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# Are gardens useful for promoting early age science education? Evidence from analysis of children's drawings

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**ABSTRACT**

This study analyzes pre-school children's mental representations of their idea of a garden, before and after implementing an educational project. A total of 39 and 43 pairs of drawings (pre-post) are analyzed in children aged four and five years, respectively, using two methods: (1) a quantitative approach, based on counting the frequency with which elements linked to curricular scientific content appear (sun, water, earth, animals, plants and trees), and (2) a qualitative approach, based on the degree of richness and specificity of such elements in the drawings. Both methods provide important information on children's interest in, and their affective-emotional relationship with, the garden and their learning of science. The choice of curricular scientific content that is explicitly focused on in the garden is considered important from the point of view of teaching, since such content can condition the construction of children's mental models of a garden, as well as scientific content in higher educational stages.

**Keywords:** scientific literacy, motivation, mental models, children's drawings

## INTRODUCTION & OBJECTIVE

In today's society, characterized by rapid change and continuous social, scientific, and technological challenges, it is essential for citizens to be capable of actively participating in such transformations (Valdez, 2021). Early exposure to scientific phenomena significantly contributes to children's understanding of scientific concepts, as well as to the development of attitudes towards science and scientific skills, such as reasoning and critical thinking, which are essential for active participation in society (Eshach & Fried, 2005).

In the current framework of the European model of teaching and learning by competences (EU, 2018), it is necessary to define scientific literacy. Pedrinaci et al. (2012) consider it an integrated set of personal abilities to use scientific knowledge in order to describe, explain, and predict natural phenomena. Scientific literacy also involves understanding the most characteristic features of science; being capable of formulating and investigating problems and hypotheses; and documenting, discussing and making personal and social decisions about the natural world and the changes that human activity generates in it (Pedrinaci et al., 2012). At early ages, learning science means rebuilding personal ideas or misconceptions towards more valid ones, whilst maintaining children's interest and innate curiosity, as well as discovering, valuing, and caring for the immediate environment (García-Carmona et al., 2014).

Early childhood education (ECE) is considered particularly key in relation to the construction of scientific representations. It has been evidenced that, in school settings, children build primitive models, called *precursors*, which are considered essential to move towards more complex ones (Cruz-Guzmán & Martínez Maqueda, 2022; De Alba Villaseñor & Ramos de Robles, 2020). ECE also constitutes a fundamental formative and personal period as it contributes to the initial development of children from all perspectives: personal, linguistic, affective-emotional, cognitive, physical, and social (Mateo González et al., 2020).

To develop scientific literacy, Moreno et al. (2017) suggest the need to put into practice strategies that are characteristic of science and allow for working on specific skills, such as hypothesis formulation, observation, and others linked to the cognitive-linguistic dimension: describing, defining, summarizing, and explaining (Monteira & Jiménez Aleixandre, 2019), which are essential in building new knowledge (Sutton, 1996). It is thus important to design didactic proposals in participatory learning environments that contribute to developing these skills, while generating positive emotions as a key element for learning science (Soltani, 2020).

The main aim of this study is to analyze 4- and 5-year-olds' mental representations of a garden, as well as of the curricular scientific content linked to it, both before and after implementing a didactic proposal focused on the design and maintenance of an organic garden. It is intended to answer the following questions:

1. What curricular scientific content do children represent in their drawings of an organic garden before the topic is addressed educationally?
2. What are the most outstanding aspects of learning of curricular scientific content evidenced by their graphic representations following the didactic intervention?

Thus, this research aims to contribute to the fields of knowledge of scientific education and ECE by delving into the type of learning promoted by a garden project in pre-schoolers. It intends to methodologically approach this task by analyzing their drawings, based on the consideration that drawing is a natural form of expression in children at these ages.

## THEORETICAL FRAMEWORK

### Gardens as Teaching-Learning Contexts

Spaces to grow plants in schools, such as gardens on the ground, cultivation beds or vertical gardens, constitute valuable didactic resources for practical work on scientific curricular content, since they allow students to directly experiment with life and its processes (Kaufman & Serafini, 1993). Their use across all educational stages and all over the world is increasing as a response to a range of needs. An outstanding need is to provide students with regular outdoor learning experiences, particularly in urban areas, which it is estimated will be home to 60% of the world population in 2030 (WWI, 2007). Direct experience in and of nature plays a vital, arguably irreplaceable, role in individuals' affective and cognitive development (Khan & Kellert, 2002), and regular contact with nature has restorative psycho-emotional effects (Berman et al., 2008; Hartig et al., 2001). There is now increasing interest in evaluating whether green or naturalized playgrounds in schools, including those with gardens, have positive impacts on students' health and well-being (Baur, 2022; Largo-Wight et al., 2018), thus improving their participation and attention in subsequent classes (Kuo et al., 2018). Additionally, it has been evidenced that direct experiences in and of nature promote the development of affective relationships with the natural world, and thus, pro-environmental or pro-conservationist attitudes and behaviors (Evans et al., 2018; Zelenski et al., 2015). This is a fundamental reason why naturalization of school environments is recommended by international organizations (IUCN, 2016), consequently promoting the incorporation of gardens in educational settings.

In recent years, the use of gardens in ECE has been specifically addressed in the literature. Some works focus on educators' perceptions in order to address issues such as barriers, facilitators, and the main benefits of incorporating gardens, evidencing positive impacts on children's comprehensive learning, health, and contact with nature (McMillen et al., 2019). Pre-schoolers' preferences for and consumption of fruits and vegetables have also been addressed, with similar results to those obtained for primary school children (Davis & Brann, 2017). Children's well-being, including positive interpersonal relationships and empathy with other living beings, has also been observed to be enhanced by garden programs (Dyg & Wistoft, 2018).

Some studies give greater prominence to learning in the field of natural sciences. For example, it has been described that gardens can be used to promote learning in multiple domains, including the so-called *cognition and science*, related to planning, decision making, problem solving, or understanding the passing of the seasons (Murakami et al., 2018). A case study conducted at an active school showed that gardens constitute authentic contexts that promote holistic learning and provide opportunities for the development of ecological awareness and scientific reasoning -including abilities such as observing, questioning, predicting, evaluating, comparing or classifying (Vandermaas-Peeler & McClain, 2015). There is, however, a gap in the literature regarding an in-depth look at what particular aspects of science content are favored by the use of gardens in ECE, and at how children are capable of communicating these through drawings. This is the gap our research aims to fill.

### Use of Graphical Representations in Context of Science Education

Drawing can be an interesting scientific activity (Cabezas & Vílchez, 2016) or, at least, an interesting activity in support or scientific work (Baidal et al., 2022; Cabezas & López, 2016).

Drawing requires observing in detail and objectively and recording such observations (Katz, 2017). Furthermore, drawing can be used to evaluate scientific knowledge. From this perspective, student's representations can serve to detect the prior ideas they have on a topic (Ainsworth et al., 2001; Anderson et al., 2014; Bartoscek & Tunnicliffe, 2017; Villarroel et al., 2018). In addition, drawing generates valuable opportunities for the personal construction of scientific concepts (Prain & Tytler, 2012; Chang, 2017) and can reveal the new knowledge acquired after teaching (Jose et al., 2017). This is especially evident when working with very young children (Cainey et al., 2017; Gernhardt et al., 2013).

However, caution is needed if we consider children's drawings as a literal record of what they know or what they learn, because, above all, spontaneous drawing is a language modeled by certain rules: it comprises a typical succession of graphic stages with a predominance of certain formal schemes and structures, it is presided over by imaginative projection, and is influenced by emotional, aesthetical preferences and subjective non-visual associations (Lowenfeld & Brittain, 2008). As a consequence, the profound analysis of children's drawings is framed under the paradigm of art education, which admits both the ambivalence of graphic signs and the superposition of meanings (Martínez-García, 2004).

In the case of drawings produced by 4- and 5-year-olds, the meaning can be cryptic to the viewer. The representation of space is subjective; elements sometimes float on the paper and there may be no graphic clue of the physical space in which

**Figure 1.** (a) Garden in form of a raised cultivation box with wheels at CEIP Reyes Católicos (Cádiz, Spain), (b) children watering (Source: First author of the study)

they are located. Some drawings do not exhibit a preferential point of view (children rotate the paper while drawing), but the idea of ground will gradually emerge; it is the so-called "baseline" (a long longitudinal stroke at the bottom of the paper). This spatial scheme can present different variants, depending on the nature of the subject represented (Melero, 2004).

Moreover, the use of color is not related to the real color of objects but can respond to practical or emotional reasons (one crayon is sharper than another or an ugly color is associated with an unpleasant theme). However, a rich use of color, abundance of details and the drawer's identification with elements of the image are indicative of vivid interest or affection towards the subject depicted (Lowenfeld & Brittain, 2008). In addition, children typically reflect what is important to them, so may include strange elements and omit others, which may, however, be implicit. Additionally, a certain shape may adopt different meanings. Finally, visual perception and kinesthetic experiences can be conditioning factors that affect graphical representation (Matthews, 2002).

## METHODS

### Research Context & Participants

The core of the research was the design and implementation of a didactic proposal based on project work (Sarceda et al., 2015), the final product of which was the design and construction of an organic garden in the form of a raised cultivation box with wheels, which was installed in the courtyard of the building, attached to school, where both classrooms are located. Courtyard has an approximate extension of 260 $m^2$, without plant elements such as pots or borders, and with a cement floor (part a & part b in **Figure 1**).

The data proceed from a broader research project funded by the Andalusian Regional Ministry of Education (PIV-040/17) in the 2017/2018 academic year. It was conducted at the CEIP Reyes Católicos (Cádiz, Spain). Its main objective was to develop and evaluate scientific literacy in ECE through the use of an organic garden. A total of 89 children from four classes participated in this research: 44 were aged four and 45 were aged five; their four class teachers also participated. Four 4-year-olds and two 5-year-olds had special educational needs, and one 4-year-old boy had reduced mobility.

The proposal implemented has been described in previous works as part of a broader investigation (Aragón, 2020). The participation of the students was continuous throughout the entire project, from the design phases to the creation, and during the maintenance and care of the garden, to finally being the consumers of the products collected. Note that a main premise was the design of a garden based on agroecological principles (Altieri & Nicholls, 2000).

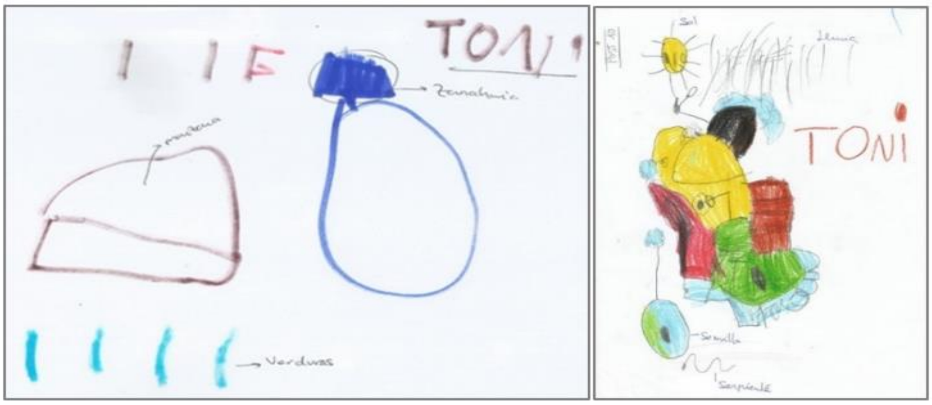
### Instrument Used to Gather Information

Drawings were used to evaluate changes in the representations referring to scientific curricular content. Drawings were done before and after the didactic intervention. In both cases, these were collected by the class teachers and the first author of this study. To this end, and in each class, drawings were done in a staggered manner: only one student at a time from each table made a graphic representation, to avoid children copying. They were asked to draw an organic garden and, later, each child delivered the drawing to their class teacher or to the researcher, depending on the case, who were at separate tables. Each child was then asked to give a verbal explanation of the elements represented, which were noted on the drawing, in order to support interpretation during their subsequent analysis.

### Data Analysis

After discarding unpaired drawings, the total sample comprised 39 paired drawings by 4-year-olds, and 43 paired drawings by 5-year-olds. These two groups of 39 and 43 drawings were analyzed separately, as the 4-year old children and 5-year-old children belonged to separate groups, and also because of the expected graphic differences depending on the maturational stage (Machón, 2009). The drawings were analyzed under two approaches.

Firstly, a qualitative analysis was conducted under expert criteria, using the grounded theory's method of constant comparison, an intensive and recurrent process of comparison of graphic documentation aimed at generating conceptual categories (Strauss & Corbin, 2011). This procedure has been used by the author in previous research and shows good results in detecting the main ordinary traits in a certain stage of artistic development, the exceptional traits, and the graphic




a b

**Figure 2.** Example of pair of drawings with a high level of change: (a) in initial drawing, there are only isolated fruits, (b) in final drawing, there are plants, germination, a snake, sun, & rain (Drawings of Student 10)

progression in paired drawings (Eugenio-Gozalbo et al., 2017, 2020).

The main characteristics of the grounded theory are that the result of the analysis, the so-called theory, is completely supported by data, so it is possible to follow the trail of the theory from the data, and it admits "mixed-methods approaches featuring both qualitative and quantitative methods" (Diehl et al., 2022, p.3). The analysis comprised two phases:

1. Preparation of two independent reports, corresponding to "before" and "after" the didactic intervention (initial and final drawings, hereafter) and considering the characteristics of children's drawings at this developmental stage (this was conducted by one of the authors, specialized in graphical representations and their evolutionary interpretation), and
2. Classification of the pairs of drawings into three groups, based on the level of change observed from the initial to the final moment.

For the categorization of change between paired drawings, clear criteria were used that allowed different researchers to take decisions (in any event, this classification was reviewed by the author specialized in graphical representations and their evolutionary interpretation). In this way, the researchers determined:

(a) pairs that showed a high level of change (substantial changes in the final compared to the initial representation),
(b) pairs that showed a medium level of change (new details were included, but both representations were clearly related), and
(c) pairs that showed little or no change.

A quantitative study was also conducted, based on the frequency of appearance of elements of interest–those linked to curricular scientific contents. The system of categories used in a previous study was taken as the starting point (Eugenio-Gozalbo et al., 2017), and was subsequently modified and completed by adding emerging elements during drawing analysis. Finally, the non-parametric McNemar test of comparison of proportions for two related samples was used to compare the frequencies of quantified elements in initial and final drawings. The level of significance was set at 0.05. The statistical package SPSS version 24 was used.

## RESULTS

### Four-Year-Olds' Drawings

The final drawings stood out for being more detailed, more complete, and for their careful combination of colors (**Figure 2**). The level of change was high in 21 pairs of drawings, medium in 13, and low in five (**Figure A1**, **Figure A2**, **Figure A3**, **Figure A4**, and **Figure A5** in **Appendix A**). Conceptual concreteness was much higher in the final drawings: these did not refer to nature in an abstract sense, and both the number of unrelated elements (houses, swings, etc.), and the number of representations showing isolated fruits were reduced (part a in **Figure 2**).

In the initial drawings, an enormous variety of solutions to represent space was observed. After the experience, the space was more defined and organized. There was an increase in the number of representations with a baseline, of those that represented the garden as a closed space, and others that exhibited large earth containers–following the model of garden that was built in the project. In other words, the garden evolved from an undefined space, or a vaguely natural landscape related to food (mainly fruits) to a defined place with soil and plants. Quantitative analysis supports the evidence provided by the qualitative analysis (**Table 1**).

Soil evolved from being represented in 46.2% of the initial drawings to 74.4% of the final ones. After the intervention, the sky was observed in the drawings as a differentiated area generated by better defining the ground line, thus resulting in a statistically significant increase in the proportion of drawings, where light was represented by the sun element. This also facilitated the incorporation of the rainbow element (from 2.6% to 25.6%, a statistically significant increase). Water was another element whose presence increased significantly, either as clouds and rain (87.5%), or as showers (12.5%). In both the initial and final drawings, plants were the most frequently represented element (**Table 1**). In the initial drawings, 10 different types of plants were identified (**Table 2**). In all cases, the stem and leaves were represented, although

**Table 1.** Statistical analysis of elements quantified in 4-year-olds' initial (pre-) & final (post-) drawings

| Category | Frequency (%) pre- | Frequency (%) post- | p-value |
|---|---|---|---|
| Animals | 17.9 | 17.9 | 1.000 |
| Trees | 5.1 | 12.8 | 0.453 |
| People | 20.5 | 25.6 | 0.774 |
| Raised cultivation system | 0.0 | 25.6 | 0.002* |
| Pots | 10.3 | 5.1 | 0.688 |
| Atmospheric phenomena: Rainbow | 2.6 | 25.6 | 0.004* |
| Sun | 15.4 | 56.4 | 0.000* |
| Water | 17.9 | 48.7 | 0.008* |
| Tools | 2.6 | 15.4 | 0.125 |
| Soil | 46.2 | 74.4 | 0.013* |
| Plants | 92.3 | 89.7 | 1.000 |
| Seeds | 5.1 | 35.9 | 0.002* |

Note. McNemar nonparametric test was performed: alpha=0.05, n=39 & *indicates statistically significant differences

**Table 2.** Frequency (%) of other types of plants before (pre-) & after (post-) in four-years old

| Plants | Frequency (%) |
|---|---|
| Before (pre-) | |
| Grass | 19.2 |
| Carrots | 13.5 |
| Tomato plants | 9.6 |
| Apples | 5.8 |
| Eggplants | 3.8 |
| Lettuces, broccoli, & bananas | 1.9 |
| After (post-) | |
| Lettuces | 13.4 |
| Carrots | 10.4 |
| Eggplants | 6.0 |
| Peppers & pumpkins | 4.5 |
| Oranges | 3.0 |
| Strawberries | 3.0 |
| Pears, plums, apples, & cauliflowers | 1.5 |


**Figure 3.** Author distinguishes flowers, eggplants, oranges, & apples (Drawing of Student 05)

only three students included roots. In the final drawings, 14 types of plants were identified, six of which included roots. The predominant formal scheme was the "flower type" (initially in 38.5% of drawings; and finally in 44.8%).

Unlike the qualitative study, the quantitative analysis revealed no significant level of change. The number of fruits without plants decreased discretely (from 11 to eight), although, in three drawings, fruits coming out of plants were represented with total clarity, something that initially only happened in one. It was also detected that the same "flower type" shape was used to represent different plants (**Figure A4** in **Appendix A**). It was also observed that subtle differences allow children to represent different types of plants, albeit with no resemblance to reality (**Figure 3**).

The representation of roots doubled in the final drawings. The number of seeds increased significantly (from 5.1% to 35.9%), which involved representing the germination process (**Figure 4**).

The representation of trees was scarce, with a slight increase from 5.1% (initial drawings) to 12.8% (final drawings). However, the level of definition did change in the final drawings, the types of trees were explicit: apple trees, orange trees, and lemon trees. The initial and final presence of fauna was very similar, and the diversity of animals did not vary substantially. Gardening tools were absent in both the initial and final drawings (2.6% and 5.1%, respectively).


**Figure 4.** Germination process drawing (Drawing of Student 15)

Overall, the initial model of the predominant garden in the 4-year-olds can be defined as "undifferentiated place, where there are vegetables", and after the gardening didactic intervention, it evolved to become an "enclosed place with soil, plants, and their seeds, which is exposed to the sun and to other atmospheric phenomena such as the rainbow, and where biological processes such as germination occur".

a b

**Figure 5.** Example of a pair of drawings showing a high level of change, but similar artistic quality (Drawing of Student 09)

**Table 3.** Statistical analysis of elements quantified in 5-year-olds' initial (pre-) & final (post-) drawings

| Category | Frequency (%) pre- | Frequency (%) post- | p-value |
|---|---|---|---|
| Animals | 18.6 | 20.9 | 1.000 |
| Trees | 51.2 | 20.9 | 0.007* |
| People | 58.1 | 27.9 | 0.004* |
| Raised cultivation system | 2.3 | 53.3 | 0.000* |
| Pots | 4.7 | 2.3 | 1.000 |
| Atmospheric phenomena: Rainbow | 0.0 | 32.6 | 0.000* |
| Sun | 39.5 | 53.5 | 0.180 |
| Water | 37.2 | 51.2 | 0.286 |
| Tools | 23.3 | 23.3 | 1.000 |
| Soil | 83.7 | 62.8 | 0.057 |
| Plants | 86.0 | 97.7 | 0.063 |
| Seeds | 7.0 | 11.5 | 0.727 |

Note. McNemar nonparametric test was performed: alpha=0.05, n=39 & *indicates statistically significant differences

### Five-Year-Olds' Drawings

The set of 43 pairs of drawings exhibited notable changes after the garden project. The level of change was medium in 21 pairs, high in 14 cases, and low in eight cases (**Figure B1**, **Figure B2**, and **Figure B3** are included in **Appendix B**).

A higher level of concreteness was observed in the elements included in their representations (part a and part b in **Figure 5**), despite, overall, and from an artistic point of view, the drawings being less rich than those of their 4-year-old counterparts.

The final drawings represented the type of organic garden that was used in the project. The following are some revealing examples: the representation of trees decreased significantly (from 51.2% to 20.9%), and that of raised boxes increased significantly (from 2.3% to 53.3%), leading to a decrease in the explicit representation of soil (**Table 3**).


**Figure 6.** Sky with sun, clouds, rain, & rainbows (Drawing of Student 22)

The appearance of the sky was already consolidated in the initial drawings; after the experience, a greater development was observed regarding the diversity of other elements (**Figure 6**). Thus, the presence of light (from 39.5% to 53.5%) and water (from 37.2% to 51.2%) increased notably, although it was not statistically significant. Water was initially represented by elements such as wells (6.3%), rain and clouds (81.3%), and showers (37.5%), and, after the experience, by rain and clouds (90.9%). The representation of atmospheric phenomena, such as rainbows, increased significantly from 0% to 32.6%.

Plants were the predominant element in both the initial and final drawings (**Table 3**). Initially, a total of 15 types of plants were identified (**Table 4**), although only in two cases were roots represented. Finally, 19 types of plants were identified, and roots were represented in 8 drawings. The "flower type" shape was predominant (39.4% and 41.2%), and we also detected that some students identified parts of their body with parts of the plants (**Figure 7**).

Seeds were scarcely included in the drawings. No significant changes were observed in the representation of other elements (**Table 3**). In the 5-year-olds' final representations, the predominant model of the ecological garden conceived would be "an enclosed space for cultivation (mostly of the raised box type), formed by the plants that exist inside it".


**Figure 7.** Drawer has put shoes on a flower, surrounding it with others that have roots (Drawing of Student 44)

**Table 4.** Frequency (%) of other types of plants before (pre-) & after (post-) in five-years old

| Plants | Frequency (%) |
|---|---|
| Before (pre-) | |
| Tomatoes | 11.3 |
| Grass & oranges | 7.0 |
| Lettuces, carrots, strawberries, & pumpkins | 5.6 |
| Potatoes | 2.8 |
| Watermelons | 2.0 |
| Lemon, pear, eggplant, blackberries | 1.4 |
| After (post-) | |
| Lettuces, carrots, & tomatoes | 8.2 |
| Strawberries | 7.1 |
| Sunflowers & oranges | 4.7 |
| Corn & chard | 2.4 |
| Broccoli, pears, peppers, cauliflowers, & onions | 1.2 |

## DISCUSSION AND CONCLUSIONS

The analysis of graphic representations drawn by children aged four and five, before and after a gardening project, evidenced a clear progress in their initial mental models of what a garden is. At both ages, there was an evolution towards a bounded space (frequently growing boxes), where the main element are plants, and where elements such as soil, sun, and water are necessary, and where biological processes, such as germination, occur. The type of garden used is important; firstly because it constituted a physical model of space for the children; and secondly, in terms of its elements and the processes that can be observed, as has been suggested in previous studies at other educational stages (Eugenio-Gozalbo et al., 2017, 2020). Change in the pairs of drawings are evident at both the conceptual and artistic levels and are related both to experiencing the garden space as a physical place, and to the motivation it inspired.

Our evidence supports the use of gardens in ECE, in particular to approach the plant world (basic anatomical structure, life cycle, and basic classification), since we observed how, after the garden experience, the 4- and 5-year-olds represented plants with a more complex structure, including the roots; they also represented germination and flowers and discriminated more plant types. This progress was likely promoted by direct observation of these characteristics in the garden, which the drawing activity subsequently contributed to consolidate (Flannery, 2019). Plants were mainly represented by the "flower type" scheme, which is characteristic of this developmental stage of drawing (Tunnicliffe, 2020). This scheme has been shown to be a symbol that can be used for different plants, and where small modifications can be important to establish distinctions, with this being consistent with the constructive nature of children's drawing, where each new form derives from previous structures (Martínez-Garcia, 2004). There is also evidence of the existence of an identification of the different parts of the human body with the parts of the plants (the flower would be the head on which is not unusual for children to draw a face, while the stem would be the body). This phenomenon is especially useful in order to stimulate the incorporation of parts that are hidden, such as the roots (which would be the feet of the plants). Finally, it is worth noting the 4-year-olds' representation of germinating seeds, which evidences that they recognize the seed and germination as part of the life cycle of plants, an important outcome if we consider that 3-year-old children consider germination and plant growth as the same process, a preconception that has also been observed in adults (Rodríguez Melero et al., 2021). Overall, the use of the garden promotes an approach to plants that is important in the context of societies that are progressively more urban and distanced from nature and the plant world (Balding & Williams, 2016; Jose et al., 2019).

Plant representations were linked to other elements, such as the sun and water, as observed in previous studies (Sanz, 2015; Villarroel et al., 2018a). In our case, water was barely represented by the 4-year-olds at the beginning, but its presence increased significantly after the experience. In the 5-year-olds, the initial presence of water was higher, thus evidencing a better understanding of this element and its relationship to plants, which is consistent with other studies (Villarroel et al., 2018b). Similarly, the proportion of drawings in which water was represented increased notably. Sun was also increasingly represented after the gardening project, indicating a greater understanding of the factors that influence plant life (Villarroel a& Villanueva, 2017). In the 5-year-olds, the incorporation of light was initially higher, which may be partly related to the evolutionary development of graphic representation of space, explicitly separating the plane of the earth from that of the sky (Lowenfeld & Brittain, 2008).

In this study, the level of change observed, and the descriptive and aesthetic richness were particularly high in the 4-year-olds, revealing a great degree of motivation for the gardening project (Lowenfeld & Brittain, 2008). The fact of painstakingly coloring a much larger area of the drawings, the wide variety of chosen tones, and the incorporation of a higher level of detail in what is represented all reveal interest and affection towards the garden, particularly in the case of children at these ages, in whom attention is still scattered and intermittent. The projection of the human body structure onto plant elements also reflects identification and affection (Matthews, 2002). This affective dimension is related to motivation towards learning, and thus constitutes a valuable dimension of the garden as a didactic resource, already observed in teachers in initial training (Eugenio-Gozalbo et al., 2019), and now evidenced in children at ECE.

As a final conclusion, the school garden constitutes a useful teaching-learning context for ECE, since it brings the plant world closer to children, promoting observation and helping children to progressively construct their initial mental models about plants: their structure, types, life cycles, and environmental requirements. We suggest school gardens are integrated with other ECE activities that promote scientific discourse, such as assemblies (Aragón et al., 2021a, 2021b). Likewise, it is important to consider that the school garden is a reference for children, and it is thus important to take decisions on what elements to include and what to focus on, among other factors (Eugenio-Gozalbo et al., 2020). **Appendix C** shows the organic garden teaching-learning sequence (Aragón et al., 2020).

**Author contributions: LA, IO-C, & ME-G:** contributed to study conception, designed study, & wrote manuscript; **LA:** collected data; **LA & IO-C:** performed analysis; & **IO-C & ME-G:** translated manuscript into English. All authors have agreed with the results and conclusions.

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**Declaration of interest:** No conflict of interest is declared by authors.

**Data sharing statement:** Data supporting the findings and conclusions are available upon request from the corresponding author.

## REFERENCES

Ainsworth, S., Prain, V., & Tytler, R. (2011). Drawing to learn in science. *Science, 333*, 1096-1097. https://doi.org/10.1126/science.1204153

Altieri, M., & Nicholls, C. (2000). *Agroecología. Teoría y práctica para una agricultura sustentable* [*Agroecology. Theory and practice for sustainable agriculture*]. PNUMA.

Anderson, J., Ellis, J., & Jones, A. (2014). Understanding early elementary children's conceptual knowledge of plant structure and function through drawings. *CBE Life Sciences Education, 13*, 375-386. https://doi.org/10.1187/cbe.13-12-0230

Aragón, L., Sánchez, S., & Enríquez, J. M. (2021a). El discurso científico en la etapa de infantil en el contexto del huerto ecológico escolar [The scientific discourse in the childhood stage in the context of the school ecological garden]. *Revista Eureka sobre Enseñanza y Divulgación de las Ciencias 18*(1), 1103. https://doi.org/10.25267/Rev_Eureka_ensen_divulg_cienc.2021.v18.i1.1103

Aragón, L., Sánchez, S., & García Salado, V. (2021b). Sostener el discurso científico en aulas de 4 y 5 años: análisis de las intervenciones de docentes y alumnado y del conocimiento emergente en torno al huerto ecológico escolar [Sustaining the scientific discourse in 4 and 5 year old classrooms: analysis of the interventions of teachers and students and the emerging knowledge around the school ecological garden]. *Revista Iberoamericana de Educación*, *87*(1), 135-153. http://doi.org/10.35362/rie8714606

Baidal, M., Cerviño, C., & Correia, F. (2022). *Manual de ilustración científica* [*Scientific illustration manual*]. Geoplaneta.

Balding, M., & Williams, K. J. (2016). Plant blindness and the implications for plant conservation. *Conservation Biology, 30*(6), 1192-1199. https://doi.org/10.1111/cobi.12738

Bartoscek, A. B., & Tunnicliffe, S.D. (2017). Development of biological literacy through drawing organisms. In P. Katz (Ed.), *Drawing for science education: An international perspective* (pp. 55-66). Sense Publishers. https://doi.org/10.1007/978-94-6300-875-4_5

Baur, J. (2022). Campus community gardens and student health: A case study of a campus garden and student well-being. *Journal of American College Health, 22*(70), 377-384. https://doi.org/10.1080/07448481.2020.1751174

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science, 19*(12), 1207. https://doi.org/10.1111/j.1467-9280.2008.02225.x

Cabezas, L., & López, I. (2016). *Dibujo científico: Arte y naturaleza, ilustración científica, infografía, esquemática* [*Scientific drawing: Art and nature, scientific illustration, infographics, schematics*]. Cátedra.

Cainey, J., Humphrey, L., & Bowker, R. (2017). Drawing experiences in marine conservation. In P. Katz (Ed.), *Drawing for science education: An international perspective* (pp. 97-110). Sense Publishers. https://doi.org/10.1007/978-94-6300-875-4_9

Chang, N. (2017). Appropiate integration of children's drawings in the acquisition of science concepts [Appropriate integration of children's drawings in the acquisition of science concepts]. In P. Katz (Ed.), *Drawing for science education: An international perspective* (pp. 135-146). Sense Publishers. https://doi.org/10.1007/978-94-6300-875-4_12

Cruz-Guzmán, M., & Martínez Maqueda, E. (2022). Iniciación a las prácticas científicas en educación infantil: Aprendiendo sobre el sistema digestivo por indagación basada en modelos [Introduction to scientific practices in early childhood education: Learning about the digestive system through model-based inquiry]. *Revista Eureka sobre Enseñanza y Divulgación de las Ciencias* [*Eureka Magazine on Science Teaching and Dissemination*], *19*(1). https://doi.org/10.25267/Rev_Eureka_ensen_divulg_cienc.2022.v19.i1.1202

Davis, K. L., & Brann, L. S. (2017). Examining the benefits and barriers of instructional gardening programs to increase fruit and vegetable intake among pre-school age children. *Journal of Environmental and Public Health, 2017*, 2506864. https://doi.org/10.1155/2017/2506864

De Alba Villaseñor, V., & Ramos de Robles, S. L. (2020). Modelización científica escolar para explorar el sistema circulatorio en educación infantile [School scientific modeling to explore the circulatory system in early childhood education]. *Enseñanza de las Ciencias* [*Science Teaching*], *38*(1), 105-125. https://doi.org/10.5565/rev/ensciencias.2765

Diehl, A., Abdul-Rahman, A., Bach, B., El-Assady, M., Krauss, M., Laramee, R. S., Keim, D. A., & Chen, M. (2022). Characterizing grounded theory approaches in visualization. *arXiv, 2203.01777*. https://doi.org/10.48550/arXiv.2203.01777

Dyg, P. M., & Wistoft, K. (2018). Wellbeing in school gardens – the case of the gardens for bellies food and environmental education program. *Environmental Education Research, 24*(8), 1177-1191. https://doi.org/10.1080/13504622.2018.1434869

Eshach, H., & Fried, M. N. (2005). Should science be taught in early childhood? *Journal of Science Education and Technology, 14*, 315-336. https://doi.org/10.1007/s10956-005-7198-9

Eugenio-Gozalbo, M., Andaluz, S., Ortega, I., & Rees, S. (2017). Detección de cambios en las concepciones sobre el huerto de alumnado de Secundaria en base a representaciones gráficas [Detection of changes in conceptions about the garden of Secondary students based on graphic representations]. *Enseñanza de las Ciencias: revista de investigación y experiencias didácticas*, núm. extr., 1229-1234. https://raco.cat/index.php/Ensenanza/article/view/335246

Eugenio-Gozalbo, M., Aragón, L., & Ortega-Cubero, I. (2020). Gardens as science learning contexts across educational stages: Learning assessment based on students' graphic representations. *Frontiers in Psychology*, *11*, 2226. https://doi.org/10.3389/fpsyg.2020.02226

Eugenio Gozalbo, M., Ramos Truchero, G., & Vallés Rapp, C. (2019). Aprendizaje de las ciencias naturales basado en el uso de huertos ecológicos: Identificación de las dimensiones percibidas por futuros maestros [Learning natural sciences based on the use of ecological gardens: Identification of the dimensions perceived by future teachers]. *Enseñanza de las Ciencias* [*Science Teaching*], *37*(3), 111-127. https://doi.org/10.5565/rev/ensciencias.2657

European Union. (2018). *Recommendation of the Council of the European Union of May 22 on the initiation of the tolerated management of technologies. Students' digital competence*. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)

Evans, G. W., Otto, S., & Kaiser, F. G. (2018). Childhood origins of young adult environmental behavior. *Psychological Science, 29*, 679-687. https://doi.org/10.1177/0956797617741894

Flannery, M. (2019). Interview with Maura C. Flannery: Drawing trees to see and appreciate them. *Plants, People, Planet, 1*, 150-152. https://doi.org/10.1002/ppp3.47

García-Carmona, A., Criado, A. M., & Cañal, P. (2014). Alfabetización científica en la etapa 3-6 años: Un análisis de la regulación estatal de enseñanzas mínimas [Scientific literacy in the stage 3-6 years: An analysis of the state regulation of minimum education]. *Enseñanza de las Ciencias* [*Science Teaching*], *32*(2), 131-149. https://doi.org/10.5565/rev/ensciencias.817

Gernhardt, A., Rübelig, H., & Keller, H. (2013). This is my family: Differences in children's family drawings across cultures. *Journal of Cross-Cultural Psychology, 44*(7), 1166-1183. https://doi.org/10.1177/0022022113478658

Hartig, T., Kaiser, F. G., & Bowler, P. A. (2001). Psychological restoration in nature as a positive motivation for ecological behavior. *Environment and Behavior, 33*, 590-607. https://doi.org/10.1177/00139160121973142

IUCN. (2016). Navigating island earth: The Hawai'i commitments. *International Union for Conservation of Nature*. https://portals.iucn.org/congress/sites/congress/files/EN%20Navigating%20Island%20Earth%20-%20Hawaii%20Commitments_FINAL.PDF

Jose, S. B., Wu, C.-H., & Kamoun, S. (2019). Overcoming plant blindness in science, education and society. *Plants, People, Planet, 1*, 169-172. https://doi.org/10.1002/ppp3.51

Jose, S., Patrick, P. G., & Moseley, C. (2017). Experiential learning theory: The importance of outdoor classrooms in environmental education. *International Journal in Science Education, 7*(3), 269-284. https://doi.org/10.1080/21548455.2016.1272144

Kahn, P. H., & Kellert, S. R. (2002). *Children and nature: Psychological, sociocultural, and evolutionary investigations*. MIT Press. https://doi.org/10.7551/mitpress/1807.001.0001

Katz, E. (2017). *Drawing for science education: An international perspective*. Sense Publishers. https://doi.org/10.1007/978-94-6300-875-4

Kaufman, M., & Serafini, C. (1993). La huerta: Un sistema ecológico [The garden: An ecological system]. In H. Weissmann (Ed.), *Didáctica de las ciencias naturales. Aportes y reflexiones* [*Teaching of natural sciences. Contributions and reflections*] (pp. 149-203). Editorial Paidós SAICF.

Kuo, M., Browning, M. H. E. M., & Penner, M. L. (2018). Do lessons in nature boost subsequent classroom engagement? Refueling students in flight. *Frontiers in Psychology, 8*. https://doi.org/10.3389/fpsyg.2017.02253

Largo-Wight, E., Guardino, C., Wludyka, P. S., Hall, K., Wight, J. T., & Merten, J. W. (2018). Nature contact at school: The impact of an outdoor classroom on children's well-being. *International Journal of Environmental Health Research, 28*(6), 653-666. https://doi.org/10.1080/09603123.2018.1502415

Lowenfeld, V., & Brittain, W. L. (2008). *Desarrollo de la capacidad intelectual y creativa* [*Development of intellectual and creative capacity*]. Síntesis.

Martínez-García, L. M. (2004). *Arte y símbolo en la infancia: Un cambio de mirada* [*Art and symbol in childhood: A change of perspective*]. Octaedro.

Mateo González, E., Ferrer Bueno, L. M., Mazas Gil, B., & Cascarosa Salillas, E. (2020). ¿Entras a la cueva? Una experiencia multisensorial para trabajar las ciencias en la etapa de educación infantil [Do you enter the cave? A multisensory experience to work on sciences in the early childhood education stage]. *Ápice. Revista de Educación Científica* [*Apex. Magazine of Science Education*], *4*(2), 51-62. https://doi.org/10.17979/arec.2020.4.2.5755

Matthews, J. (2002). *El arte de la infancia y la adolescencia* [*The art of childhood and adolescence*]. Paidós.

McMillen, J. D., Swick, S. D., Frazier, L. M., Bishop, M., & Goodell, S. (2019). Teacher's perceptions of sustainable integration of garden education into Head Start classrooms: A grounded theory approach. *Journal of Early Childhood Research, 17*(4), 392-407. https://doi.org/10.1177/1476718X19856378

Monteira, S. F., & Jiménez Aleixandre, M. P. (2019). ¿Cómo llega el agua a las nubes? Construcción de explicaciones sobre cambios de estado en educación infantile [How does water get to the clouds? Construction of explanations about changes of state in early childhood education]. *Revista Eureka sobre Enseñanza y Divulgación de las Ciencias* [*Eureka Magazine on Science Teaching and Dissemination*], *16*(2), 2101. https://doi.org/10.25267/Rev_Eureka_ensen_divulg_cienc.2019.v16.i2.2101

Moreno, C., González Mateo, S., & Meneses Villagrá, J. Á. (2017). Enseñanza de las ciencias a través de la metodología indagatoria en educación infantil. Proyecto limpiemos el agua [Teaching science through inquiry methodology in early childhood education. Let's clean the water project]. In *Proceedings of the 10th International Congress on Research in Science Teaching*.

Murakami, C. D., Su-Russell, C., & Manfra, L. (2018). Analyzing teacher narratives in early childhood garden-based education. *The Journal of Environmental Education, 49*(1), 18-29. https://doi.org/10.1080/00958964.2017.1357523

Pedrinaci, E., Caamaño, A., Cañal, P., & De Pro, A. (2012). *Once ideas clave. El desarrollo de la competencia científica* [*Eleven key ideas. The development of scientific competence*]. Graó.

Prain, V., & Tytler, R. (2012). Learning through constructing representations in science: A framework of representational construction affordances. *International Journal of Science Education, 34*(17), 2751-2773. https://doi.org/10.1080/09500693.2011.626462

Rodríguez Melero, A. M., Cáceres Ruiz, M. J., & Franco-Mariscal, A. J. (2021). ¿Cómo hacemos crecer una planta? Una indagación con niños de 3 años de educación infantile [How do we grow a plant? An investigation with 3-year-old children of early childhood education]. *Enseñanza de las Ciencias* [*Science Teaching*], *39*(3), 231-253. https://doi.org/10.5565/rev/ensciencias.3345

Sanz, O. (2015). Acercamiento a la comprensión del concepto de ser vivo en educación infantile [Approach to understanding the concept of a living being in early childhood education]. *e-Revista de Didáctica* [*Didactics e-Magazine*], *15*, 99-118. https://doi.org/10.37261/15_alea/6

Sarceda, C., Seijas, S., Fouce, D., & Fernández, V. (2015). El trabajo por proyectos en educación infantil: Aproximación teórica y práctica [Project work in early childhood education: Theoretical and practical approach]. *Revista Latinoamericana de Educación Infantil* [*Latin American Journal of Early Childhood Education*], *4*(3), 159-176.

Soltani, A. (2020). Influence of motivating science class, family, and peer models on students' approaches to learning science: A structural equation modeling analysis. *Research in Science Education, 50*, 1665-1687. https://doi.org/10.1007/s11165-018-9748-1

Strauss, A., & Corbin, J. (2011). Grounded theory methodology. In N. K. Denzin, & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research* (pp. 273-285). SAGE.

Sutton, C. (1996). Beliefs about science and beliefs about language. *International Journal of Science Education, 18*, 1-18. https://doi.org/10.1080/0950069960180101

Tunnicliffe, S. (2020). *Emerging biology in the early years: How young children learn about the living world*. Routledge. https://doi.org/10.4324/9781351234740

Valdez, G. I. (2021). Sustentabilidad, socioformación y sociedad del conocimiento: Tres claves para una transformación del mundo [Sustainability, socio-education and knowledge society: Three keys to a transformation of the world]. *Ecocience International Journal, 3*(4), 20-38. https://doi.org/10.35766/ecocience.21.3.4.2

Vandermaas-Peeler, M., & McClain, C. (2015). The green bean has to be longer than your thumb: An observational study of preschoolers' math and science experiences in the garden. *International Journal of Early Childhood Environmental Education, 3*(1), 8-27.

Villarroel, J. D., & Villanueva, X. (2017). A study regarding the representation of the sun in young children's spontaneous drawings. *Social Sciences, 6*(3), 95. https://doi.org/10.3390/socsci6030095

Villarroel, J. D., Antón, A., Zuazagoitia, D., & Nuño, T. (2018a). A study on the spontaneous representation of animals in young children's drawings of plant life. *Sustainability, 10*(4), 1000. https://doi.org/10.3390/su10041000

Villarroel, J. D., Antón, A., Zuazagoitia, D., & Nuño, T. (2018b). Young children's understanding of plant life: A study exploring rural urban differences in their drawings, *Journal of Biological Education, 52*(3), 331-341. https://doi.org/10.1080/00219266.2017.1385505

WWI. (2007). *La situación del mundo 2007: Nuestro futuro urbano* [*The state of the world 2007: Our urban future*]. World Watch Institute.

Zelenski, J. M., Dopko, R. L., & Capaldi, C. A. (2015). Cooperation is in our nature: Nature exposure may promote cooperative and environmentally sustainable behavior. *Journal of Environmental Psychology, 42*, 24-31. https://doi.org/10.1016/j.jenvp.2015.01.005

## APPENDIX A: FOUR-YEAR-OLDS' DRAWINGS

a b

**Figure A1.** High level of change: pre-intervention drawing includes swings & a giraffe, but post-intervention drawing is limited to elements from garden & marks out the space with a door (Drawing of Student 23)


a b

**Figure A2.** Medium level of change: pre-intervention drawing shows apples, carrots, & bananas without a plant, but post-intervention drawing shows a flower, a fruit coming out of a plant, & a water surface, as well as the sun (Drawing of Student 17)


a b

**Figure A3.** Low level of change: post-intervention drawing presents the same elements, with a rainbow as the only novelty (Drawing of Student 26)

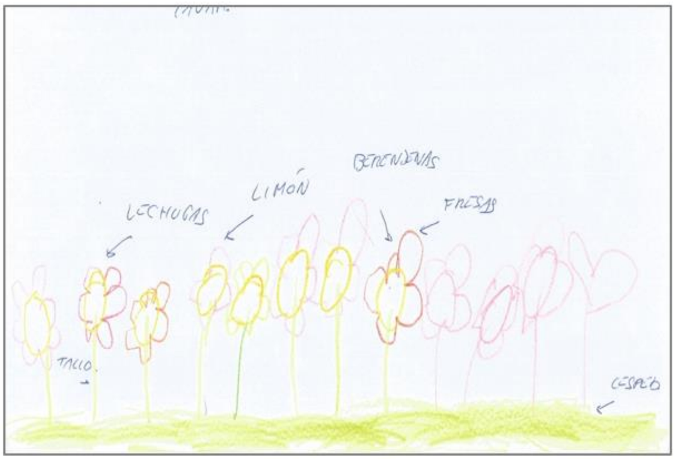


**Figure A4.** Flower scheme as a generic symbol represents lettuce, lemon, or eggplant (Drawing of Student 31)


**Figure A5.** Plant has a “head” & leaves act as arms (Drawing of Student 42)

## APPENDIX B: FIVE-YEAR-OLDS' DRAWINGS

a b

**Figure B1.** Pre-intervention drawing shows a scene in nature, some fruits without a plant & a cart with fruits & post-intervention drawing reflects school garden, covered by a large rainbow (Drawing of Student 66)


a b

**Figure B2.** In pre-intervention drawing, plants are in pots & post-intervention one has a similar composition, but plants have roots & fruits, & girl is watering plants (Drawing of Student 65)


a b

**Figure B3.** Pre- & post-intervention drawings are practically same (Drawing of Student 63)

# APPENDIX C

**Table C1.** Organic garden teaching-learning sequence (Aragón et al., 2020).

| Activities | Didactic purpose | Data collection instrument | Duration |
|---|---|---|---|
| Act.1. First carpet session: What do we know about the organic garden? | To explore the children's prior ideas about the following topics: What is an organic garden and what is it like? Where do we find organic gardens and what do we do in one? | White paper roll (mural)<br>Audio<br>Video<br>Observation notebook | 25 minutes |
| Act. 2. Individual drawings on the children's initial models of the garden and explanation of their drawings. | To explore the children's initial garden models and to explain the elements present in the garden. | Individual drawings<br>Audio<br>Observation notebook | 45 minutes |
| Act. 3. Writing at home. | The children describe, at their level, what an organic garden is for them, and the answer is to be written down by the family. | Writing at home | 1 week |
| Act. 4. Second plenary session: What elements can we find in an organic garden? Put them in order of importance. | The children propose the elements related to the garden and put them in order of importance in the garden. | White paper roll<br>Audio/video<br>Observation notebook | 45 minutes |
| Act. 5 What will our garden be like? | To look at different types of gardens to analyze different options and discuss the possibility of creating a garden in the school and discuss which would be the most suitable. | Observation notebook | 45 minutes |
| Act. 6 Where shall we put the garden? | To connect with their prior ideas about the elements present in the garden and their order of importance. Think about the sun and light as the main elements and decide where to put the garden in the schoolyard. | White paper roll | 2 45-minute sessions |
| Act. 7. Experiments with elements of the garden. For the same type of seed: a) it was sown at different depths; b) with and without soil; c) with soil and with and without water; and d) with soil and with and without light. | To test the children's hypotheses on the order of importance of the elements of the garden. | Observation notebook<br>Audio | 45 minutes |
| Act. 8. Seed boxes & plants (I). Extraction & observation of different vegetable seeds. Sowing of different seeds in seed boxes. Labeling & placing them in space set up as a greenhouse. | To build on the children's prior knowledge about the elements considered most important by the students: Seeds and plants. | Photos<br>Observation notebook | 1 hour |
| Act. 9. Seed boxes and plants (II). Observation of the parts of a plant, description and identification of seedlings. | To build on the children's prior knowledge about the elements considered most important by the students: Seeds and plants. | Audio<br>Video<br>Observation notebook | 1 hour |
| Act. 10. Sowing in the seed bed. | Preparation of the bed for planting using principles of permaculture. | Video | 3 hours |
| Act. 11. Third plenary session: What's happened to the seeds? | Discuss the results of activity 8: sowing of different types of seeds with different speeds of germination | Audio/video<br>Observation notebook | 20 minutes |
| Act. 12. Fourth plenary session: What results did we get from our experiments? | Discuss the results of the experiments conducted in activity 7. | Audio/video<br>Observation notebook | 40 minutes |
| Act. 13. Expanding the garden: Vertical garden. | To reuse materials to create a vertical vegetable garden to increase biodiversity & encourage auxiliary fauna. | Photos | 1 hour |
| Act. 14. Observing and exploring the garden using magnifying glasses, insect scopes and tweezers. | To develop scientific competence by encouraging observation & exploration of plants & insects present in the garden. Handling material used for observation. | | Playtimes (30 minutes) |
| Act. 15. Organizing for watering: drawing up a watering schedule. | To think about the importance of water for the plants in the garden. To encourage cooperative work to organize the care and watering of the vertical garden. | White paper roll | Daily 15-20-minute sessions |
| Act. 16. Trip to the *Casa de los Colores* (Cádiz Provincial Council) | To learn about the origin of some of the seeds and seedlings in the garden. To carry out workshops on content complementary to the garden: insects, healthy eating and gardening. | | 5 hours |
| Act. 17. Gathering the crops: food workshop. | Gather plants from the garden for children to eat. Make a salad with different types of organic lettuces collected from the garden. | | 1 hour |
| Act. 18. Making an individual record of the steps followed to make the salad. | Recall and revisit the process followed in order to assimilate and reinforce eating and hygiene habits. | Worksheet | 45 minutes |
| Act. 19. Individual drawings of the garden model. | To evaluate the final garden models after completing the didactic unit. | Drawings/audio<br>Observation notebook | 1 hour |