Chapter 18
Learning Biology in the Early Years Through Nature Play in the Forest: An Exploratory Study from Slovenia

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18.1 Introduction

In early years, children mostly learn through play. Outdoor environments, especially natural environments with their characteristics of diversity, variability, unpredictability, openness and richness in sensory stimuli are known to be especially stimulating for children's play and learning. The potential offered by the outdoor environment is supposed to be most effectively used for education through unstructured, child-initiated and child-led play (Maynard & Waters, 2007; Wilson, 2012).

In recent research, the term 'nature play' has been used to define freely chosen, unstructured, and open-ended playful interactions with and in nature (Erickson & Ernst, 2011; Ernst et al., 2021). The purpose of this study is to contribute empirical data about the importance of nature play in early childhood, especially for learning biology.

18.1.1 The Benefits of Children's Engagement with Nature

Childhood experiences in the world of nature are crucial for children's life. Several studies have identified nature as a significant space, which supports physical and mental health, as well as emotional well-being, and fosters children's holistic

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development in all the developmental domains (Adams & Savahl, 2017; Gill, 2014; Sahlberg & Doyle, 2019; Wilson, 2012). Children's engagement with nature leads to better learning because learning in nature improves learners' attention, levels of stress and self-discipline, and it provides a more supportive, quieter and safer context of learning (Kuo et al., 2019). Play and learning in natural environments also improve the learning of disadvantaged children with learning disabilities and with underachieving academic scores (Maynard et al., 2013).

Many studies have consistently shown that children are more physically active when outdoors (Dankiw et al., 2020; Gill, 2014; Torkar & Rejc, 2017). Walking over rough terrain, climbing trees and running around in the natural environment positively affects children's motor development: children's gross and fine motor skills and stamina; children's coordination and balance; improves health-related fitness (Santana et al., 2017). Additionally, it reduces obesity risks (Dankiw et al., 2020; Herman et al., 2009).

Nature has prosocial effects as it fosters warmer, more cooperative relations (Dankiw et al., 2020; Scott et al., 2018). Natural environments bring children more freedom and sense of autonomy (Adams & Savahl, 2017; Dankiw et al., 2020; Kuo et al., 2019). Outdoor play and learning have a positive effect on children's self-esteem, self-confidence and self-awareness, as well as on how they make choices and take risks (Gill, 2014; O'Brien & Murray, 2007). It helps children acquire skills that are so important later in adulthood, such as perseverance, self-efficacy, resilience, teamwork, leadership and communication (Kuo et al., 2019). Nature reduces their behavioural problems (Fiskum & Jacobsen, 2012); it showed to be effective in the reduction of disruptive episodes and dropouts among 'at-risk' children (Ruiz-Gallardo et al., 2013). Children who ordinarily struggle when indoors emerge as leaders and a low-performing child gets more of a chance to build an image of a strong, competent person (Maynard et al., 2013; Kuo et al., 2019).

In the affective field of development, research has shown an increase in mood and better emotional regulation: a decrease in depression and aggression (Brussoni et al., 2017; Gill, 2014). Children generally love playing in natural environments (Wilson, 2012). In the nature, children have been observed to laugh and smile more than those in highly structured play environments (Singer, 1994).

Outdoor experiences foster environmental ethics. There is good evidence of a link between time spent in nature in early childhood and adult environmental attitudes (Barrable & Booth, 2020; Gill, 2014; Torkar, 2014). Frequent outdoor experiences and contact with nature strengthen children's empathic relationship with nature, as well as promote their intrinsic care, emotional connection and appreciation of nature. A lack of regular positive experiences in nature is associated with the development of discomfort, fear and the dislike of the natural environment, as well as a failure to develop a personal connection to the world of nature (Adams & Savahl, 2017; Ernst et al., 2021; Gill, 2014; Jørgensen, 2016). Connectedness with nature should be advanced in early childhood, i.e. under the age of 11, as environmental education programmes have been found to be more sustainable amongst this

age group (Liefländer et al., 2013). Nature experiences also improve environmental knowledge (Gill, 2014; Kuo et al., 2019).

18.1.2 The Role of Play in Early Childhood

Most of what children need to learn in their early childhood could be discovered through play. Play is a fundamental avenue for early childhood learning and is deeply rooted in early childhood education as the primary way to meet children's developmental needs (Sahlberg & Doyle, 2019; Wilson, 2012). Research supports the idea that play is so important to our development and survival that the impulse to play has become a biological drive and that it is internally generated. Children are naturally drawn to the low-risk scenarios of play in order to learn, grow, adapt and thrive (Brown, 2009). Neuroscience studies in recent years have also linked childhood play to brain development and proper functioning (Yogman et al., 2018). Play helps shape the brain. Animal play researchers who have studied the effects of play on brain development in depth suggest that the brain actually develops a sense of itself during play through stimulation and testing. This helps to explain why play is most prevalent during childhood, which is also the most important period of brain development (Brown, 2009; Loebach & Cox, 2020; Yogman et al., 2018).

18.1.3 Learning Biology in Early Years

Young children actively construct a coherent worldview and knowledge based upon their personal experiences. Therefore, active engagement is crucial for children's learning. Essential qualities of early biology education are to be hands-on and interest based. Adults should create a context in which pre-schoolers can have worthwhile, meaningful, cooperative and fun learning experiences; play is one of such contexts (Curriculum for preschools, Ministry of Education and Sport, 1999). Loebach and Cox (2020) observed children's behaviour in different outdoor spaces (not exclusively natural environments) and developed typology for capturing children's play behaviour (Loebach & Cox, 2020). Among nine different types of outdoor play behaviour (physical, exploratory, imaginative play, play with rules, expressive play, digital play, restorative play and non-play), they described a new play type – *bio play* – which included playful interactions between children and living things: 'Although these experiences might also be recorded in another category, such as *exploratory play*, the significance of these natural experiences is profound enough to warrant capturing these interactions through a distinct play type' (Loebach & Cox, 2020, p. 5611). This new type, named 'bio play' was divided into three play subtypes: 'Plants', 'Wildlife' and 'Care'.

18.1.4 Nature: A Stimulating Place for Children's Play and Learning

Quality play requires access to a rich learning environment. Natural environments provide a variety of spaces and ground cover, loose parts that children can manipulate, the possibility of 'random' events and can be characterised by natural elements, such as plants, animals, rocks, mud, sand, gardens, forests and ponds, or water. Thus, nature provides the diversity, variability, openness, rich and varied sensory stimuli needed to engage and challenge young children, which enhances the opportunity for learning and development through play (Dankiw et al., 2020; Ernst et al., 2021; Klofutar et al., 2022; Wilson, 2012).

Spending time in nature promotes developmental forms of play. Many researchers have demonstrated significant increases in constructive, dramatic, imaginative and symbolic forms of play (Kuo et al., 2019; Wilson, 2012). Wojciehowski and Ernst's (2018) study measured the creative outcomes of play in the natural environment. Results showed significant increases in originality, play fluency and imagination compared to controls who played in traditional play spaces.

The natural environment is a very appropriate learning environment for a wide range of activities: from highly structured, adult-led activities to unstructured, free, child- initiated and child-led play. Finally, the term 'nature play' has been used and is defined as freely chosen, unstructured and open-ended playful interactions with and in nature (Erickson & Ernst, 2011).

The natural environment with its features is a place where high-quality interactions between a child and an adult can develop (Maynard et al., 2013). The adult is encouraged to respond to children's initiatives and base activities on their interests and prior knowledge (Waters & Maynard, 2010). The educator should always be ready for sensitive interventions, while allowing children to play freely without interference (Waller, 2007). The educator enters nature play as a facilitator of learning and a more experienced partner. At the right moment, he or she engages with it, elevating it to a higher level and enabling more effective learning (Maynard & Waters, 2007; Maynard et al., 2013).

The importance of play in early childhood learning has been well established and the natural environment has been recognized as one of the most stimulating environments for it. Free (unstructured, child-initiated and child-led) play is the category of play in which the potential offered by the natural environment is supposed to be most effectively used. In the field of early science education (and especially in the field of early biology education), little research has been done on the importance of free, unstructured play in the natural environment (nature play) for gaining initial science experiences, acquiring science literacy, developing science skills, and environmental awareness (Beery & Jørgensen, 2018; Jørgensen, 2016; Tunnicliffe, 2020). The main purpose of our research was to contribute empirical data on what children can learn about biology through nature play in the forest.

18.2 The Exploratory Case Study

The aim of this exploratory case study was to find out how nature play in the forest provides preschool children with play episodes where they experienced biological phenomena and living organisms. The following research questions were formed:

1. How frequently did bio play episodes occur during nature play?
2. What living beings did the children interact with during the bio play episodes?
3. Which types of bio play episodes were detected?

One of the main reasons for choosing this research methodology was to provide empirical evidence on daily educational practice and, in particular, educational context. Case study methodologists stress that teachers always teach in particular places, specific groups of students and under conditions that significantly shape and temper teaching and learning practices (Freebody, 2003). Early exploratory case studies are set to explore any phenomenon in the data which serves as a point of interest to the researcher, where variables are still unknown and the phenomenon not at all understood (Meredith, 1998).

A non-random sample of 21 four-to six-year-old children (11 girls, 10 boys) from a public preschool in a suburb region of Ljubljana, Slovenia, participated in the study. The European commission's ethical rules in social science research were considered. Informed consent was obtained from the parents and teachers to conduct the study.

The preschool is situated less than a kilometre from a semi-natural deciduous forest. The forest was bright, mostly flat, with a little woody undergrowth and a few fallen trees. The group of children was accompanied by their two preschool teachers. The two researchers, who made the observations, were also present. The children were told to play in the forest. As a guideline for defining the role of the educator in the children's nature play, we used the principle of 'least intrusive involvement' (Kostelnik et al., 2007), which means providing only the level of support actually needed to extend children's engagement in an activity and acting as a facilitator, not an instructor of the learning process. Children's nature play was observed over a period of four consecutive days, with each session lasting approximately 1 h and a half at the same time of the day (morning). The weather was warm, sunny or partly cloudy throughout.

The study was documented through video records gathered with small video cameras attached to children's heads to automatically record sound and images from their perspective. Three randomly selected children in the group were equipped each time with small video cameras (Fig. 18.1) attached to their heads to automatically record sound and images from their perspective. Altogether 12 children were equipped over the 4 days.

Evidence from video and photographic images and unstructured narrative observations are presented together in a back-and-forth fashion. The video recordings were then transcribed, independently reviewed and analysed by two researchers using 'a read re-read' process to identify and consequently analyse the data.

Fig. 18.1 Children with small video cameras in the forest

Table 18.1 Description of analysed video recordings

Day	1	2	3	4
Children's code (letter) & gender: 1-boy, 2-girl)	A-1, B-2, C-1	D-1, E-1, F-2	G-2, H-2, I-2	J-1, K-1, L-2
Minutes of play	88:00	98:00	105:00	98:00
Minutes of transcripts	264:00	294:00	315:00	294:00
Minutes of bio play episodes	3:20	86:21	71:49	13:41
Number of bio play episodes	5	14	12	9
Minute of overlaps of 2 or 3 cameras	0:00	24:18	45:01	0:00

Altogether, 12 video recordings, for a total of 1167 min of transcripts were analysed. Of these, recordings identified as play episodes (N = 39) where the children experienced living organisms and biological phenomena (bio play episodes) were analysed and overlaps of 2 or 3 cameras in these episodes were recorded (Table 18.1). A tool for observing play outdoors (TOPO) was used to analyse nature play episodes (Loebach & Cox, 2020). Only bio play episodes were further analysed. For example, if children treated the wooden stick only as an object and a play tool, and they did not perceive it as part of a plant (i.e. a living being), we did not recognise such an episode as bio play. There was a perfect agreement on the number of identified bio play episodes between the two independent coders (Cohen's kappa = 1.0). We focussed on all three subtypes of bio play (plants, wildlife, care). The emotionality and care of children for living beings was identified through their verbal and nonverbal expressions showed in the play episodes. We also looked at the intersection of bio play with other types of outdoor play described by Loebach and Cox (2020). During the analysis of episodes, we allowed the possibility of creating new

codes that were not previously foreseen. Children's codes are represented with capital letters and gender (1-boy, 2-girl).

18.3 Results

All bio play episodes, their frequency, and total time are shown in Table 18.2. In addition, the number of play episodes in which the teacher was asked by the children to enter play as a facilitator and experienced partner was recorded. Altogether, 14.9% of the total time (excluding overlaps of 2 or 3 cameras) were recordings identified as play episodes in which the children experienced biological phenomena involving naturally occurring biofacts and living organisms: episodes are named after the main object(s) observed by the children (e.g. snail, bird egg, moss).

The episodes described and their frequency are largely driven by the characteristics of the learning environment (forest), but also provide information about the objects the children were attracted to in the forest. They paid the most attention to the butterfly, the slug, the brown frog, the bird egg and the salamander. The number of episodes and the time devoted to animals is longer compared to plants and fungi. For some animals, such as the earthworm and snail, one might expect more and longer episodes, but this was not the case. We assume that they already had more experience with them, which was confirmed by their preschool teacher. It is noticeable that many of the episodes in which the teachers were involved were longer. They helped to facilitate the observation and conversation of the children in the group (Fig. 18.2).

Table 18.2 Bio play episodes, their frequency, their total time, the number of play episodes in which the teacher was asked to join, types and subtypes of TOPO

Name of the bio play episode	Total number of bio play episodes	Total time of all bio play episodes	Number of bio play episodes where teachers entered as a facilitator	Bio play subtypes	Intersections with other play types
Slug	5	57:33	3	Wildlife, care	Exploratory-sensory, exploratory-active, expressive-conversation
Butterfly	4	1:10:35		Wildlife, care	Exploratory-sensory, exploratory-active, exploratory-constructive, expressive-conversation
Salamander	3	13:30	3	Wildlife, care	Exploratory-sensory, exploratory-active
Bird egg	2	11:30	2	Wildlife	Exploratory-sensory

(continued)

Table 18.2 (continued)

Name of the bio play episode	Total number of bio play episodes	Total time of all bio play episodes	Number of bio play episodes where teachers entered as a facilitator	Bio play subtypes	Intersections with other play types
Spider	2	4:50		Wildlife, care	Exploratory-sensory
Ant	2	4:07		Wildlife	Exploratory-sensory
Spruce tree	2	3:55	1	Plants	Exploratory-sensory, exploratory-active, imaginative-symbolic
Butterbur	2	2:31	1	Plants	Exploratory-sensory, exploratory-active
Fern	2	1:55		Plants	Exploratory-sensory
Moss	2	1:07		Plants	Exploratory-sensory
Black elder	2	1:03		Plants	Exploratory-sensory
Brown frog	1	10:52	1	Wildlife	Exploratory-sensory, exploratory-active
Flowers	1	6:00		Plants	Exploratory-sensory, exploratory-active
Bird feather	1	5:07		Wildlife	Exploratory-sensory
Oak galls	1	2:13		Plants	Exploratory-sensory
Earthworm	1	0:29		Wildlife	Exploratory-sensory, exploratory-active
Blueberry	1	0:28		Plants	Exploratory-sensory
Centipede	1	0:15		Wildlife	Exploratory-sensory
Snail	1	0:10		Wildlife	Exploratory-sensory
A wood-decay fungus	1	0:18		Wildlife	Exploratory-sensory
Blackberries	1	0:13		Plants	Exploratory-sensory
Bird dropping	1	0:05		Wildlife	Exploratory-sensory

Various types and subtypes of bio play episodes, where the children experienced living organisms and biological phenomena, were observed (Table 18.2). Concrete examples are given in the following sections to illustrate what children learned and experienced. Most commonly, bio play intersects with exploratory-sensory play (e.g. slug, butterfly), exploratory-active play (e.g. slug, salamander, butterfly), exploratory-constructive play (e.g. butterfly) and expressive conversation play, which was most evident in the episode where children interacted with a butterfly and a slug. Bio-care play was most evident from children interaction with an injured butterfly. Codes of children with head cameras (see Table 18.1) are used in the descriptions of examples and other children (without cameras) are coded with the letter CH and a number (1-boy, 2-girl), e.g. CH-1.

While playing and exploring in the woods, small ground animals caught the children's attention, though sometimes only briefly. Other times, the observation lasted

Fig. 18.2 Observing a salamander

longer and developed into an activity. They invited and shared their observations with their peers. This is evident in the following conversation in which the children closely observed a snail, its tentacles, and its pneumostoma. After the initial sensory experiences, the teacher was asked to answer some questions and provide information to support the children's observations. This example beautifully demonstrates that the teacher can support learning when the children are sensually engaged in experiential learning.

Slug

1. H-2: Slug, a black one, a tiny slug. ((She wants to relocate it with a butterbur leaf, but she accidentally touches the animal. Then she grabs the slug and the snail begins to crawl on her arm.)) ((smiles)) That tickles me! ((She carries it to a group of children playing near the teacher.))
2. CH-2: Yuck! ((Some children initially show a negative feeling when they look at the slug and back away. But then they approach and begin to observe the animal.))
3. H-2: It is licking me.↑ Will it fall out of my hand?
4. CH-2: This will not happen.
5. H-2: Yes, because it is stuck to my hand with slime. ((She holds her hand upright.)) It is still crawling up the vertical surface. ((She then walks with the slug in her hand, overcoming obstacles on the ground. She explains to the other children:)) The slug is with me because it loves me. ((She runs her fingers over the front of its body.)) When you do this to it then it hides the tentacles.
6. Teacher: Observe carefully how many tentacles the slug has?
7. H-2: One, two, three… and four.

8. Teacher: Eyes are at the end of the tentacles.
9. CH-2: ((She stands next to Maja, observes the slug and suddenly says in amazement.)) Hey, it has a hole here!
10. H-2: Oh, the hole has opened and closed again.
11. Teacher: Why does slug have this hole?
12. H-2: There are little slugs in it.
13. Teacher: The slug breathes through this hole.

Shortly after, the group found a salamander and began observing the animal, passing it from hand to hand and sharing their observations. The children's handling of the snail and salamander shows their respect for living animals and their interest in animal morphology and behaviour. The teacher provides instructions for handling the animal and takes care of animal's wellbeing.

Salamander
((Children found a salamander. They are excited at first; then they calm down and begin to look at the animal.))

1. K-1: ((He takes the animal into his hands, looks at it and smiles.)) Do you dare to touch it and hold it? ↑
2. Teacher: ((She joins the group.)) Whoever is holding the salamander should crouch down so that the animal does not accidentally fall down. Be gentle when handling the salamander. And do not touch their eyes and mouths when handling the salamander.

((K-1 hands the salamander to other children… The salamander walks and moves from hand to hand. Children are loud))

3. CH-1: You are scaring it. ((He hands the salamander back to K-1.))
4. CH-2: See, with K-1 it has calmed down completely.

In the children's direct experiences with animals described above, their biological ideas and emotions can also be recorded. The most vivid example is the conversation of a group of children who found an injured butterfly. They discussed the reasons why the butterfly cannot fly. They tried to take care of the injured animal by providing it with suitable shelter and food. The paragraph illustrates what children collectively knew about the animal's welfare and ecology, which they took into account in the activities. An example of an ecological idea is their discussion about the predator-prey relationship between spider and butterfly.

Butterfly
((F-2 walks through the forest and comes to CH-2 who tells her she found a butterfly on the ground. F-2 squats down and carefully places the butterfly on her palm.))

1. F-2: Do you see how beautiful it is.

((They meet another C-2 who screams at the sight of the butterfly.))

2. F-1: What are you screaming about? ↑ The butterfly is not hurting anyone.
3. CH-1: Yes.

((The butterfly falls from F-2's hands on the ground.))

4. CH-2: The butterfly cannot fly.
5. CH-1: It fell into the water, got wet, and cannot fly.
6. F-1: Let us put it on the moss. Do not scream, because you can see it's scared.
7. CH-1: The butterfly has lost the dust on its wings and it should be placed on a flower blossom. ((He finds a large flower blossom, for which F-2 praises him.))
8. CH-1: Let's put the butterfly in a place where it is warm and that the butterfly would like.
9. F-1: Yes. I will go this way; it will not be slippery here. ((Holding the butterfly in her hands.))

((CH-1 shows F-2 the den the children built the day before.))

10. F-2: Yes, this is where we want to put the butterfly.
11. CH-1: Oh yes, here, on the moss.
12. F-1: It will be called Čara. ((F-1 carefully places the butterfly on the moss)).
13. CH-2: We should build a small shelter for the butterfly. ↑

((The girls build a house out of sticks, but F-2 thinks it is too small and begins to build a new house with the boys.))

Spider

1. CH-1: Here is a spider's web. A spider can eat the butterfly here.

((They finished the house and they want to put the butterfly inside.))

2. F-1: Watch out, there's a spider on the house. The spider can eat the butterfly.

((CH-2 gently removes the spider.))

3. F-2: The house is still too small. ((CH-1 tears down the house and he starts building a new one.))

The group dynamic of a child being in the company of friends and peers can be in some cases crucial in overcoming prejudice. This can be observed in the above-mentioned narratives about the encounters with the slug (sequence 2) and the butterfly (sequences 1–2, 6). Such peer (social) learning is certainly one of the first steps to overcoming prejudices. During the nature play, the children also noticed other arthropods (ant, centipede) and expressed various emotions – from fear to excitement. This usually happened incidentally during the play. They observed something and shortly shared their experiences with each other. The children also found the shells of birds' eggs and wanted to know the bird species from the teacher.

During the nature play, the children came across different plants and fungi which they mostly perceived as a playing material (exploratory constructive play), not as living beings at first sight. Sometimes they named them or briefly talked about their usefulness. Among the plants observed, there were some that were edible or medicinal (e.g. blueberry, black elder, blackberry), which the children also pointed out in their conversations. They built dens, animal houses, bridges and other structures out of branches and shrubs. They added leaves, cones, flowers and fruits to the construction, covered the roofs with bark, made ornaments by gluing together flowers and fern leaves with spruce resin, and covered the surfaces with moss, etc. This aspect of playing with natural materials is also very interesting for research, but we do not discuss it in detail in the present paper.

Mushroom

1. C-1: I still need to cover it ((the house)) with leaves.
((CH-1 brings a wood mushroom to Miha.))
2. C-1: We have two of those mushrooms at home.

Medical Plants
((B-2 had a very small wound and showed it to the educator. The educator suggested covering the wound with a plantain leaf.))

1. CH-1: This is that grass. ((He brings the plant.))
2. Teacher: Tie the leaf around the wound.
3. CH-1 ((to B-2)): You have to leave this wound in peace and let me bandage it. Then the wound will heal and you can throw the bandage away. ((He bandages the wound.))
4. B-2: So, the wound is healed.
5. CH-1 ((After a while he runs to B-2)): I know another medicinal herb. Should I use it to bandage your foot?

18.4 Discussion and Conclusion

Freely chosen, unstructured, and open-ended playful interactions with and in nature define nature play (Erickson & Ernst, 2011; Ernst et al., 2021) and make learning outcomes highly open-ended and unpredictable. The opportunity for nature play is a valuable activity for young children, as it provides opportunities to gain first-hand experiences in biology.

The list of bio play episodes in Table 18.2, which represent 15% of the total playing time, shows that children can experience species diversity in the forest. Children focused on the animals, plants and fungi which they observed on the forest floor. There is no focus on the biodiversity in the treetops during their play. Similarly, the results of research with Norwegian kindergarten children (Beery & Jørgensen, 2018) support the idea that childhood interaction with variation and diversity with living and nonliving items from nature allows children important learning opportunities, including deeper understanding of biodiversity.

A comment is also necessary regarding the frequency and time devoted to different organisms: It is noticeable that children focus more on animals than on plants and fungi. Many adults have ‘plant blindness’ – the inability to see or notice the plants in one’s own environment, leading to the inability to recognise the importance of plants in both the biosphere and human affairs, and the inability to appreciate the aesthetic and unique biological features of plants (Wandersee & Schussler, 2001). This phenomenon was also observed in our research. Not only do they not see or notice the plants, in line with the research of Gatt et al. (2007), it is evident that some children even struggle with the concept of plants being alive. Perhaps that is why in their play they looked at plants more as materials for building, decorating, fencing, etc., and not as living beings.

The differences in children's experiences of plants, animals, and fungi are also evident in the different types and subtypes of the play episodes. Findings of the study show that bio play commonly intersects with exploratory-sensory and exploratory-active types of play. This is in line with the findings of Loebach and Cox (2020). Exploratory play helps develop children's observational skills, to make a transition from seeing to observing and developing scientific process skills and science concepts (Klofutar et al., 2022; Tomkins & Tunnicliffe, 2007). An example of this was children observing the tentacles of a slug. Furthermore, it is important to highlight the role of teachers in improving the observational skills of children by providing extended time for careful observations and directing them with questions and encouragement (Eberbach & Crowley, 2009; Tomkins & Tunnicliffe, 2007).

Experiences with observed animals are perceived more emotionally and lead to deeper learning about them. With plants and fungi, on the other hand, children are content with knowing their names and uses. Strgar (2007) and Pany et al. (2018) also point out the importance of emphasising the usefulness of plants for effective teaching and learning.

In the recordings identified as play episodes in which children experienced living organisms and biological phenomena, teachers played an important role as facilitators and experienced play partners. The play episodes in which teachers were involved were often longer. Teachers were very sensitive to the children and allowed them to play freely without interfering (Waller, 2007) and facilitating a more effective learning experience (Maynard et al., 2013).

Two limitations of the study should be highlighted. The first limitation was the lack of standardised analysis of the data collected and the selective access to the children in the sample due to the use of only three head cameras per group; the second was that the small sample and specific learning environment further limited the generalisability of the findings.

In conclusion, despite the limitations of the exploratory study methodology, this study has demonstrated the importance of nature play for the spontaneous learning of biology in the early years. It has improved the understanding of the phenomenon under study, which is not yet clearly defined. Our findings may contribute to more systematic and analytical studies needed to further investigate the role of nature play in biology learning.

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