

TEACHING SUSTAINABILITY: THE PEDAGOGICAL FUNCTIONS OF SCHOOL GARDENS

*ENSINO DA SUSTENTABILIDADE:
AS FUNÇÕES PEDAGÓGICAS DAS HORTAS ESCOLARES*

*ENSEÑANZA DE LA SOSTENIBILIDAD:
LAS FUNCIONES PEDAGÓGICAS DE LOS HUERTOS ESCOLARES*

LIA PALETTA BENATTI, Dra. | UFJF – Universidade Federal de Juiz de Fora

ABSTRACT

This paper explores the role of school gardens as pedagogical tools, focusing on their potential beyond mere food provision. In visited schools, gardens are not intended to meet dietary needs due to limited cultivation space relative to student populations. However, they offer opportunities for diverse educational activities, including agroecology and environmental education, contingent upon educators' willingness to integrate them into various disciplines. Despite logistical challenges, such as resource acquisition and interdisciplinary integration, gardens contribute to promoting healthy eating habits among students, staff, and faculty. Effective garden management remains crucial, with individual teachers often assuming responsibility. Additionally, the paper explores design's innovative potential in conceptualizing gardens not just as ornamental spaces but as catalysts for therapeutic, social, and knowledge-building experiences. A proposed framework guides practical application and outcome evaluation, emphasizing considerations like activity meaning, experiential nature, social interaction facilitation, knowledge generation, and aesthetic appeal. Ultimately, by addressing these aspects, educators can develop projects that resonate emotionally and culturally, yielding enduring and meaningful outcomes.

KEYWORDS

School gardens; Sustainability; Education; Design; Cultivation.

RESUMO

Este artigo explora o papel das hortas escolares como ferramentas pedagógicas, com foco em seu potencial além da simples provisão de alimentos. Nas escolas visitadas, as hortas não têm o objetivo de suprir necessidades alimentares devido ao espaço limitado de cultivo em relação ao número de alunos. No entanto, elas oferecem oportunidades para diversas atividades educativas, incluindo agroecologia e educação ambiental, dependendo da disposição dos educadores em integrá-las a várias disciplinas. Apesar dos desafios logísticos, como aquisição de recursos e integração interdisciplinar, as hortas contribuem para a promoção de hábitos alimentares saudáveis entre alunos, funcionários e professores. A gestão eficaz das hortas é essencial, sendo que, muitas vezes, professores individuais assumem essa responsabilidade. Além disso, o artigo explora o potencial inovador do design ao conceber hortas não apenas como espaços ornamentais, mas como catalisadores para experiências terapêuticas, sociais e de construção de conhecimento. Um modelo proposto orienta a aplicação prática e a avaliação dos resultados, enfatizando considerações como o significado das atividades, a natureza experiencial, a facilitação da interação social, a geração de conhecimento e o apelo estético. Em última análise, ao abordar esses aspectos, os educadores podem desenvolver projetos que ressoem emocional e culturalmente, gerando resultados duradouros e significativos.



PALAVRAS-CHAVE

Hortas escolares; Sustentabilidade; Educação; Design; Cultivo.

RESUMEN

Este artículo explora el papel de los huertos escolares como herramientas pedagógicas, centrándose en su potencial más allá de la mera provisión de alimentos. En las escuelas visitadas, los huertos no están destinados a satisfacer las necesidades dietéticas debido al espacio limitado para el cultivo en relación con las poblaciones estudiantiles. Sin embargo, ofrecen oportunidades para diversas actividades educativas, incluida la agro-ecología y la educación ambiental, siempre y cuando los educadores estén dispuestos a integrarlos en diversas disciplinas. A pesar de los desafíos logísticos, como la adquisición de recursos y la integración interdisciplinaria, los huertos contribuyen a promover hábitos alimenticios saludables entre estudiantes, personal docente y administrativo. La gestión efectiva de los huertos sigue siendo crucial, con frecuencia, los maestros individualmente asumen la responsabilidad. Además, el artículo explora el potencial innovador del diseño al concebir los huertos no solo como espacios ornamentales, sino como catalizadores de experiencias terapéuticas, sociales y de generación de conocimiento. Un marco propuesto guía la aplicación práctica y la evaluación de resultados, enfatizando consideraciones como el significado de la actividad, la naturaleza experiencial, la facilitación de la interacción social, la generación de conocimiento y el atractivo estético. En última instancia, al abordar estos aspectos, los educadores pueden desarrollar proyectos que resuenen emocional y culturalmente, produciendo resultados perdurables y significativos.

PALABRAS CLAVE

Huertos escolares; Sostenibilidad; Educación; Diseño; Cultivo.

1. INTRODUCTION

In the global pursuit of sustainability and healthy living, educational environments play a crucial role in shaping future generations. School gardens have emerged as an important tool in this context, promoting not only environmental awareness but also healthy eating habits among students.

Design, as an interdisciplinary activity within a complex contemporary scenario, manifests itself in various ways. This multiplicity is also evident in activities related to plant cultivation. The relevance of design lies precisely in its capacity to connect and create bridges within a context of spatialization and fragmentation of knowledge (Cardoso, 2012). When considering the relationship between design project actions and the interface with the plant kingdom, a multitude of possible interactions can be envisioned.

In this research, the perspective of design is used in conjunction with environmental education to address the use of school gardens. A school garden, in a simplified and objective definition, functions to intervene in the food culture of students and all involved actors, enabling them to replicate their new knowledge of healthy and environmentally sustainable nutrition within their family environment (Lima; Conde Sobrinho; Silva Junior, 2015).

However, the implementation of a garden in a school environment presents several challenges for institutions. It requires various resources and often does not meet the nutritional demands of the school community. This article aims to investigate the balance between the difficulties of managing a garden and the justifications for the solutions implemented in three different scenarios.

2. METHODOLOGY

The overarching goal of this research is to understand the complex process of plant cultivation through the lens of design, using it as a framework to analyze strategies for promoting this activity. To achieve this, theoretical foundations from design, environmental education, and ethnobotany are explored to propose models for the creation, management, and evaluation of cultivation systems.

The first stage of the study involves documenting and analyzing field visits to school gardens to identify and assess the potential of cultivation as a pedagogical tool. Following this, a comparative analysis examines the educational functions of school gardens, providing a critical perspective on the roles designers can play in this setting. This analysis integrates design with other

disciplines to uncover potential synergies between various sectors that can enhance creative activities.

The identified concepts are organized to culminate in design guidelines aimed at elucidating the subjective aspects of plant cultivation, facilitating their application in projects related to cultivation activities.

3. SCHOOL GARDENS

Recognizing the importance of personal development, we chose to visit daycare centers and schools with gardens to understand their pedagogical functions.

Three visits were conducted at schools utilizing gardens. The first visit was to a private school offering both elementary and secondary education. In a contrasting setting, a rural public state school providing elementary and secondary education was visited. Finally, the third visit was to a public university with its own garden.

3.1 Saci International School

Recognizing the significance of personal development, we visited the Saci International School, a private institution in Juiz de Fora/MG, offering preschool and elementary education along with optional bilingual (English) extracurricular activities. The school's pedagogical approach follows the Montessori method, aiming to facilitate the holistic development of individuals through principles of freedom, activity, and independence, with an emphasis on knowledge transmission (Lancillotti, 2010).

The Saci International School features a garden located in its outdoor area, partially situated on land borrowed from a neighboring club (Picture 1). Presently, the school collaborates with a couple of farmers from the MOGICO group (Monte de Gente Interessada em Cultivo Orgânico), a collective comprising consumers, producers, and technicians from Juiz de Fora and the surrounding region, who assist with garden maintenance weekly and conduct pedagogical activities with students.



Picture 1: Saci International School garden
Source: the author, 2018.

Within this garden and orchard space, activities encompassing Science and Practical Life are conducted, including composting, harvesting food for school meals, and culinary classes. Students actively participate in planting, harvesting, research, experimentation, and tasting activities (Saci, 2019).

According to the school's principal, although the garden doesn't fully meet the demands of the cafeteria meals, students occasionally assist with harvesting vegetables for inclusion in meals. Nonetheless, the promotion of healthy eating habits is encouraged, echoing observations made by Cunha (2015, p. 128), who highlighted "awareness of the benefits of ecological cultivation of food for self-consumption and the cultivation activities undertaken by some students at home" in her report.

The school garden serves as a multifunctional educational tool for various subjects and preschool activities. For younger children (up to approximately 3 years old), it serves as an area for exploration and discovery of colors and textures. Guided activities are introduced gradually as children progress, tailored to each teacher's preferences. While participation is optional, there is significant interest among the teaching staff across various disciplines and themes. Thus, the school garden serves as a living laboratory that enriches the learning process (Cunha, 2015).

Both the principal and the collaborating farmers agree that while the garden has the potential to introduce healthy foods into students' diets, family involvement is crucial for sustaining healthy habits. Additionally, beyond nutritional benefits, the garden's educational activities promote cooperation and agroecology among students (Lima, Conde Sobrinho, Silva Junior, 2015).

Under the influence of the MOGICO proposal, the garden features a variety of Non-Conventional Food Plants (PANC), such as "peixinho" (*Stachys byzantina*) and purple lettuce (*Lactuca canadensis*), along with the cultivation of native maize species.

Aligned with the Montessori approach, which encourages self-directed learning, plants are integrated into the indoor classroom environment as well (Picture 2) to stimulate curiosity and foster a sense of responsibility among students.



Picture 2: Plant inside the classroom at Saci International School
Source: the author, 2018.

This integration of plants into the learning environment aligns with Maria Montessori's philosophy, which emphasizes self-directed education and learning through exploration (Lancillotti, 2010).

3.2 Tiago Delgado State School

The visit to Tiago Delgado State School was guided by the institution's vice principal. Situated in the rural village of Manejo, within Lima Duarte/MG, this public school provides education ranging from elementary to high school levels, as well as adult education.

In contrast to Saci International School, Tiago Delgado State School boasts a more extensive garden area (Picture 3), which, although still not fully meeting the cafeteria's needs, provides herbs and vegetables to students' meals more regularly.

It's noteworthy that state schools in Minas Gerais benefit from manuals offering menu suggestions tailored to each educational stage. These menus integrate basic food groups with nutritional guidelines, taking into

account the dietary and agricultural customs of the state (Minas Gerais, 2014).



Picture 3: Tiago Delgado State School garden
Source: the author, 2018.

Additionally, the suggested menu ingredients provided by SEE/MG (Minas Gerais State Department of Education) are accompanied by a seasonal harvest table, indicating the availability of each food item throughout the year. Such documentation aids in planning garden cultivation to support the cafeteria.

According to the vice principal, extracurricular activities are available to certain classes, and the topics covered during these non-formal hours are often chosen with input from the students themselves. Thus, in response to their initiative, there was a demand for environmental education, leading to the utilization of the garden space.

In this framework, students play a significant role in decision-making regarding the garden, including the selection of plants and their active involvement in cultivation activities. Lima, Conde Sobrinho, and Lima Junior (2015) underscore that "the establishment of a school garden should, above all, engage students, educators, and partners in the process. Such endeavors embody the principles of cooperativism and agroecology, fostering educational and productive balance."

Beyond disciplinary activities, where teachers from any subject can use the space for instruction, students also utilize their free time in the garden, collaborating to brainstorm and implement improvements. They are even permitted to eventually harvest vegetables for family consumption.

As a public school primarily serving low-income children and youth, all garden improvements, along with other school enhancements, are achieved without public funding. Instead, they rely on group mobilization and

non-monetary resources. Neighboring producers donate materials, and students and teachers collaborate in mutual aid efforts, among other strategies to achieve objectives without financial reliance. This approach reflects some of the current challenges in design, emphasizing its role as a facilitator of interpersonal relationships rather than transactions of ownership (Secomandi, 2014).

When Bonsiepe (2011) posed the question, "how can we reclaim a concept of democracy not dominated by the economy and restore its credibility?" he interrogated a present landscape dominated by market forces shaping social and economic interactions. Gradually, communities are recognizing the value of collective action as essential assets, equating in significance to tangible resources. "As crucial as the values of utility and exchange highlighted in product acquisition are the values of esteem, linked to emotional factors and satisfaction" (Pinto, 2017, p. 395).

A community mobilizing and crafting its own narrative using alternative resources (beyond mere currency) for implementation can serve as one viable response to Bonsiepe's inquiry.

3.3 Education School

The Education School (FACED) at the Federal University of Juiz de Fora (UFJF) features an open, grassy area at the back of its structure. With the aim of making the space more productive, one of the institution's professors took on the task of setting up a garden in this area (Picture 4). However, what is noticeable is that visually, it is not immediately apparent that it is a garden; there are no signs or well-defined beds as in the two schools mentioned earlier. It is only upon approaching the plants, which occupy the peripheral area rather than the center, that one realizes they are edible plants.



Picture 4: Education School - UFJF
Source: the author, 2018.

There is no leadership or individuals with specific obligations regarding garden care, as the initial idea is to leave the space open so that anyone can freely take the initiative to engage with it. FACED staff, students, and professors are the ones who usually take care of some stage of cultivation. It is worth noting that "anyone can cultivate a garden, as long as they have reserved time for it" (Melo, 2019, p. 120).

At times, professors and participants in the college's activities teach classes or hold meetings in this area, as was the case with the course "Pedagogical Potentials of Agroecological School Gardens," promoted by members of the Environmental Education Study Group (GEA), which in 2018, held part of its activities in the garden.

In the university setting, students are adults, and campus dining is optional. Therefore, the garden here does not need to instruct the student body on good dietary or even environmental practices, as it is not the main focus of FACED's courses. Participation arises from individuals' desire to be in that space and engage in cultivation activities, largely without any obligation.

Professors may often wonder about their level of involvement in guiding a project or activity, but in the university, student autonomy is a fundamental aspect of their learning. One can envision a more active participation where certain issues are imposed, such as the working method, for example, or the delegation of tasks to specific members. However, in addition to teaching a project, it is important to teach about the responsibilities of decision-making. Therefore, the less decisive the teacher's role, the greater the freedom and autonomy of the group of students to express themselves, learn, and decide thoughtfully. And perhaps decision-making, knowing how to choose, define, is one of the main lessons in a career.

4. THE GARDEN AS A DIDACTIC OBJECT

The gardens observed in the visited schools do not mandate compulsory usage by any teacher/professor, nor do they directly contribute to meeting the dietary needs of students or staff in any of the scenarios presented. So, why do schools invest in maintaining a garden? Wouldn't this allocation of resources seem excessive for an uncertain outcome?

Considering that none of the schools have institutionalized the use of the garden, it may appear as though this effort could be misdirected. However, in contemporary discourse, concepts like environmental

responsibility and social inclusion are prominent and often emphasized within educational frameworks (Cardoso, 2012). Hence, integrating cultivation activities into the curriculum appears to offer a practical means of engaging students in environmental education.

In 1978, Tanner drew a comparison between conservation education and environmental education, suggesting that the former focused solely on nature, without incorporating the human environment, while the latter actively involved human-environmental dynamics to foster discussions on political, cultural, and socio-economic issues related to environmental themes (Layrargues, 2000).

Aligned with the principles of environmental education as outlined by Tanner, advocating for the presence of a garden within a school environment without mandating its use at specific points in the curriculum grants educators the flexibility to integrate it as they see fit within their pedagogical approach. This adaptability underscores that the emphasis should not solely be on determining the optimal form and timing for teaching environmental concepts within a particular discipline but rather on embedding environmental consciousness into the institutional ethos, irrespective of the subject being taught.

The challenges faced by environmental educators underscore that presenting information in a linear format, such as through pamphlets extolling the benefits of plant cultivation or natural food consumption, is unlikely to catalyze behavioral changes. Thus, the essence of the proposal lies in devising alternative methods that encourage individuals to reflect on their habits within their immediate environments.

In essence, it encompasses more than merely imparting ecological knowledge; it fosters a sense of civic responsibility (Layrargues, 2000). Ultimately, environmental education encompasses a diverse range of knowledge, necessitating a departure from didactic methods towards engagement with the conflicts and complexities inherent in the environments that both transmit and receive knowledge.

The presence of a garden in educational institutions facilitates various activities that support educators in achieving diverse educational objectives. Literature offers insights into a spectrum of outcomes resulting from garden-based initiatives, including combating student apathy and disengagement (Souza; Carvalho; Souza, 2018), promoting dietary awareness and healthier eating habits (Santos *et al.*, 2014), soil conservation efforts (Melo, 2019), fostering social values, and reducing

violence (Oliveira; Cintrão, 2004), as well as advancing environmental sustainability (Paula; Benedetti, 2018). With its multidimensional nature, a garden serves as a versatile platform for teaching a range of subjects, spanning geography, history, sociology, biology, and chemistry, while also addressing cross-cutting themes such as agroecology and pesticide usage (Cunha, 2015), among numerous other possibilities, each tailored to the unique needs and preferences of individual educators.

5. CAN DESIGN BE A TOOL FOR ENVIRONMENTAL EDUCATION?

Despite the discourse surrounding formal environmental education dating back to the 1977 Tbilisi conference (Layrargues, 2000), educators across various disciplines continue to grapple with the challenge of fostering critical engagement with the subject matter, rather than relying on preconceived notions derived from antiquated theories. Addressing a pervasive state of environmental unawareness extends beyond the confines of elementary and secondary education to encompass stakeholders such as policymakers, decision-makers, and administrators (Fernandes *et al.*, 2018).

The creation of platforms for community deliberation and critique has emerged not only as an integral component of environmental education but also within the realm of social design. Indeed, ongoing debates question whether design initiatives should transcend the conventional paradigm of perpetuating dependency on products and brands to instead facilitate the development of liberating solutions that empower marginalized communities (Bonsiepe, 2011).

While conventional design practice historically centered on the development of interventions aimed at ameliorating the conditions of socially marginalized groups, a paradigm shift is evident. Embracing the concept of infrastructuring, designers are now envisioned as more than mere problem-solvers; rather, they play a pivotal role in discerning the political dimensions inherent within the design process.

Adopting an infrastructuring approach entails transitioning from a directive stance to one that prioritizes the facilitation of inclusive and participatory spaces conducive to the expression of diverse viewpoints on societal issues. Through this lens, designers are positioned to orchestrate collaborative efforts among disparate stakeholders to navigate and address the multifaceted challenges that emerge (Del Gaudio, 2017).

Contemporary scholarship underscores that, instead of merely developing didactic products, fostering environments conducive to open discourse holds greater promise for effective educational outcomes reflective of real-world complexities. While physical artifacts may serve instrumental roles in pedagogical contexts, their potential for engendering sustained dialogue remains limited. Recognizing the dynamic nature of discourse vis-à-vis the static attributes of material artifacts prompts a critical inquiry: How can design practices be harnessed to cultivate spaces conducive to nuanced and evolving debates?

6. DESIGN AS A PROJECT, NOT A PRODUCT

While a didactic object, a common project type in design and education, may not be the most necessary or relevant development in the presented context, it is worth considering that a designer's involvement in cultivation activities should take into account subjective factors, such as user experience.

The term User Experience (UX) is an area of design study that deals with planning the effects felt by a user as a result of interaction with the context a usage of a system, a device, or a product, including the influence of usability, utility, and motor impact during interaction and the memory retained after the interaction (Hartson; Pyla, 2012).

Engagement with a garden can be crafted to provide an impactful experience for its users (students, teachers, staff, etc.). The garden itself already holds the potential to impact user experience. It is an ecosystem with a diversity of living beings and evolving elements in an open setting subject to weather changes. Thus, even if there are repeated activities of the same theme, each one will offer a unique experience.

Therefore, for learning, a designer may not necessarily need to create tools for handling plants or special clothing, for instance. While the use of an object may bring an interesting experience the first time it is used, the elements of surprise and interest may diminish with repetition. The use of the garden may present a series of complicating factors regardless of the activity: presence of insects, days of intense sun or rain, plants that grow, sprout, or die. Each visit or activity will offer a unique experience. Thus, a designer would act as a facilitator rather than a developer in this environment.

In addition to practical considerations, emotions are also generated. Regarding emotional design, it is said that our connection is not with objects per se, but with the

relationship, the meanings, and feelings they represent (Norman, 2004). When speaking of cultivation, one speaks above all of relationships, as cultivation is defined by interaction with other living beings (the plants in this case) that will behave and react in specific ways according to the caregiver's behavior. In today's disposable society, where product use may last only a few seconds before disposal, the interaction with plants tends to be more enduring. Considering shorter-lived crops like lettuce, which can be harvested in about 2 months, to trees that can last decades (or more), one understands why the bond with plants can be so strong for those who cultivate them.

A garden also presents socializing potential that permeates any stage of cultivation activities, especially those involving food plants, such as vegetable gardens and orchards. This point is relevant precisely because it contrasts with the current lifestyle profile in urban areas. Cities constrain their residents, who increasingly close themselves off in smaller circles of socialization.

In a school context, interaction with the garden is usually guided by educators, suggesting that memories will be created not only of the plants but also of the interpersonal contacts that cultivation activities generate. The school garden promotes interaction among children and with the environment, allowing them to understand themselves as part of nature, reinforcing values of solidarity, collectivity, and respect (Nunes, 2019).

This necessary interaction with the plant environment can be explained by the principle of biophilia, which suggests that human dependence on nature extends beyond issues of material and physical sustainability to encompass aesthetic, intellectual, cognitive, spiritual, and satisfaction needs.

Lidwell *et al.* (2010) suggest that environments with natural images reduce stress and increase concentration. The author proposes that in constructing environments, aspects of biophilia should be considered but notes the positive outcomes when applied to those engaged in learning, healing, and concentration activities.

The principle of biophilia may be one of the justifications for the use of the garden yielding a variety of positive results as a learning environment. According to Kellert (1993), the human need for an aesthetic experience of nature has suggested an apparent mismatch with artificial environments.

The gardens observed in the visited schools do not primarily aim to fulfill the dietary requirements of students, teachers, or staff within the institutions. The discrepancy between the number of students per institution and the available cultivation area, coupled with the demand for various resources, underscores this challenge, which persists even in the rural school setting.

Therefore, the garden serves as a pedagogical tool, extending beyond its role in dietary matters to encompass a range of educational objectives. It can be effectively utilized to teach agroecological practices, environmental education, or other educational methodologies, provided educators embrace this multifaceted approach. However, its implementation poses multifaceted challenges, including spatial constraints, personnel requirements, and the need for resources such as water, seedlings, fertilizer, and tools. Moreover, integrating the garden into disciplines unrelated to the natural sciences presents additional pedagogical complexities.

In a study examining school gardens in Juiz de Fora/MG, Araújo *et al.* (2017) critique the prevailing didactic and pedagogical use of these green spaces, arguing that the environmental issues addressed in these institutions fail to foster a critical discourse among students regarding environmental justice and food sovereignty.

Furthermore, effective garden management emerges as a crucial consideration. While many teachers use the garden for disciplinary activities, the responsibility for its establishment, care, and maintenance typically falls upon individuals rather than being shared collectively.

Despite its indirect role in food provision, the garden serves as a valuable tool for promoting healthy eating habits among students, faculty, and staff, thereby warranting recognition and support within educational contexts.

The role of design in incorporating plant-based elements into projects is not novel. However, the innovative aspect of the present proposal lies in reimagining the cultivation activity as a catalyst for therapeutic, social, and knowledge-building experiences, alongside its aesthetic contributions to the environment.

In conclusion, the paper presents a framework for guiding practical applications and evaluating outcomes in projects involving cultivation (Table 1).

7. CONCLUSIONS

Areas and project questions	
Experience/ emotion/ meaning	<ol style="list-style-type: none"> 1. What feelings are involved in this context? 2. Do plants have representations that relate to people, places or situations experienced?
Socialization	<ol style="list-style-type: none"> 1. Does it promote interaction between people? 2. Does it create groups with a common interest? 3. Does it generate social value? 4. Does it promote the sharing of knowledge and experiences?
Biophilia / aesthetics	<ol style="list-style-type: none"> 1. Does it insert plants into new environments? 2. Is the cultivation activity consistent with the activities carried out in the environment in which it operates? 3. Is the visuality coherent with the environment?
Knowledge	<ol style="list-style-type: none"> 1. Does it introduce new knowledge about cultivation into people's lives? Does it generate autonomy? 2. If so, is it done in a manner consistent with the activities involved in cultivation? 3. Does it involve reflection? Is knowledge subject to discussion?

Table 01: Relevant factors for the development of human/plant interfaces.

This framework emphasizes considerations such as the intrinsic meaning of the activity, the nature of the experience it engenders, its potential for facilitating social interaction, the knowledge it generates, and its aesthetic dimensions. By addressing these aspects, educators can develop projects that resonate with users on emotional and cultural levels, yielding enduring and meaningful outcomes.

REFERENCES

ARAÚJO, J. aqueline Cerqueira de; FERRAZ, Mariana Sell de Miranda; SPOLAOR, Fernanda Antunes; RODRIGUES, Angélica Cosenza. **Mapeando as hortas escolares na rede pública estadual de Juiz de Fora, MG.** IX EPEA Encontro Pesquisa em Educação Ambiental – UFJF. Available in http://epea.tmp.br/epea2017_anais/pdfs/plenary/0195.pdf Access: 21/11/2019.

BONSIEPE, Gui. **Design, cultura e sociedade.** Blucher, São Paulo, 2011.

CARDOSO, Rafael. **Design para um mundo complexo.** Cosac Naify, São Paulo, 2012.

CUNHA, Antonielle Pinheiro da. **Projetos de hortas escolares e debate agroecológico em pernambuco e no contexto latinoamericano.** Giramundo, Rio de Janeiro, v. 2, n. 4, p. 121-133, jul./dez. 2015. Available in: <https://www.cp2.g12.br/ojs/index.php/GIRAMUNDO/article/view/548> Access in: 21/11/2019.

DEL GAUDIO C. **Os desafios para o design no âmbito social e as perspectivas futuras:** o conceito de infraestruturação e a redefinição do papel do designer. In: *Ecovisões projetuais: pesquisas em design e sustentabilidade no Brasil.* Blucher, São Paulo, 2017. Available in: <https://openaccess.blucher.com.br/article-details/06-20541> Access in: 25/07/2018.

FERNANDES GW [et al.] **Cerrado:** em busca de soluções sustentáveis. Vertente produções artísticas, Rio de Janeiro, 2018.

HARTSON R, PYLA PS. **The UX Book:** Process and Guidelines for Ensuring a Quality User Experience. Elsevier, Waltham, 2012.

KELLERT SR. **Introduction.** In.: KELLERT SR.; WILSON EO. *The Biophilia Hypothesis.* Island Press, Washington, 1993.

LANCILLOTTI, Samira Saad Pulchério. **Pedagogia montessoriana:** ensaio de individualização do ensino. Revista HISTEDBR On-line, Campinas, número especial, mai.2010. Available in: <https://periodicos.sbu.unicamp.br/ojs/index.php/histedbr/article/view/8639787/7350> Access in: 10/10/2019.

LAYRARGUES, Philippe Pomier. **Educação para gestão ambiental:** a cidadania no enfrentamento político dos conflitos socioambientais. In: *Sociedade e Meio Ambiente: a educação ambiental em debate.* São Paulo: Cortez, 2000. p. 87-155. Available in: http://www.icmbio.gov.br/educacaoambiental/images/stories/biblioteca/Publica%C3%83%C2%A7%C3%83%C2%B5es_da_COEDU/Referencial_Te%C3%83%C2%B3rico/Educa%C3%83%C2%A7%C3%83%C2%A3o_para_a_gest%C3%83%C2%A3o_ambiental.pdf Access in: 19/09/2018.

LIDWELL W.; HOLDEN K.; BUTLER J. **Princípios universais do design.** Bookman, Porto Alegre, 2010.

LIMA, Geise Maria Machado, CONDE SOBRINHO, Wilson Amaro Moreira; SOUZA JUNIOR; José Itabirici. **Educação ambiental e implantação de horta escolar.** Cadernos de Agroecologia, [S.l.], v. 10, n. 3, may 2016. Available in: <http://revistas.aba-agroecologia.org.br/index.php/cad/article/view/20067> Access in: 10/10/2019.

MELO, João Siqueira de. **Horta escolar, cultivar é educar.** Revista Insignare Scientia, v. 2, n. 1, jan./abr. 2019. Available in: <https://periodicos.uuffs.edu.br/index.php/RIS/article/view/10776>. Access in: 20/11/2019.

MINAS GERAIS. Secretaria de Estado de Educação. **Cardápios da alimentação escolar:** educação básica. 2014. Available in: <http://www2.educacao.mg.gov.br/images/documentos/CARDAPIO%20EDUCACAO%20BASICA%202014.pdf> Access in: 08/02/2019.

NORMAN, Donald. **Emotional design:** why we love (or hate) everyday things. Basic Books, New York, 2004.

NUNES LR. **Trajetórias formativas docentes:** o que significam professoras em diálogos cogenerativos sobre hortas escolares. Dissertação. Universidade Federal de Juiz de Fora, Programa de Pós-Graduação em Educação, 2019. Available in: <https://repositorio.ufjf.br/jspui/bitstream/ufjf/10844/1/leticiarieguettonunes.pdf> Access in: 21/11/2019.

OLIVEIRA, Juliana Munaretti de; CINTRÃO, Janaína F.F. **Violência escolar e horta comunitária:** a educação ambiental enquanto agente de socialização. Revista Uniara, n.15, 2004. Available in: <http://www.revistarebram.com/index.php/revistauniara/article/view/311> Access in: 20/11/2019.

PAULA, Cássia Andrada de; BENEDETTI, Ana Caroline Paim. **A inserção de ideias verdes em contexto escolar e sua influência na formação de cidadãos.** RELACult, V. 04, edição especial, nov., 2018, artigo nº 1019. Available in: <http://periodicos.claec.org/index.php/relacult/article/view/1019> Access in: 20/11/2019.

PINTO, Laura de Souza Cota Carvalho Silva. **Design, alimento e negócio:** o caso De-Lá, um empório em busca da valorização do território brasileiro. In:

Ecovisões projetuais: pesquisas em design e sustentabilidade no Brasil. São Paulo: Blucher, 2017.

SACI. Escola Internacional Saci. **Horta e pomar.** Available in: <http://www.escolasaci.com.br/pt/ensino/nossos-espacos> Access in: 08/02/2019.

SANTOS, Maria Jeane Dantas dos; AZEVEDO, Thiago Anderson Oliveira de; FREIRE, José Lucínio de Oliveira; ARNAUD, Débora Karenine Lacerda; REIS, Francisca Lúcia Aurélio Mesquita. **Horta escolar agroecológica:** incentivadora da aprendizagem e de mudanças de hábitos alimentares no ensino fundamental. HOLOS, Ano 30, Vol. 4, 2014. Available in: <http://www2.ifrn.edu.br/ojs/index.php/HOLOS/article/view/1705> Access in: 20/11/2019.

SECOMANDI, Fernando. **Design e as Interfaces de serviço.** Estudos em Design, Rio de Janeiro: v. 23, nº. 1 [2015]. Available in: <https://estudosemdesign.emnuvens.com.br/design/article/view/197/174> Access in: 20/11/2019.

SOUZA, Paulo Henrique de; CARVALHO, Núbia Patielle Assis; SOUZA, Marta João Francisco Silva. **Contribuições de uma sequência didática interdisciplinar em uma abordagem investigativa:** a horta escolar no contexto. ESPAÇO PEDAGÓGICO v. 25, n. 2, Passo Fundo, p. 322-338, maio/ago. 2018. Available in: <http://seer.upf.br/index.php/rep/article/view/8167> Access in: 20/11/2019.

AUTHORS

ORCID: 0000-0003-1628-9585

LIA PALETTA BENATTI, Dra. Universidade Federal de Juiz de Fora - UFJF, Bacharelado em Design, Juiz de Fora (MG), Brasil | Correspondência para: Instituto de Artes e Design - Campus Universitário, Rua José Lourenço Kelmer, s/n - São Pedro, Juiz de Fora - MG, 36036-900. e-mail: lia.paletta@ufjf.br

HOW TO CITE THIS ARTICLE:

BENATTI, Lia Paletta. Teaching sustainability: The pedagogical functions of school gardens. **MIX Sustentável**, v. 10, n. 5, p.111-121, 2024. ISSN 2447-3073. Disponível em: <<http://www.nexos.ufsc.br/index.php/mixsustentavel>>. Acesso em: __/__/__. doi: <<https://doi.org/10.29183/2447-3073.MIX2024.v10.n5.111-121>>.

SUBMITTED ON: 28/05/2024

ACCEPTED ON: 18/09/2024

PUBLISHED ON: 31/11/2024

RESPONSIBLE EDITORS: Lisiane Ilha Librelotto e Paulo Cesar Machado Ferroli

Record of authorship contribution:

CRedit Taxonomy (<http://credit.niso.org/>)

LPB: conceptualization, data curation, formal analysis, investigation, methodology, project administration, supervision, visualization, writing - original draft and writing - review & editing.

Conflict declaration: