed by Bernardon et al.,[29] 25.5% of the units studied here were discontinued gardens. In this study, during the process of implementation and pedagogical use, the greatest challenges described were the lack of inputs, of adequate space, of involvement of the school staff and, for the TAEs, the lack of time in the working day for the pedagogical activities.

The issue of the lack of inputs was strongly evidenced at all times when elements that make it difficult for the project to be carried out were identified, with frequent reports of a lack of resources to purchase quality land, tools, seedlings and seeds. However, many of these inputs could be obtained in alternative ways, e.g., one may cite the obtaining of a quality land by means of the

use of the land of the unit, or of regions near the place, complemented with fertilizer produced by composting, using organic residues of the school feeding. Through these, seeds and roots of some foods may also be obtained for the production of seedlings. Thus, more sustainable gardens may be built together with the students, both from an environmental and financial point of view.

Concerning the accomplishment of pedagogical activities using the theme and the space of the garden, it was possible to observe that, in the participating units, the implementation have already seemed to be accompanied by its pedagogical use. They were carrying out activities involving the care of the garden; the theme of healthy eating, with the contact of students with fruits, legumes and vegetables through cooking and tasting activities; and the use of the garden linked to the school curriculum, promoting a more dynamic and meaningful learning. Collins et al.[32] also described similar use in school units in New Zealand, integrating the gardens with curricular subjects, cooking classes, and promoting fruit and vegetable consumption.

Both for the implementation of the garden and for the accomplishment of pedagogical activities, the greatest potentiality found was the interest and involvement of the students in the project, which demonstrates the coherence of the insertion of the theme in the school environment. Another factor reported by the participants as positive was the involvement of the school staff. The involvement of not only the staff but the whole school community, including the families of the students, was very significant for the success of the project.

An association was found for the garden to be active in the unit and the following indicators: inclusion of the garden theme within JEIF meetings, more than six educators of the unit were involved in the project, more than six professionals of the unit were involved in the project and the involvement of the families of the students. The discussion of the subject at the JEIF meetings was also associated with the accomplishment of pedagogical activities, including the use of the garden inserted in the curricular subjects.

Hazzard et al.[30] identified in California that units with a greater participation of "garden coordinators", parents and community volunteers had more human and financial resources to support the project. Similarly, Ozer[28] explained the importance of the involvement of parents to maintain the gardens not only during the school term, but also during the school vacations, discussing the greater vulnerability of school gardens that had only one "leader". Among the school units of this study, the greatest contributions of the families of the students appeared to be with inputs and participation in joint effort, however, they were also present in the aid of care, participation in pedagogical activities, encouraging their children to participate in the garden and sharing techniques and personal experiences.

In this respect, the importance of both the involvement of the entire school community and the participation of different professionals in school units is evident, which should also occur during the training, such as in the "Pedagogical Gardens" course, in which three members from

each unit participated, in order that the project is not the responsibility of only one "leader". It was also very interesting the participation of professionals with different positions or actions, since they brought different contributions to the project.

Undertaking the course among these units was observed as another important potentiality. Iared et al.[31] emphasized in their study in São Carlos the need for the formation of school autonomy in the face of the fragility of the project of educational gardens observed with the constant changes of management and organizational structure. Among the units participating in the "Educational Gardens" course, it was possible to observe different results in relation to the school units of the municipality that did not take the course and also responded to the form annually sent by the Coordenadoria de Alimentação Escolar (School Feeding Coordination). The first point observed was the greater presence of the "lack of support" factor as a reason to make the implementation and maintenance of the garden difficult among the units that did not complete the course, being cited by 39.9% of them.

Another issue observed was the lower use of PET bottle and tire as a place for cultivation within the school gardens of the units that carried out the course. This use is contraindicated by SVMA because of the risk of release of chemical contaminants in the crop. Their low utilization among the surveyed units may have been influenced by the lower proportion of CEIs in this sample in relation to the general population, since this type of unit is responsible for their greater use. However, even among the 15 CEIs participating in this study, only one made use of these materials.

In addition to these aspects, a positive association was found between the course and the practice of composting ($p^a<0.001$), a resource of great importance for soil fertilization and that provides the reuse of organic waste produced in school feeding. Among the units that did not complete the course and had a garden, only 32.5% were composting, while 72.7% of the units with the course were composting. The use of the two forms of composting (soil compost and vermicompost) was also more frequent among the units that took the course.

There was also a positive association between having completed the course and having the subject of gardens inserted in the PPP of the unit ($p^a<0.001$), present in 76.4% of the schools which took the course and 36.6% of the schools without the course. Finally, there was an association between undertaking the course and the garden being active at the site ($p^a<0.001$). Among the participating units, 50.9% were active; among the units without the course, 24.3% had an active garden.

Conclusions

In the school units participating in the "Educational Gardens" course, a higher prevalence of active gardens was found in relation to the rest of the municipality. The process of implementation of the gardens in these places was accompanied by their pedagogical use, involving the students

in activities from the conception of the garden, the care, the harvest, cooking classes and the insertion of thematic gardens in curricular subjects, thus contributing to the approach to eating issues such as food origin, forms of production and consumption of fruits, legumes and vegetables.

In addition to the involvement of the aforementioned actors (students' parents, students, teachers, management team, support team), we consider important the involvement of the kitchen team in the conception of the garden, since they are actors involved in the production of daily meals in the units. The kitchen becomes an important link between the educational garden and the consumption of food, also going through the process of composting with residues generated in the kitchen, such as peels of vegetables and eggshells, used as inputs, thus feeding the garden cycle.

Thus, it is of great importance for the success of educational garden projects to involve the entire school community in the units, as well as the presence of the theme within curricular discussions, both for its implementation and maintenance as well as for better pedagogical use. Carrying out training with school units was also verified as an effective strategy.

In future studies, it would be interesting to evaluate other aspects of the process of implementation and the use of school gardens, such as their use as an educational tool by teachers and their effects within the school environment, for students, their families and the whole community.

Collaborators

SRML Oliveira worked in all the stages from the conception of the study until the revision of the final version of the article; BS Villar participated in the conception and design of the study, of the data analysis and of the revision of the study in all stages; JMP Florido participated in the conception of the study, the data collection and interpretation; F Schwartzman and D Bicalho participated in the revision of the article.

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