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School Gardens: A Multiple Case Study on Pedagogical Innovation and Community Engagement in Spain and Portugal

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Abstract

The school garden has a long-standing pedagogical tradition linked to active, experiential, and community-based education, represented by authors such as Montessori, Freinet, and Dewey. Currently, its role has been consolidated as a relevant educational resource used to address the challenges of sustainability education, pedagogical innovation, and student holistic development. This research takes a qualitative approach based on a multiple case study conducted in four educational centers in Spain and Portugal. Semi-structured interviews, documentary analysis, and reflective memoranda were used. Content analysis was performed using a deductive–inductive coding approach in ATLAS.ti software v. 25th, combining literature-derived categories with those emerging from the data, following a thematic analysis (TA) approach. The results suggest that school gardens promote meaningful learning, the development of transversal competencies, improved school climate, and community involvement. Pedagogical, social, and emotional benefits were identified, as well as high levels of satisfaction among all participants. However, obstacles were found to persist, mainly related to a lack of time and teacher coordination. The study confirms that the school garden serves as a pedagogical resource with a high transformative potential. Its effectiveness depends on intentional curricular integration, teacher commitment, and the engagement of the educational community, aligning with the principles of an active, sustainable, and contextualized pedagogy.

Keywords: school garden; case study; education for sustainability; experiential learning; community participation

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1. Introduction

1.1. Historical Background: A Resource with a Long History

The use of school gardens in education has a long tradition that is intertwined with pedagogical, social, and environmental dimensions. It dates back to the educational renewal movements of the late 19th and early 20th centuries, when new conceptions of learning and the active role of learners emerged. The so-called New School promoted a profound change in terms of understanding teaching, focusing on experience, observation, and the direct participation of students in the learning process.

Some of the main figures of this movement were Dewey and Dewey (1915), Montessori (1912), Decroly (1929), and Freinet (1946), whose ideas laid the foundation for active and experiential teaching. According to these authors, knowledge should be built from the subject's relationship with their environment and should not be limited to the memorization of content. Thus, contact with the natural environment and the school garden in particular

emerged as an ideal space for learning by doing. It is a space where children can experiment, observe, and reflect on the natural and social processes surrounding them.

Dewey (1916) summed up this approach with his famous statement: "Education is not a preparation for life; education is life itself", highlighting the importance of connecting school with everyday life. The garden acts as an educational microcosm reflecting the students' natural, social, and cultural environment and encourages the development of autonomy, responsibility, and cooperation.

In rural areas, school gardens also took on a practical and social function by teaching basic agricultural techniques, promoting self-sufficiency, and strengthening school–community links. It was considered to be an educational resource as well as a tool for social cohesion and improving local living conditions.

In the 1970s, the rise of environmental education, sustainable development, and pedagogical innovation brought school gardens back into the spotlight. These gardens were consolidated as spaces of ecological awareness and training in sustainable values. The Tbilisi Intergovernmental Conference on Environmental Education (UNESCO, 1978) was a milestone in recognizing the need for education that connects people with nature. Since then, school gardens have been integrated into international environmental education and sustainable development programs through the promotion of agencies such as the FAO (2010) and UNICEF (2022).

In the following decades, the scope of the school garden expanded even further, incorporating health education and the promotion of balanced eating habits, especially in urban contexts. Today, it is a central resource within the competency-based and interdisciplinary approach of the education system, seeking to integrate learning from distinct areas (Science, Mathematics, Languages, or Art Education) while promoting values such as cooperation, observation, critical thinking, and respect for the environment (Kincheloe et al., 2004).

Furthermore, it may be related to the current interest exhibited during the 20th century with respect to educating in nature and acquiring a healthier lifestyle (Hueso, 2021).

This historical evolution reflects broader changes in how active learning is understood and in the value attributed to experience. It should not be considered a mere collection of initiatives. Throughout its development, the school garden has consistently been associated with experiential learning, curricular integration, community participation, and values related to the environment and health. This accounts for its continued relevance beyond methodological trends. However, limited knowledge is available with respect to how these principles are translated into current educational practices. This study examines the motivations behind implementation, educational objectives, pedagogical foundations, community involvement, curricular articulation, and associated challenges. It aims to analyze both the continuity and the contemporary transformations of this pedagogical legacy.

1.2. About the School Garden: What Is It?

Beyond the simplified idea of the garden as merely another resource that complements other existing ones in the educational center, it is currently considered an educational and pedagogical space integrated into school life. Here, students actively participate in the growing, care, and observation of plants and vegetables for learning purposes. It is not simply an agricultural facility but serves as an interdisciplinary teaching resource that links theory and practice and promotes meaningful learning in multiple areas of the curriculum.

From a pedagogical point of view, the school garden can be seen as a living laboratory. It gives students firsthand experience with the processes of plant growth, natural cycles, ecological interactions, or the social implications of food production. In some ways, incorporating the garden into teaching practices may serve as an effective tool for introducing a more dynamic, functional, and intimate education experience. As Zambrano et al. (2018,

p. 458) pointed out, "the school garden is conceived as a strategy that dynamizes the learning process while enhancing and developing active teaching". This connection makes the garden a privileged space for participatory and contextualized learning.

The FAO (2010) defined school gardens as active learning environments that promote environmental education, healthy nutrition, and community participation, contributing to sustainable development. This definition reveals its threefold dimensions: educational, social, and environmental.

Therefore, the school garden performs both an instrumental and an educational function. It is a didactic resource, as well as a means to educate on values, sustainability, and health. Its holistic nature allows for the development of key competences, the promotion of autonomy, cooperative work, and shared responsibility. Clearly, the school garden not only teaches about plants, but it also emphasizes learning, coexistence, and care for the environment.

1.3. Current Relevance of the School Garden: Purpose and Sustainability

In the contemporary educational context, which is characterized by the search for meaningful learning, the promotion of transversal competencies, and the need to address major global challenges, the school garden is a particularly relevant tool.

From an environmental perspective, school gardens respond to the urgency of promoting education for sustainable development, in line with the Sustainable Development Goals (SDGs) of the 2030 Agenda, specifically SDG 4 (Quality Education), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). Through direct observation and contact with the earth, students learn about the interdependence between living things, natural resources, and human actions, developing an ecological awareness that is difficult to achieve in the conventional classroom.

From a pedagogical point of view, the school garden embodies the principles of active learning and competence learning, situating the student as the protagonist of their own learning. Garden work encourages interdisciplinarity, combining scientific, mathematical, linguistic, and artistic knowledge. Furthermore, it encourages experimentation, problem-solving, and collaborative work, all of which are central aspects in current educational curricula (Marques & Cuéllar, 2021).

On a social and emotional level, the school garden offers a space for coexistence, cooperation, and mutual respect. Garden projects foster emotional education and inclusion by permitting students to contribute using their abilities and participate in a common goal. They also strengthen the link between school, families, and community, promoting civic participation and a sense of belonging (Pollin & Retzlaff-Fürst, 2021).

Finally, the health and food dimensions of the school garden make it a highly relevant resource. In a global context where childhood obesity and disconnection with natural foods are rising problems, the school garden facilitates understanding of food processes and promotes healthy habits. Research has shown that participation in school gardens is associated with increased consumption of fruit and vegetables, as well as a more conscious attitude toward food (Holloway et al., 2023).

The continuity of the school garden lies in its ability to respond simultaneously to educational, social, and environmental challenges, offering a comprehensive learning model that is consistent with the values of sustainability and active citizenship.

However, various studies have cautioned that the viability of school gardens may depend too heavily on individual initiatives of teaching staff, face difficulties in long-term maintenance, or be relegated to occasional activities without effective curricular integration. Moreover, their pedagogical potential may be diluted when adopted as symbolic resources

or temporary projects, instead of stable instruments for educational innovation. Recognizing these tensions is essential for critically analyzing how they are currently implemented.

1.4. The School Garden in Schools: Some Illustrative Experiences

The experience accumulated in different countries demonstrates the effectiveness of the school garden as a pedagogical and social tool. In Spain, its implementation has spread notably in pre-school, primary, and secondary schools, both in rural and urban settings.

Programs such as the Ecological School Gardens (Huertos Escolares Ecológicos) in Andalusia, L'Hort Escolar in Catalonia, or the Eco-Schools in the Valencian Community are examples of good practices that integrate vegetable gardens into school education projects. These programs promote interdisciplinarity, cooperative work, and environmental education, linking curricular content with the students' daily lives.

Studies such as those by Rodríguez Marín et al. (2021) and Marques and Cuéllar (2021) have highlighted that school gardens in Spain contribute to educational and social transformation by promoting sustainable habits, community involvement, and a sense of collective responsibility. They also promote student inclusion with different abilities and improve school coexistence.

Internationally, the use of school gardens has an established track record. In the US, the Edible Schoolyard Project, founded in 1995 by Alice Waters in California, is a world reference. This project integrates growing, cooking, and healthy eating into the school curriculum, having very positive results in terms of student motivation and the acquisition of healthy eating habits.

In Latin America, countries such as Mexico, Chile, and Colombia have developed school gardens as strategies for food security, environmental education, and community strengthening, especially in rural or socially vulnerable contexts. The FAO (2010) has documented numerous experiences in the region, highlighting their role in improving nutrition and community participation.

In Europe, several initiatives coordinated by UNESCO and the FAO, such as Education for Sustainable Development through School Gardens, promote school gardens as learning spaces for sustainability and global citizenship. In countries such as Finland, the United Kingdom, or France, these projects have been integrated into national environmental education and school health policies.

The implementation of the school garden in different countries may be considered evidence that its impact depends on its structural integration within the educational program and the level of institutional support. When incorporated into the curriculum and supported at both community and policy levels, it fosters meaningful learning, sustainability, and social cohesion. However, experience has shown that its transformative capacity does not lie in the resource itself, but in the pedagogical and organizational framework that sustains it.

Furthermore, the literature tends to focus on successful experiences, while the factors contributing to failures or abandonment remain insufficiently analyzed. Overall, the research coincides in highlighting that the school garden is a privileged pedagogical space where practice and reflection, scientific knowledge, and life experience converge, generating significant and lasting learning.

1.5. Educational Research Contributions: What the Data Tell Us

The scientific literature confirms the educational value of the school garden. Authors such as Botella et al. (2014) highlighted its role as a tool for pedagogical innovation that connects theory with practice, facilitating the development of key competencies. This perspective emphasizes how the school garden is considered an active and contextualized

learning environment, capable of integrating different areas of knowledge and developing attitudes of respect toward nature. However, studies such as those by Maliotou and Liarakou (2024) reveal the need for collective vision and strategic planning, as well as a close connection to the curriculum, teacher commitment, and community involvement, all of which are difficult to achieve.

In its reports on food education, the FAO (2010) noted that school gardens promote environmental education, healthy nutrition, and community participation, and that their implementation may directly contribute to the achievement of the UN's Sustainable Development Goals.

In the Spanish context, the works of Rodríguez Marín et al. (2021), Marques and Cuéllar (2021), and Corbacho-Cuello and Muñoz-Losa (2025) have highlighted the transformative capacity of the school garden to promote experiential learning, environmental awareness, and interdisciplinary skills. These studies also reveal that successful projects are those that involve the entire educational community, encourage cooperative work, and promote shared responsibility.

Internationally, the impact of the school garden has been widely studied. The Edible Schoolyard project in the U.S. (DiCaprio, 2023) or the ecological garden programs promoted by the FAO in Latin America show that the integration of the school garden into the curriculum improves motivation and scientific and environmental knowledge. It also serves to reinforce the students' emotional and social well-being.

Systematic reviews, such as the one conducted by Ohly et al. (2016), focus on the importance of these natural spaces in fostering attention span. However, the data presented are not conclusive, despite the fact that there is partial and differing evidence of its positive impact. In their literature review, Chan et al. (2022) confirmed that school gardens have effects on the promotion of a healthy diet. Furthermore, Austin (2022) concluded that their benefits refer to both aspects associated with health and others related to personal development, such as increasing well-being, cooperation, and environmental awareness. Similarly, Papadopoulou et al. (2020) pointed out that student participation in school garden experiences has contributed to improved academic performance and increased interest in learning.

Overall, the research has concluded that the school garden promotes a more holistic education, focusing on experience, cooperation, and sustainability. It is a resource that facilitates meaningful learning, strengthens the sense of community, and fosters active citizenship and commitment to the environment. Nevertheless, the heterogeneity of the findings and methodologies indicates that the impact of the school garden is multidimensional and context-dependent. This highlights the need for studies that more deeply examine the conditions underlying its origins, practical development, variability, and sustainability.

Far from being an educational practice of the past, today, the school garden serves as a pedagogical instrument that is fully up-to-date and in line with the contemporary challenges of education. Its value lies in its ability to integrate diverse knowledge, connect students with their environment, and promote fundamental values for a sustainable society.

As a living laboratory (Williams & Dixon, 2013; Acharya et al., 2023), a space for coexistence, and a source of active learning, the school garden embodies the vision of a school that is open to the world, where students learn by doing, sharing, and caring. In other words, it is a pedagogical environment for experimentation, where pupils engage in authentic processes of observation, cultivation, and problem-solving. Its permanence and expansion in schools will ultimately depend on the commitment of the educational community to a more humane, participatory, and ecologically responsible education model.

Experiences and studies have shown that the educational impact of the school garden is not automatic. Rather, it depends on its proper integration into the curriculum, coherent pedagogical planning, and the active involvement of the educational community. Without these elements, projects tend to dissipate or become isolated initiatives. This underscores the importance of considering the conditions necessary for their continuity and sustainability.

The literature acknowledges the school garden's potential to promote experiential learning, environmental education, and student participation. Nevertheless, significant limitations persist. Descriptive approaches focusing on perceived benefits predominate, while few empirical studies have examined their actual implementation in schools. Furthermore, research on effective curricular integration, medium-term institutional sustainability, and the pedagogical conditions underlying consolidation or difficulty remains insufficient. These gaps underscore the need for context-specific approaches that are grounded in educational practice.

The main objective of this research is to explore the implementation of the school garden as a pedagogical and community-based tool within educational contexts in Spain and Portugal. The following specific objectives are proposed:

- To explore the motivations and meanings attributed by participants to the launching of the school garden project, considering the personal, educational, and community reasons underlying its implementation.
- To explore the educational, social, and environmental purposes guiding the use of the school garden, as well as the expectations of different stakeholders regarding its role.
- To interpret the pedagogical conceptions and theoretical references guiding school garden activities and to identify how they are translated into practice.
- To describe the involvement and roles of distinct members of the educational and social community in the development of the school garden, analyzing the dynamics of collaboration and participation.
- To explore teachers' and students' perceptions of the integration of the school garden into the curriculum and its role in fostering the development of key competencies and meaningful learning.
- To understand the educational, personal, and community benefits that participants associate with their experience in the school garden, both individually and collectively.
- To identify and analyze the difficulties and tensions perceived in the implementation and sustainability of the school garden and to interpret their impact on the development of the project.
- To examine the evaluations and emotions associated with participation in the school garden and to explore the sense of satisfaction, belonging, and commitment that it fosters among participants.

2. Materials and Methods

A multiple case study was used for this research, according to the qualitative methodology framework (Simons, 2012). Using an analytical, descriptive, and interpretative approach (Flick, 2015), we sought to analyze, describe, and understand complex social phenomena based on previously established procedures (Stake, 1995). The case study was grounded in the exploration and interpretation of perceptions, experiences, and meanings attributed by the participants, which allowed for the capture of nuances that are difficult to address with quantitative data (Simons, 2012; Stake, 2010). Furthermore, by triangulating the information gathered in the different cases, we sought to generate a holistic understanding of complex phenomena (Merriam, 2001).

This research is based on thematic analysis (TA) (Braun & Clarke, 2006), a qualitative methodological approach designed to generate insights from the data rather than to test pre-existing hypotheses. TA is characterized by both inductive and deductive processes and can identify emerging patterns and relationships within the data. Through constant analysis, simultaneous information processing, and the progressive construction of conceptual categories, TA is recognized as an ideal strategy in the social sciences, since it is based on the data itself (Braun & Clarke, 2021). Therefore, by following a rigorous analytical method, this approach allows for conclusions to be drawn from the empirical evidence. This facilitates a deep and meaningful understanding of the phenomenon under investigation.

To conduct the study, four schools with very distinct characteristics were selected. The selection was carried out by means of non-probability purposive sampling (Wood & Smith, 2018) according to the following criteria: (a) having been highlighted as especially relevant by key informants (teacher training center advisors, education inspectors, university faculty), (b) having a written project that evidenced teaching in the school garden, and (c) participating on a voluntary basis in accordance with the ethical criteria of confidentiality and informed consent.

The public schools are located in south-west Spain and central-west Portugal. For this study, interviews were conducted with teachers, school leadership teams, and student groups in order to obtain a plural and balanced representation of the distinct situations. The aim was not to contrast the experiences of the two countries, but rather to recognize each case in its specific nature.

The educational centers were selected using purposive sampling (Patton, 2015), according to the following inclusion criteria: (a) pre-school, primary, or secondary schools with a school garden in active operation for at least two years; (b) schools located in Spain or Portugal; (c) schools that are willing to participate in the study and provide access to key informants. Schools where the garden was only symbolic or was not actively maintained at the time of the study were excluded.

Within each center, participants were selected through purposeful sampling (Creswell & Poth, 2018) to represent the distinct roles involved in the school garden project. The participants included: (a) school principals, for their institutional perspective; (b) project coordinators, for their technical and pedagogical expertise; (c) homeroom teachers or teachers involved, for their direct classroom experience. The final number of participants (n = 15 interviews) was determined according to the principle of theoretical saturation (Bowen, 2008). This is the point at which new interviews no longer yield novel information for the analytical categories. Data collection followed a sequential process: interviews with school principals offered an overview of the institutional context and helped identify project coordinators, while interviews with coordinators guided the selection of the teachers most actively involved in the project.

Information was collected through semi-structured interviews (Kvale, 2011), occasional dialogue, document analysis, non-participant observation, and the research diary. The semi-structured interviews were organized around a common script that addressed the following dimensions: (a) motivations for creating or maintaining the garden; (b) pedagogical foundations underpinning the experience; (c) forms of curricular integration of the garden; (d) roles and participation of the educational community; (e) perceived achievements and benefits; (f) obstacles and difficulties encountered; and (g) participants' degree of satisfaction with the experience. The interview script was reviewed by the research team and piloted in an initial interview to ensure its clarity and relevance. Interviews lasted approximately 20 min, were audio-recorded, and transcribed using the artificial intelligence tool notta.ai. Researchers cross-checked selected transcript fragments against the original recordings to ensure the accuracy of the data used for analysis.

The descriptive data were systematized using specific templates that included the characteristics of the teaching staff, the school, and the students. Incidental inputs were recorded in the research diary and subsequently refined in the form of reflective memos in order to facilitate coding. For this study, however, we focused primarily on the interviews. The reflective memos were considered as complementary input (Table 1).

Table 1. Information-gathering instruments, distribution by school, and nomenclature.

Instruments	No. and Distribution by School	Quotation Nomenclature
Interview—School Principal	4, one per school	PRIN
Interview—Project coordinator	4, one per school	COOR
Interview—Homeroom Teachers	7, 2 per school, except one school with one	HT
Memorandum	4, one per school	MEM

Data processing was carried out simultaneously with the data collection. This was initiated with a general system of categories that had been previously defined based on a rigorous review of the existing literature on the subject. However, new categories emerged after data collection, which required a restructuring of the category table. The final version is shown in Table 2.

Data analysis was conducted using a mixed coding approach (deductive-inductive) (Krippendorff, 2019), complemented by elements of thematic analysis (Bardin, 2002). First, an initial system of categories was established deductively, based on a systematic review of the specialized literature on school gardens. Subsequently, during coding with ATLAS.ti V25, an inductive procedure was applied, permitting the identification of new emerging categories not initially contemplated, as well as the refinement of existing ones.

The coding process was conducted independently by two researchers following the principles of completeness and mutual exclusion (Krippendorff, 2019). After this initial phase, a comparison and consensus meeting was held to review the codings. Discrepancies were resolved through reasoned discussion, and when agreement could not be reached, a third researcher acted as a mediator to determine the final coding. This procedure of researcher triangulation (Patton, 2015) enhanced the reliability and consistency of the findings while minimizing individual subjectivity.

Additionally, a cross-validation process was conducted through member checking, in which the participants reviewed a summary of the preliminary findings to confirm that the researchers' interpretations accurately reflected their perceptions and experiences (Lincoln & Guba, 1985).

To minimize potential biases in data collection and analysis, the following strategies were implemented: (a) source triangulation (interviews, documents, memoranda), which enabled the cross-checking of information and reduced reliance on a single source; (b) researcher reflexivity, maintained through reflective memoranda in which each researcher recorded their impressions, assumptions, and potential influences on data interpretation; and (c) thick description of contexts and participants, providing detailed information to enhance the transferability of findings to other contexts (Lincoln & Guba, 1985).

Regarding data treatment, no significant information was lost, since all interviews were fully recorded and transcribed. In the rare instances where an audio segment was unintelligible, it was noted in the transcript and excluded from the analysis. Reflective memoranda were used as complementary material to enrich interpretation, but they did not replace the primary interview data.

Table 2. Table of categories, questions, and objectives.

Category: Resulting Nodes	Research Question	Objectives
Motivations MTVE	Why is the SG (school garden) project being launched?	To understand the motivations and meanings that the participants attribute to the launching of the school garden project, taking into account the personal, educational, and community reasons behind its implementation.
Purpose PUR	What are they used for?	To explore the educational, social, and environmental purposes guiding the use of the school garden, as well as the expectations of the distinct actors with respect to the garden.
Foundations on which they are based FOUN	On what theoretical principles are they based?	To interpret the pedagogical conceptions and theoretical references guiding the practice in the school garden, identifying how they translate into daily experience.
Role of the community COMM	Who is involved in the development of the SG? What is their role?	To describe the involvement and roles of the different members of the educational and social community in the development of the school garden, analyzing the dynamics of collaboration and participation.
Connection with the curriculum CURR	What knowledge and competencies are addressed?	To explore teachers' and students' perceptions of the integration of the school garden into the curriculum, and how this space favors the development of key competencies and meaningful learning.
Achievements and benefits ACH	What results are achieved?	To understand the educational, personal, and community benefits that participants associate with their experience in the school garden, both individually and collectively.
Obstacles OBS	What hinders or limits its potential?	To identify and analyze the difficulties and tensions perceived in the implementation and sustainability of the school garden, interpreting their impact on the development of the project.
Satisfaction SATISF	What degree of satisfaction does the experience generate?	To interpret the evaluations and emotions associated with participation in the school garden, exploring the sense of satisfaction, belonging, and commitment that it generates among those involved.

As a result of the analytical process, the textual corpus was reduced to 192 quotes, organized into eight codes corresponding to the research categories, as shown below in Table 3.

Table 3. Categories and number of quotes.

Categories and Codes Used	No. of Quotes
Motivations (MTVE)	23
Purpose (PUR)	17
Foundations on which they are based (FOUN)	31
Community Role (COMM)	15
Connection with the curriculum (CURR)	26
Achievements and benefits (ACH)	37
Obstacles (OBS)	12
Satisfaction (SATISF)	31

Finally, for direct quotes in the Section 3, the following procedure was followed. First, the case number was identified, then the position of the person being interviewed, and finally two numbers, where the first is the order of the document in Atlas.ti storage, and the second is the order of the quote in the document itself. An example of this would be: C2-COOR, 6:1.

Context: About the Participants

The Agrupamento de Escolas Casa das Rainhas (C1), located in the district of Leiria (Portugal), is a paradigmatic model of public education that harmonizes pedagogical innovation with deep community and territorial roots. Its educational project, focused on the students and guided by a teacher who acts as a companion, extends beyond mere instruction. It is a dynamic agent of social cohesion and sustainable development based on the use of flexible spaces designed for methodologies that encourage creativity, experimentation, and project work. This educational commitment has materialized in a cohesive network of educational centers—10 kindergartens; 3 basic schools plus another that is integrated into the secondary school (the cluster headquarters).

Innovation is a tangible pillar, evidenced in its 'Future Classrooms Lab' (salas do futuro) and in the critical integration of technology, as demonstrated by the participation of its professional courses in European projects such as EPIC-WE (game-based learning). At the same time, the cluster has a symbiotic relationship with its environment. Its adherence to programs such as the Eco-Schools (Eco-Escolas) and Blue School (Escola Azul) (heirs, in part, of the experience 'A Escola na horta', which unfortunately ended in 2015), translates into concrete actions led by students: from the Circular Fashion Fair and the campaign to collect used phones, to the creation of eco-patios and research on the production of biomethane or 'green gas' from algae in the Óbidos lagoon.

This community vocation extends to the cultural and civic sphere. Projects such as the Youth Parliament, in which students debated in the republic's Assembly, or the collaboration with the municipality (junta de freguesia) for the painting of a mural at a bus stop, exemplify experiential and service pedagogy. The powerful Library Network encourages reading through initiatives such as the 'Children Vote' (Miúdos a Votos) or the 'Reading Battle' (Batalha de Leitura). Other international programs, such as Erasmus+, allow students to broaden their horizons, promoting linguistic diversity through intercomprehension.

In short, the Agrupamento de Escolas Casa das Rainhas embodies the effective balance between tradition and modernity. It is an institution that, based on its local identity, trains competent, critical, and committed citizens, enabling them to act, think, and learn in a globalized world with a deep sense of belonging.

The CEIP Huertas de la Colina (C2) is located in a town in the region of El Condado in Huelva (Spain) and has a population of just over 14,000 inhabitants. Over recent decades, the municipality has undergone a transformation of its socio-economic structure from a

predominantly agricultural base to a progressive turn toward the service sector and an incipient industrialization process.

The school is located on the periphery of the municipality, in a setting characterized by social diversity. It is a bilingual public school offering preschool and primary education, organized in two classes per grade from the second cycle of preschool to the sixth year of primary education.

From an organizational and technological point of view, the school has ICT resources in all of its teaching areas, equipped with a variety of digital tools. It also has a 'Future Classrooms Lab' (Aula del Futuro), conceived as an institutional project aimed at transforming learning environments through the integration of educational technology. Here, the aim is to promote active learning methodologies and the development of key competencies in students and teachers.

In terms of outdoor spaces, the school has a large playground with different educational facilities, including a school garden equipped with specific furniture that allows the development of teaching activities in this environment. This space constitutes a central element of the school's pedagogical proposal and is closely linked to its commitment to sustainability and environmental education.

Throughout its history, the CEIP Huertas de la Colina has consolidated an institutional identity linked to the Eco-School program, consistently receiving the Bandera Verde (Green Flag) award. It also participates in initiatives such as 'Green Classrooms' (Aulas Verdes) and 'Open-Air Schools' (Escuelas a Cielo Abierto), aimed at integrating natural spaces into the teaching–learning process. All of these actions make the school a benchmark for educational innovation and environmental coherence. It clearly favors multidisciplinary educational experiences that transcend the conventional classroom and promote learning in direct contact with the natural environment. The school engages in activities such as systematic work in the school garden and visits to protected natural spaces, including Doñana National Park.

The CEIP La Villa (C3), located in a suburb of a coastal town in Andalusia (Spain), is a single-class-per-grade school for each year of the second cycle of preschool and primary education. Its main objective is to provide a quality education to its students, attempting to offer the greatest possible development of their academic and personal possibilities.

One of the backbones of the school's identity is its Service-Learning Project. Its main purpose is to promote values such as respect, empathy, and admiration for the elderly while simultaneously creating spaces for intergenerational encounters and exchanges. This project takes the form of a wide range of educational activities, including a radio program run jointly by students and senior citizens, crochet workshops run by volunteer grandmothers, and regular collaboration with a local retirement home. These experiences promote meaningful learning, social commitment, and the development of students' citizenship skills.

As a result of this project and after several years of inactivity of the space destined for the school garden, an initiative arose for its recovery and enhancement. Recruiting elderly volunteers, the school garden began to be revitalized at the beginning of the 2024/2025 school year. The initial works were characterized by a series of difficulties, including the need for intensive clearing work and the poor soil fertility in certain areas. These were circumstances requiring additional effort and progressive planning of the actions.

The school also participates in other relevant educational projects, including the CIMA Project and the Library Program, which contribute to the development of linguistic competence, the promotion of reading, and education in values. At the same time, and given the demands of today's digitalized society, the CEIP La Villa is developing a 'Future Classrooms Lab' project. This project relies on technological resources and innovative

materials to permit the implementation of active methodologies and the pedagogical use of digital technologies. In this way, students are prepared for the challenges of the 21st century.

The Agrupamento de Escolas Parque da Mina (C4), located in the metropolitan area of Lisbon (Portugal), was created with the goal of providing quality education while promoting values such as citizenship, responsibility, and respect. Over the years, this school clustering has evolved with pedagogical innovation and inclusion of all at its core. The school's journey is a clear example of how perseverance, teamwork, and community spirit can transform education and the lives of all who pass through it. With a dedicated team of teachers, staff, and collaborators, it has been possible to create a learning environment that stimulates curiosity, creativity, and critical thinking. The school cluster consists of a kindergarten, a Basic School center, another school combining kindergarten and basic school, and the cluster headquarters grouping secondary school classes.

Different projects are carried out at the school, such as the 'Affectionate Suitcase' (Una maleta de cariños) solidarity and volunteering project, the ESCXEL project, or the SEMEIA project. The Affectionate Suitcase is a service-learning project in which students and teachers are challenged to ask for 'A Suitcase of Affection' and (symbolically) fill it with items intended for families in need, children with psychomotor development issues, the homeless, or a previously chosen institution in need. The ESCXEL Project is a network of excellence schools made up of 32 public schools and the Faculty of Social and Human Sciences of the Nova University of Lisbon. In this network, partnerships develop between schools and other participants, resulting in significant changes in the improvement of teaching practices. Finally, the SEMEIA project is based on a conscious process of pedagogical practice intended to promote quality teaching to ensure effective and meaningful learning through interdisciplinarity. It has a coordinator, who meets weekly with the cycle's teachers to discuss organizational matters and to elaborate on the activities to be developed.

The most representative project of the educational center, however, is the Eco-Schools project. It has been developed in Portugal since 1999 by the Associação Bandeira Azul de Ambiente e Educação (ABAAE). Its objective is to promote actions and recognize the quality work being carried out by schools in the field of Environmental Education for Sustainability. The project has a sub-section through which the ABAAE and the Portuguese Association of Biological Agriculture (AGROBIO) have established the Organic Vegetable Gardens project, inviting all schools participating in the Eco-Schools program to take part.

3. Results

3.1. Category 1. Motivations: Reasons for Incorporating the School Garden into Compulsory Education (MTVE)

In order to understand why a vegetable garden is set up in a school, it is necessary to consider the reasons offered by the actors themselves (teachers, students, families, school management, etc.). Their testimonies suggest that the motives are not univocal, but rather, are woven into a web of personal, educational, and community meanings, making each experience meaningful and unique.

With respect to tradition and institutional identity, school gardens do not emerge as isolated initiatives, but as part of a history rooted in the school's unique identity: "There was already a garden when I arrived at the school" (C1-PRIN, 2:1). This historical continuity is confirmed in another school, where it is stated that "our vegetable garden is already several years old, . . . at least 10 years old" (C3-PRIN, 11:2). Moreover, these initiatives are framed within and legitimized by consolidated institutional programs. This is especially the case with the Eco-School, in which it is noted that "the school is always taking part in Eco-School programs [. . .] and it was decided that this year it would be one more complement to the

functioning of the school as an Eco-School" (C1-COOR, 1:1). This link is not casual, but structural, since, as another school principal affirms, "we are an Eco-School, and one of the actions carried out within the Eco-School Project is the school garden" (C1-PRIN, 2:3).

The use of resources and the physical context emerge as practical and tangible motivations that allow for the transformation of an underutilized space. As one teacher points out: "It was a plot of land that was abandoned. . . and we decided to take advantage of it" (C1-HT2, 4:1). The previous existence of a "good space to use" (C3-HT1, 12:1) becomes a trigger for action, suggesting a motivation based on improving the available resources of the school environment.

Moreover, depending on how the school garden is worked, it can certainly be transformative of conventional practices: "Our idea was to promote innovative and creative teaching that would allow us to move away from traditional education" (C2-COOR, 6:1). This improvement is perceived as a powerful promoter of learning: "We thought it would motivate learning. It was an innovation that provoked the desire to learn" (C2-HT1, 8:3). The pedagogical value is based on direct experience, as one teacher argues: "The child is in contact . . . with nature. It is not the same for me to talk to him about a tomato as it is for him to have it in front of him, to sow it and to observe it" (C1-HT1, 3:1).

Finally, the garden is conceived as a catalyst and cohesive element of the educational community. Its implementation seeks to foster cooperation, since it "allows students to develop social skills . . . as well as teamwork" (C1-HT2, 4:3). This community philosophy defines the identity of some schools, which proudly affirm: "We are not a school, this is a family" (C4-PRIN, 16:1). However, this motivation also demands self-criticism and aspiration for improvement, as suggested by the reflection of one of the teachers: "We could have made more of it, [. . .] we could have included families as part of the activity" (C1-HT2, 4:10), indicating a desire for even broader and more meaningful participation.

3.2. Category 2. Educational Purposes of the School Garden in Compulsory Education (PUR)

The school garden in compulsory education responds to the need to promote innovative and creative teaching that is capable of overcoming traditional approaches focused on the direct transmission of disciplinary content. The participating teachers mention that their aim was to "promote innovative and creative teaching that would make it possible to break away from traditional education" (C2-COOR, 6:1), opting for methodologies that break with the rigidity of the conventional classroom. The garden also makes it possible to leave the enclosed classroom, offering an educational proposal that extends beyond "the classic school textbooks and their already repeated programs" (C2-HT1, 8:2) by promoting more dynamic and contextualized learning.

Likewise, the school garden is configured as a collaborative learning space, as opposed to the conventional classroom organization. As the teachers indicate, "this is a space focused on collaboration", moving away from "the typical class arranged to respond to lessons in a textbook" (C2-HT1, 8:5). This organization encourages active student participation, teamwork, and co-responsibility, all of which are key elements for the development of social and civic competencies. With the school garden, students are encouraged to make personal and collective decisions with a specific purpose based on a shared and defined experience.

Another of the fundamental educational purposes of the school garden is education for sustainability and respect for the environment. Teachers stress the importance of "working with sustainability, placing more importance on the natural product itself, how it develops, how we should do it" (C3-HT1, 12:2), which implies a great understanding of natural processes and the responsible use of resources. Through these practices, the goal is for students to acquire sustainable habits and appreciate the origin of the food that they eat.

Complementarily, the school garden aims to develop an attitude of care, respect, and enjoyment of nature. The teachers state that "we want them to learn to take care of nature and to enjoy what it has to offer" (C3-HT2, 13:4), as well as to understand that "nature requires attention and respect, and that it is through this care that we can enjoy its fruits" (C3-HT2, 13:9). These experiences contribute to establishing a more conscious and responsible relationship between students and the natural environment.

From this perspective, the school garden is conceived as a key tool for the development of environmental awareness and citizenship education. According to the interviews, "we work a bit on sustainability and how we should create a better planet" (C3-HT1, 12:3), understanding that this task is part of our responsibility as citizens. Furthermore, specific activities aimed at environmental reflection are mentioned, including the importance of "collecting plastics, understanding where waste goes and reflecting on its impact on the planet" (C3-HT2, 13:9). This helps to reinforce the students' critical thinking and social commitment.

As a whole, it is proposed that the school garden not only acts as a didactic resource, but also as an integral educational space that promotes pedagogical innovation, meaningful learning, collaboration, and the training of responsible citizens with the resources and the environment in which they live. All of this coincides with many of the skills needed for a society that is oriented toward sustainability and environmental respect.

3.3. Category 3. Some Theoretical References: Foundations Supporting the Pedagogical Use of the School Garden (FOUN)

Beyond environmental activism or mere direct experience in nature, the school garden is based on a series of pedagogical principles that support and justify its educational use in compulsory education, transcending the merely playful or recreational space. In this sense, the teachers interviewed perceived the garden as an intentional didactic resource, aimed at transforming teaching–learning processes and promoting a more meaningful, critical education that is committed to contemporary social reality. Upon analyzing the interviews, it is evident that the work in the school garden is based on a coherent set of theoretical foundations of a pedagogical nature that place the students and their experience at the center of the teaching–learning process.

Firstly, the contributions expressed show a clear attachment to experiential and research-based learning. The school garden is conceived as an educational space in which direct experience is the starting point for the construction of knowledge. As one of the interviewees pointed out, the garden project is based on "experimental learning, where school research is the driving force behind teaching" (C2-COOR, 6:5). This conception implies that students do not merely receive information, but they actively participate in processes of observation, experimentation, and analysis. Similarly, the need to "have direct experiences in order to be able to verify and discuss based on data, consultation, and exchange" (C2-COOR, 6:6) is highlighted, reinforcing a view of learning that is linked to enquiry, empirical contrast, and reflective dialogue.

This approach is also framed within an active teaching perspective, in which students are the protagonists of learning. The centrality of the student is made explicit when it is stated that "we always make everything student-centered" (C4-HT2, 18:3). From this perspective, the school garden facilitates the activation of previous knowledge, the formulation of questions, and the progressive construction of knowledge through interaction with the environment, placing the teacher in a role of accompaniment and pedagogical mediation.

The interviews also highlight the influence of certain groups, such as the Modern School Movement (Freinet), as one of the main theoretical sources of the project. The link with this pedagogical current appeared when one of the teachers noted that they are "part of the Modern School Movement (Freinet) in Portugal" and mentioned participating in

training spaces linked to this pedagogical tradition (C2-HT1, 8:1). Another experience also mentions that "the model of the Modern School movement [. . .] is our source" (C3-COOR, 10:7). This reference bases the work in the garden within a pedagogical framework that values experiential learning, investigation of the environment, cooperation, and the connection between school and daily life, principles that are fully consistent with the educational use of the school garden.

In line with this model, the work in the garden is articulated through the project methodology, which is considered to be a flexible and open strategy, adapted to the interests and contexts of the students. According to the interviews, "we really like working with the project methodology with the students". However, it is recognized that each teacher and each group develops different proposals (C3-COOR, 10:4). This statement highlights a non-prescriptive approach to the methodology, in which the garden acts as a backbone, but with a differential margin according to each attempt.

On the other hand, the quotes repeatedly stress the importance of cooperative and participatory learning. Collective work appears as a central element of the analyzed projects, so much so that it is stated that "collaborative work is the most important of all" (C3-COOR, 10:8). Similarly, the garden experience is defined as "cooperative, participatory, and based on direct experience" (C4-HT1, 17:4). From a socio-constructivist perspective, these practices promote the shared construction of knowledge, the development of social skills, and the assumption of collective responsibilities, aspects that are especially relevant in compulsory education.

Finally, the work in the school garden is based on a clear ethical and value dimension that is linked to environmental and sustainability education. The interviewed individuals state that the experience aims to "promote social and natural values" and that its purpose is to "educate for a sustainable world" (C2-COOR, 6:7). Thus, the garden is configured as a privileged educational space used to promote attitudes of respect for the environment, ecological awareness, and social commitment, integrating academic learning with the comprehensive training of students.

The analysis of the interviews allows us to affirm that the school garden, as developed in these experiences, is based on a solid theoretical framework that integrates experiential learning, active teaching, Freinet pedagogy, project methodology, cooperative learning, and education in values for sustainability. These theoretical foundations provide the school garden with pedagogical coherence, consolidating it as a highly valuable educational resource in compulsory education.

It should be noted that these pedagogical principles do not manifest themselves identically in all of the experiences analyzed. Each of the educational practices linked to the school garden emphasizes certain aspects over others, depending on the specific context, objectives, and characteristics. Nevertheless, when considered as a whole, the interviews revealed a common core of pedagogical foundations that recur in a consistent and meaningful way, forming the most representative foundations that justify the educational use of the school garden in compulsory education.

3.4. Category 4. Role of the Community: The School Garden as a Shared Responsibility (COMM)

When school gardens are established as innovative experiences, a complex participatory architecture is identified in which apparently traditional roles are dialectically reconfigured.

Regarding student participation, not only are they the recipients of the activity, but they are also active agents in the management and maintenance of the garden. Their contribution is characterized by significant practical involvement: "The children . . . help the coordinator . . . and get quite involved" (C1-HT1, 3:5). They also express a constant motivation: "The children have really enjoyed it. They have been involved. They have

participated and they kind of need it... many times they tell me: Teacher, when are we going to the garden again?" (C1-HT2, 3:8), or "yes, we love it..." (C3-MEM1, 14:1), and they really value the direct experience with nature and the harvest, "I like it when we go to the garden and pick... the vegetables" (C1-MEM1, 5:1). In some cases, they take on organizational roles, even guiding the teachers: "... now we have to clear it, then we are going to make the furrows..." (C4-COOR, 15:1).

Teacher participation is diversified, with some taking an active pedagogical leadership role: "Next year I have to start it from the get go and plant from the beginning ... this year I started at the wrong time" (C1-HT1, 3:9), and others acting as a mediator: "Our role ... is to inform and guide, we do not force" (C2-HT1, 8:12); and even to encourage student participation in their own assessment, although "as complementary information, not definitive" (C2-HT1, 8:9). However, they face external pressures that limit their commitment: "Teachers feel threatened by these national tests and react by applying more reinforcement to direct teaching" (C2-PRIN, 7:9). This tension translates into unequal involvement: "Many teachers like the school garden... And others do not adhere so much to the project" (C3-PRIN, 11:3). In some cases, a "lack of motivation on the part of the teaching staff" is directly identified (C3-COOR, 10:14).

For their part, families and volunteers (including grandparents, parents, and other community members) are fundamental pillars for the garden's sustainability. Their support is logistical and technical, with one teacher pointing out: "A knowledgeable father, uncle, grandfather, mother, ... could have come and helped us in the harvesting" (C1-HT2, 4:10). Older people, especially, bring invaluable knowledge: "The grandparents ... ran the whole garden" (C4-COOR, 15:2). The volunteer community is gradually being integrated: "One parent who said that this would end up lowering the proficiency level has joined the volunteer group and is now one of the most active members" (C2-COOR, 6:13). The emotional connection generated is profound: "It is so nice to see ... the grandparents there sowing and the students come up to them ... and greet them, meet them, hug them ... they are already part of the school" (C4-COOR, 15:6).

As for the school leadership team and the project coordination, both leaderships act as institutional facilitators, promoting the project and managing resources: "We are an Eco-School. One of the actions carried out within the Eco-School Project is the school garden" (C1-PRIN, 2:3). They manage their implementation through structured processes: "planning, training, and resourcing" (C2-PRIN, 7:4). Their role is fundamental in facilitating autonomy and participation, given that they organize "the life in the classroom according to a distribution of tasks" (C3-COOR, 10:6) and connect different actors through meetings with "the representatives of the parents' association" (C3-COOR, 10:15). They clearly promote a collaborative culture in which "everyone is on the same page" (C4-PRIN, 16:1) and "innovative and creative teaching that allows for a departure from traditional education" (C2-COOR, 6:1), while granting them legitimacy, since "the City Council has publicly rated ... the project" (C2-COOR, 6:14).

Finally, the school garden acts as an integrating space that strengthens relationships between all actors. A horizontal structure is fostered in which "everyone feels they are protagonists and have taken ownership of the project" (C2-COOR, 6:3). The relationships built are highly valued: "It is a very positive and productive support network" (C2-HT1, 8:17). The garden generates a strong sense of community identity, indicating that volunteers "are part of the school and feel recognized by all the members who comprise it" (C3-MEM, 19:1). Collaboration extends to the joint organization of activities, where "mothers and fathers also coordinate to come and play ecological games" (C3-COOR, 10:15).

3.5. Category 5. Ways of Integrating the School Garden into the Curriculum (CURR)

In the analyzed schools, different levels of integration of the school garden into the curriculum were observed. These levels ranged from an occasional use linked to specific projects to a clearly interdisciplinary and planned incorporation.

In School C4, the school garden has the lowest level of curriculum integration. Its relationship with teaching is limited to specific moments in the academic year and to specific school projects. Specifically, the garden is linked to the ecology and environmental care project undertaken during the third term, as indicated by the teachers: "In the third term, the school is going to work on the ecology and environmental care project (...) so the garden will also be related" (C4-HT1, 17:2). In this way, the garden serves as a complementary resource, without a continuous presence in the curriculum.

A slightly higher level of integration is observed in School C3, where the school garden is incorporated in a more stable way, although restricted to a specific area and three teachers. According to the coordinator, its use is concentrated "mainly within the area of environmental studies, in the first cycle" (C3-COOR, 10:1). This suggests that the garden is mainly conceived as a resource for working on content related to the natural environment, without clear interaction with other subjects or educational levels.

In School C1, the school garden is in an intermediate phase of integration. It is characterized by a clear aim to be incorporated into the curriculum, but continues to be irregularly implemented and limited to a specific group of teachers. The coordinator recognizes that "the garden is carving out a place in this school's student curriculum" (C1-COOR, 1:4). However, the connections with the curricular areas are made on an ad-hoc and unsystematic basis, as the school principal notes when indicating that "I occasionally connect the garden with some curricular areas (...) but on a one-off basis, not with a program" (C1-PRIN, 2:4). Therefore, the use of the garden depends on partial teacher initiatives or specific situations.

Finally, School C2 represents the highest degree of curricular integration of the school garden. In this school, the garden is conceived as a resource closely linked to the regular classroom curriculum, as the coordinator mentions: "Our school garden proposal has a high level of connection with the regular classroom curriculum" (C2-COOR, 6:8). The teachers emphasize its interdisciplinary potential, noting that the garden activities allow students to work on content from multiple subjects in an integrated way: "There are many relationships between the different subjects and the activities in the garden: measuring, counting, calculating, distributing, making plans, writing, reading, representing, etc." (C2-HT1, 8:11). Despite the requirements of the national curriculum organized by subject, the school opts for a flexible organization that facilitates global learning: "We have linked the subjects to facilitate learning" (C2-HT1, 8:6).

However, despite their differences in the integration level of the school garden into the formal curriculum, all four schools agree that the school garden enables learning that extends beyond the regular classroom subjects.

In School C1, teachers specifically emphasize the development of attitudinal and competence knowledge. According to one teacher, work in the school garden "involves attitudinal knowledge, of course, because children develop autonomy, social skills, etc." (C1-HT2, 4:5). The garden thus acts as a space that encourages responsibility, cooperation, and personal initiative.

This idea is clearly reinforced in School C2, where it is emphasized that the garden enables work on learning that is not explicitly included in the subjects, but that is fundamental in today's education scenario. As the teachers point out, "there is knowledge that we would not be able to work on without this resource. There is a lot of knowledge that is not included in the subjects, although it is very necessary nowadays" (C2-HT2, 8:13).

The school garden is therefore understood as an irreplaceable pedagogical resource for the development of relevant and contextualized learning.

In School C3, although the school garden is specifically linked to the area of Environmental Studies, the coordinator recognizes its potential as a transversal learning space. It is suggested that "the garden allows specific work on the contents of environmental studies, but then becomes a working space that is transversal to all disciplinary areas" (C3-COOR, 10:2). In this way, the garden transcends its initial function and is projected as a shared educational environment.

Finally, in School C4, the teachers emphasize the ethical and value dimension of the school garden, pointing out that "we connect it with the topic of values" (C4-HT2, 18:5). The school garden is used as a privileged context to work on respect, care for the environment, and coexistence.

The results suggest that beyond the degree of integration into the formal curriculum, in all of the schools, the school garden is perceived as an educational space that promotes attitudinal, social, ethical, and competency learning, which is difficult to achieve from an exclusively disciplinary perspective.

3.6. Category 6. Achievements and Benefits: Contributions of the School Garden to School Education (ACH)

The results linked to the category achievements and benefits showed a broad and diverse set of inputs resulting from the implementation of the school garden and associated community initiatives. In general terms, the testimonies reflect pedagogical, convivial, emotional, and community benefits, as well as improvements in the school's identity and in the participation of different educational actors. The convergence of these dimensions shows that the garden has consolidated itself as an integral educational resource, capable of generating significant learning and strengthening social cohesion.

Firstly, the participants highlight the importance of the institutional and material support received, which has enabled the project to be launched and sustained. Mention is made, for example, of the "collaboration of the Andalusian Regional Government's plant program", which provided "seeds, compost, straw bales. . ., a wheelbarrow, watering cans, hoes, pickaxes", which "makes the work easier because otherwise the school would have to cover all those expenses" (C1-COOR, 1:6). Another teacher notes that "this year we have received a kit of material from the Regional Ministry of Education. . . so you don't have to take money out of the school's budget for that kind of resources" (C1-PRIN, 2:6). These contributions not only alleviate the financial burden, but they also allow the project to develop with continuity and quality.

At a pedagogical level, the benefits are especially visible in the students' practical and experiential learning. One teacher explains that the children have learned "to recognize some vegetables that they didn't know before, to understand how cultivation works, because they used to think that the plants just appeared there as if by magic" (C1-HT1, 3:10). This learning is complemented by the direct experience of the natural cycle, as described in another testimony: "Living the experience of planting, waiting the time needed for the plants to grow, and then harvesting, all of this is learning. . . and it is also curricular learning" (C3-COOR, 10:10). Contact with nature is perceived as an essential element for holistic development, since it "provides many possibilities for learning in a practical and healthy way" (C2-HT1, 8:4).

In addition, the garden contributes to improving the school climate and coexistence: "Many children are in the garden during their recess, so there is less conflict in the playground" (C1-PRIN, 2:6). It is also underlined that official evaluations "positively highlight the climate of the educational community" (C2-PRIN, 7:6). The atmosphere generated in the garden is described as especially positive: "They look happy, relaxed, and really

engaged in what they are doing" (C2-HT1, 8:14). Even students with greater difficulties in adapting find a space for integration: "I have children from compensatory education. . . I have never seen them laugh. . . and this type of activity helps them to integrate and feel useful" (C4-HT2, 18:9).

Another of the most significant achievements is the creation of a collaboration network between teachers, families, volunteers, and, most importantly, the elderly living in the area. The testimonies reveal how this intergenerational participation has become a cornerstone of the project. It is mentioned, for example, that "the relationships established between families, teachers, and volunteers. . . form a very positive and productive support network" (C2-HT1, 8:17). The figure of the grandparents acquires a symbolic and affective value: "Children see. . . the grandparents there sowing and the students come up to them . . . and greet them, meet them, hug them . . . they are already part of the school" (C4-COOR, 15:6).

The community impact is also reflected in the identity of the school. One of the school principals states that the garden "has given the school an identity. . . it differentiates it from the others, because it has its own 'grandparenting' (abueleando) project" (C4-PRIN, 16:5). This uniqueness strengthens the sense of belonging and projects a positive image to the local community.

The project has also generated benefits in the students' eating habits. One teacher reports that some of the families commented that their children "eat lettuce, eat tomato. . . it's different here" (C3-HT1, 12:7), suggesting an improved willingness to eat healthy foods when they are part of a lived experience.

Finally, the results show that the project promotes educational inclusion. The garden is presented as an ideal space for students with specific needs, since "they need to manipulate and see more than a picture. . . and it is ideal for them" (C4-HT1, 17:5).

Overall, the data suggest that the school garden not only fulfills a pedagogical function but also acts as a backbone of community life, generating learning, links, and experiences that extend beyond the classroom. Its ability to integrate different agents, improve coexistence, promote healthy habits, and strengthen the school's identity makes it an educational resource of great transformational value.

3.7. Category 7. Obstacles: Difficulties, a Challenge to Overcome (OBS)

Within the processes that are established with respect to the school garden, certain obstacles exist that the participants must overcome in order to achieve the objectives that have been established. The most recurrent obstacle for teachers using the school garden for teaching is time and organizational constraints. This has been highlighted by the teachers: "The limitations are always a matter of scheduling" (C1-COOR, 1:3). Lack of time was the most recurrent and cross-cutting obstacle in all of the schools. The teachers mentioned that school organization makes it difficult to integrate the garden into the daily dynamics: "Perhaps the biggest challenge is the lack of a specific timetable. We don't have a time slot dedicated solely to the garden, so we must look for free moments" (C3-HT2, 13:3).

Secondly, and directly related to time constraints, the difficulties in teacher coordination and participation constitute additional obstacles that have been observed: "You need time to coordinate with colleagues teaching in other areas" (C1-PRIN, 2:5). Another difficulty is the unequal involvement of teachers and the dependence on a small group of teachers who take on most of the responsibilities: "The main disadvantage is that not all teachers work in this way and bring children to participate in these activities" (C3-COOR, 10:11).

Thirdly, the pressure of standardized assessments across the Portuguese territory makes it difficult to adopt interdisciplinary approaches in the school garden. Especially at higher levels, teachers feel the need to apply traditional methodologies and direct

instruction: "Innovative initiatives are viewed as an obstacle to success in tests that demand classical academic results" (C2-PRIN, 7:9).

There are also material and infrastructural shortcomings that hinder teaching. One example of this is the lack of suitable materials "because beyond the manuals, everything that is done must be done by the teachers, and that is difficult to maintain for a long time" (C2-COOR, 6:10). The lack of stable financial resources is another obstacle: "In the garden we have had to make investments ourselves as a school and use money that we don't really have; teachers even bring seedlings to plant in the garden" (C4-HT2, 18:13). There are also issues with the garden itself: "We've been asking the city council throughout the whole school year to install an irrigation system up there. Even the grandparents went to the town hall to request it, and there was just no way" (C4-COOR, 15:4).

Finally, although with a lower frequency, difficulties were also observed in the management of the student body, given the heterogeneity and diversity existing in classrooms: "There are many students and it is difficult to pay attention to all of them" (C2-HT1, 8:15). Likewise, the teachers attempt to ensure that all children can visit the school garden: "We would like there to be a weekly time for everyone to go to the garden" (C3-COOR, 10:9).

In short, numerous obstacles exist that teachers must overcome when teaching in the school garden. The research suggests that many of these obstacles are cross-cutting across all of the schools, highlighting the significant time investment required for this type of initiative.

3.8. Category 8. Satisfaction: From Effort to Achievement (SATISF)

The results extracted from this category have the common characteristic that all participants feel a high degree of satisfaction when participating in experiences involving a school garden. The results reveal the satisfaction of the members of the educational community, organized as teachers, students, families, external agents, and collaborators.

Teachers repeatedly express their enjoyment and motivation to participate in this initiative: "I would like to continue doing this. I really liked it" (C1-HT1, 3:7). The experience is perceived as rewarding, both for the teaching–learning experience itself as well as for the impact observed on the students: "We are more and more enriched from this experience, and that is gratifying for me. I mean, it is super gratifying for me".

Similarly, the teaching staff expressed their perception of the level of student satisfaction: "The children enjoy it very much. . . they love it" (C4-HT2, 18:8). They also describe their level of commitment: "The children have really enjoyed it. They have been involved. They have participated and they kind of need it. They need to go to the garden" (C1-HT1, 3:8).

These statements are in line with the students' own testimonies where they display an especially high level of satisfaction, categorizing the school garden experience as the "best time of the week" and describing the emotion associated with specific tasks such as watering, sowing, weeding, or harvesting food: "I like it when teacher Manuel gives me the hose to water" (C3-MEM, 14:1).

As has been repeated throughout this category, families are other agents who have valued the experience very positively, both due to the learning that it generates and the school climate that it promotes. In some cases, however, a transformation of attitudes may be observed with families who were initially skeptical about the project: "Interestingly, one parent who said that this would end up lowering the proficiency level has joined the volunteer group and is now one of the most active members" (C2-COOR, 6:13).

External agents, considered to be people or organizations that participate or collaborate in the experience, have also transmitted their level of satisfaction. One example of this is the representation of the Autonomous Administration through the education inspectorate:

"As for the inspectors, when they see it, they also like it" (C4-PRIN, 16:3) or the Municipal Administration: "They have publicly rated the project very highly" (C2-COOR, 6:14).

Similarly, some partners have become the main protagonists of the experience, as is the case of the grandparents in the so-called "grandparenting" project. It is stated that "...the grandparents also like it because they feel useful. The grandparents who come to the garden enjoy it very much" (C4-HT2, 18:11), becoming the backbone of the project: "There are always grandparents willing to help. It is a means of opening the school to the community. And that is very important" (C4-HT2, 18:18).

In short, the high degree of satisfaction of all members of the educational community is unanimous when the school garden experiences are put into perspective.

4. Discussion

The coexistence of historical, pedagogical, practical, and community factors suggests that the school garden functions as an integrating nexus that responds to distinct institutional needs.

4.1. Pedagogical Aims and Methodological Renewal

In line with the specialized literature, the results suggest that the school garden is an educational resource with great potential in compulsory education. It promotes educational approaches that extend beyond the traditional models that focus on the transmission of content. Teachers' contributions highlight its value as a space for methodological innovation, allowing for the diversification of learning scenarios beyond the conventional classroom and the exclusive use of the textbook, in line with Marques and Cuéllar (2021) and Turner-Hill et al. (2021).

It has also been noted that the school garden promotes collaborative learning and active student participation, promoting the development of social, civic, and emotional competencies. The organization of activities based on cooperation, co-responsibility, and shared decision-making places students at the center of the learning process. This is in line with the principles of active methodologies described by Pollin and Retzlaff-Fürst (2021).

Moreover, education for sustainability is one of the central aims of the school garden. The practices developed facilitate the understanding of natural processes, the appreciation of the origin of food, and the acquisition of responsible habits linked to the care of the environment and health, in line with the approaches of Conde-Núñez et al. (2018); Eugenio Gozalbo and Aragón Núñez (2016); and Walshe et al. (2024). This approach has been reinforced by the experiential nature of the school garden, which promotes meaningful learning through direct observation and experimentation. It has positive effects on academic performance and motivation to learn (Papadopoulou et al., 2020; Kuo et al., 2019), and on collaborative enquiry and critical reflection based on data obtained in school research processes (Ortiz-Ordoñez et al., 2023).

4.2. Theoretical Foundations, Research, and Community Participation

The findings are also consistent with the contributions of Vílchez and Escobar (2014) and Zambrano et al. (2018) as they highlight inquiry-based learning as the ideal methodological axis. This places students in an active role in the construction of knowledge. However, in accordance with the warnings of Aragón and Morilla (2021), the results reveal the need to overcome simplified conceptions of school research (occasionality, little structure, etc.), which reduce it to mere direct experience. It is necessary to create more complex proposals integrating the formulation of predictions, systematic experimentation, and the drawing of well-founded conclusions.

Likewise, the influence of Freinet pedagogy and the Modern School Movement is clearly manifested in the practices described, coinciding with the suggestions of Eugenio Gozalbo and Aragón Núñez (2016). The principles of researching the environment, cooperation, and connection between school and reality take on concrete form through the project methodology (Pozuelos & Rodríguez, 2008), which is presented as a flexible and contextualized strategy. Its effectiveness, however, depends on rigorous teaching planning to ensure the coherence and depth of learning.

Collaborative, civic, and community-based learning (Cramer & Tichenor, 2023) emerges as another central axis from a socio-constructivist perspective. This promotes the shared creation of knowledge and the development of social competencies. The role of the community extends beyond mere participation, revealing a significant link to the principles of community education and situated learning (Arnseth, 2008). These findings are in line with those of authors such as Williams and Dixon (2013), who have identified gardens as communities of practice where knowledge is co-constructed through the legitimate participation of diverse actors. Our study advances this conceptualization by revealing how this participatory architecture is dialectical and reconfigured. Students take on guiding roles; teachers act as mediators; and the experiential knowledge of elders (volunteer grandparents) is integrated in parity with curricular knowledge (Egerer et al., 2024).

4.3. Curriculum Integration: Between Flexibility, Formalization, and Added Value

The analysis of this research coincides with the work of Falzon and Conrad (2024) by suggesting that the integration of the school garden into the curriculum does not follow a homogeneous model. Instead, it takes on distinct forms depending on the institutional and pedagogical context of each school. Thus, the school garden, as a flexible resource, is capable of adapting to specific uses linked to specific projects and to more stable and interdisciplinary proposals. This reinforces the idea that the garden does not impose a single curricular logic but accommodates different organizational cultures and educational approaches.

The findings are also in line with the contributions of Wyse et al. (2018) by suggesting that the school garden has a greater educational potential when it is inserted in integrated curricular proposals. In schools where its use is systematic and planned, the garden serves as the backbone for learning, promoting the connection between areas and the development of contextualized knowledge. However, in contrast to approaches that prioritize exclusively globalizing frameworks, the results reveal that a more disciplinary use of the garden is also possible. This may especially be the case in contexts in which the curriculum is strongly structured by subjects, without the educational value being invalidated.

These approaches concur with Subramaniam (2002) in emphasizing that the pedagogical value of the school garden lies in its ability to address current problems and to develop the potential of each student. In all of the schools analyzed, the contribution of the school garden to the development of attitudinal, social, and ethical learning, which is difficult to approach from an exclusively academic perspective, has been recognized. Thus, the garden is consolidated as a relevant educational space for the holistic development of students, regardless of whether it is part of an integrated curriculum or in more disciplinary approaches. This broadens and qualifies the existing theoretical perspectives on its role in schools.

4.4. Achievements, Satisfaction, Obstacles, and Sustainability Factors

As an innovative proposal, the school garden is sustained over time by anchoring itself in the school's identity and its school community relationships (Austin, 2022; Hargreaves & Fink, 2008). Furthermore, the high level of satisfaction reflected in the study and identified in other experiences (Marques & Cuéllar, 2021; Lalama-Franco et al., 2025; Suárez, 2021)

reinforces its sustainability. Our analysis allows us to integrate the multidimensional benefits identified (educational, convivial, community, etc.) under a common framework. The school garden serves as a socio-educational and ecological transformation resource that, by connecting learning, community, and environment, generates well-being and cohesion in a synergetic way. The high level of satisfaction of all of the actors emerges, not as an isolated result, but as a reflection of this comprehensive and shared transformation.

As some voices pointed out, however, resistance persists. This resistance is linked to internal pressures, such as a lack of funding or a stable economic endowment (Hoover et al., 2021), and external pressures, such as standardized assessments, which act as structural limits to alternative pedagogies (Lipman, 2004). Our data illustrate how certain obstacles operate in daily practice. Assessment pressure not only limits time availability, it also conditions teachers and pushes them toward direct teaching, creating a clear tension between innovation and accountability. In order to overcome these barriers, the response may not be additional resources, but rather, a reconceptualization of the evaluative and organizational cultures of today's schools.

Overall, the school garden may be considered as an educational space with global resonance, whose pedagogical, community, and ecological principles transcend borders and cultures, leading to a more connected, critical, and sustainable school model.

4.5. Study Limitations and Future Research Lines

This study has several limitations that should be considered when interpreting its findings. First, its qualitative and context-specific nature precludes statistical generalization to other schools or educational settings. Therefore, the transferability of the conclusions is left to the reader's judgment, based on the similarity between their context and the cases described here.

Second, the use of purposive sampling for center selection may have introduced a bias toward successful or well-established experiences, potentially overestimating the benefits of the school garden and underestimating the challenges in less favorable contexts.

Third, social desirability may have influenced participants' responses during the interviews, particularly regarding satisfaction and perceived achievements. Although strategies such as source triangulation and member checking helped mitigate this bias, they cannot eliminate it entirely.

Fourth, the study provides a cross-sectional view of experiences at a single point in time, which does not allow for analysis of the evolution of projects or the sustainability of observed effects. Future research could adopt longitudinal designs to track the development of school gardens over several years.

Finally, although a mixed coding approach (deductive-inductive) and quality control mechanisms (double coding, consensus, triangulation) were used, interpretive subjectivity is inherent in qualitative analysis. These procedures were designed to minimize bias, but they cannot eliminate it entirely.

5. Conclusions

This study aimed to explore the implementation of the school garden as a pedagogical and community tool in educational contexts in Spain and Portugal. It identified its foundations, modalities of curricular integration, benefits, and obstacles. The findings have been organized with respect to the initial objectives.

In line with the objective of exploring its pedagogical and community implementation, the analysis reveals that the school garden is based on a broad educational concept that extends beyond its use as a specific didactic resource. The motives behind its implementation are consistently linked to experiential learning, community participation, and

connection with the natural environment. This positions the garden as an element having a strong symbolic and cohesive value within school life. Thus, it represents both a commitment to active pedagogies and an aspiration to build more integrated and collaborative educational communities.

The results suggest that the school garden may be consolidated as an integral educational space, provided that its use is articulated through intentional and coherent pedagogical planning. Its educational impact lies not only in the activity itself, but also in how it is integrated into the curriculum and the school's didactic proposals, especially in contexts oriented toward education for sustainable development. From this perspective, the garden is not merely a complement but a significant axis of the teaching–learning process. It is an intentional pedagogical resource that promotes meaningful learning based on research, direct experience, and the active participation of students. These practices are based on theoretical approaches that coincide with active pedagogy (especially the Freinet tradition), project methodology, and socio-constructivism. When these foundations are systematically developed, the garden becomes a privileged environment for collaborative and community learning.

The experiences analyzed also reveal that the school garden may operate as a microsystem of educational innovation and collaborative organization, in which different agents of the school community converge. This transformative potential coexists, however, with institutional tensions and contradictions related to the organization of time, teacher coordination, and the demands of the education system. Managing these factors is key to ensuring that the garden advances as an authentic space for socio-educational transformation.

From a curricular point of view, the data indicate that the school garden is a flexible resource whose integration depends on the context and the pedagogical decisions of each school. Its potential is most clearly manifested in integrated curriculum proposals that facilitate contextualized learning and connections between subject areas. It has also demonstrated its value in more disciplinary approaches. Beyond its formal place in the curriculum, the garden contributes significantly to the development of social, attitudinal, and ethical learning, consolidating itself as a relevant framework for the integral development of students.

To ensure an understanding of both achievements and obstacles, it has been noted that the benefits associated with school garden experiences encompass educational, emotional, and community dimensions. There are positive effects on coexistence, educational inclusion, the acquisition of healthy living habits, and environmental awareness. These achievements, however, are constrained by persistent structural obstacles, especially organizational and temporal ones. These constraints highlight the need for education policies that are more consistent with the implementation of innovative and community-based pedagogies.

With respect to the contributions of the school garden, the high level of satisfaction consistently expressed by all participants reinforces its relevance and meaningfulness in the pedagogical development of educational institutions. In many cases, this space acquires an identity of its own that represents the school and creates a shared sense of belonging and pride. In this way, it contributes to the sustainability and continuity of the educational experience.

In short, the school garden emerges as a pedagogical device that advances learning, community, and sustainability, assuming that it is implemented in coherent organizational and curricular frameworks. Its value lies not only in the learning that it generates, but also in the relationships, meanings, and educational practices that it enables. It positions itself as a means of rethinking the school from a more integrated, participatory, and contextualized perspective.

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Institutional Review Board Statement: In Spain, the obligation to submit a project for evaluation by a Research Ethics Committee generally applies to studies involving medicinal products, in accordance with Law 14/2007 on Biomedical Research. In the case of research in the field of social sciences where information is collected through interviews with adult participants, it is sufficient to obtain the corresponding informed consent from those involved.

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