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Developing ecological literacy in a forest garden: children's perspectives

Maria Hammarsten, Per Askerlund, Ellen Almers, Helen Avery and Tobias Samuelsson

School of Education and Communication, Jönköping University, Jönköping, Sweden

ABSTRACT

Today, cities become more dense, green spaces disappear and children spend less time outdoors. Research suggests that these conditions create health problems and lack of ecological literacy. To reverse such trends, localities are creating urban green spaces for children to visit during school time. Drawing on ideas in ecological literacy, this study investigates school children's perspectives on a forest garden, a type of outdoor educational setting previously only scarcely researched. Data were collected through walk-and-talk conversations and informal interviews with 28 children aged 7 to 9. Many children in the study expressed strong positive feelings about the forest garden, the organized and spontaneous activities there, and caring for the organisms living there. We observed three aspects of learning in the data, potentially beneficial for the development of children's ecological literacy: practical competence, learning how to co-exist and care, and biological knowledge and ecological understanding.

KEYWORDS

forest garden; social studies of childhood; children's perspectives; walk-and-talk conversations; ecological literacy

Introduction

*It's a big place where one can live freely and such.
Where you can do fun activities with the plants and with the insects
and where you can help. (Mona)*

What is a forest garden? In the above quote, Mona, a 9-year-old girl, explains this to a researcher. Mona is participating in a project where we have studied primary school children's visits to a forest garden, a new outdoor educational setting for children.

In her answer, Mona mentions facets of what a forest garden is and what you can do there, based on her perspective and her own experiences. The term forest garden was introduced in the 1980s by Robert Hart (Crawford, 2012; Jacke & Toensmeier, 2005; Whitefield, 2002) to describe a variety of agroforestry systems with ancient traditions in so-called home garden systems in the tropics.

Forest gardens are multifunctional, multi-layered, polyculture ecosystems designed by humans to produce fruit, berries and robust edible perennials (Crawford, 2012; Jacke & Toensmeier, 2005; Whitefield, 2002). The focus on perennials decreases the need for maintenance and prolongs the harvest season in temperate regions relative to traditional vegetable school gardens with annuals (Almers, Askerlund & Kjellström, 2018). There are several reasons for the increased interest in forest gardens as educational settings. The practical benefits over traditional school gardens include a lower work load and a longer harvest season with edible sprouts in early spring and berries in late autumn. An advantage over excursions to distant woodlands and parks is the possibility of

establishing such forest gardens in the schoolyard or nearby for daily regular contact (Almers et al., 2018). There are thus many good reasons for promoting forest gardening for children, and projects involving forest gardens have been initiated in recent years [see, for instance, Region Jönköpings län (2018), a Swedish ongoing project aiming at creating multifunctional outdoor environments that promote health and sustainability for preschools].

Recently, media in Sweden (Ritzén, 2018) report that public green spaces tend to disappear as cities become more dense, depriving children of areas for recreation and play and, more generally, decreasing the possibility for children to spend time outdoors. Internationally, similar trends have been discussed over the years. Some scholars even claim that children have lost contact with nature, which in turn has created health-related problems among children, and argue that this trend must be reversed (Louv, 2008).

A substantial body of literature over the years suggests that children's interaction with outdoor environments promotes healthy development, well-being and positive environmental attitudes and values (Blair, 2009; Chawla, 1999, 2015; O'Brien & Murray, 2007; Taylor & Kuo, 2006; Waite, 2010). Based on a systematic review, Adams and Savahl (2017, p. 316) provide further evidence for the conclusion that 'childhood experiences in nature are crucial for children in their daily lives as it contributes to several developmental outcomes and various domains of their well-being' and that such experiences foster an intrinsic care for nature (Adams & Savahl, 2017). In relation to the development of a caring attitude towards nature, the concept of ecological literacy, or ecoliteracy, becomes useful. According to Orr (1992, p. 92), ecological literacy involves 'knowing, caring and practical competence'. It is about understanding how humans interact with ecosystems and how this can be done in a sustainable way. Education leading to ecological literacy is multidisciplinary and holistic, and it sees humans as part of nature. It starts in childhood outdoor experiences, develops into care and respect for other organisms, and leads to an understanding of the natural systems. Furthermore, it is participatory and emphasises the importance of relation to place (McBride, Brewer, Berkowitz, & Borrie, 2013; Mitchell & Mueller, 2011). Despite the relatively extensive body of research described in a review by Adams and Savahl (2017), very few studies have asked children directly about what nature means to them. Adams and Savahl (2017) conclude that to understand children's connection or lack of connection to nature, more research would be needed on the meaning children themselves attach to nature.

Over a decade ago, Clark (2007) pointed to a relative rarity of children's own accounts in an otherwise large body of texts describing outdoor environments for young children. In a review of earlier studies, Castonguay and Jutras (2009) noted that children tend to prefer places that allow them to engage in preferred activities because of available materials or the place itself (Korpela, Kyttä, & Hartig, 2002; Loukaitou-Sideris, 2003; Min & Lee, 2006) and also places that give them opportunities to meet friends (Korpela et al., 2002; Min & Lee, 2006). However, few studies can be found concerning children's preferences for specific outdoor environments and their functions.

Due to the limited body of research, scholars argue that there is still a need for more participatory research about children's outdoor environments in general (Clark, 2005; Merewether, 2015) and that there is a particular need for investigations of children's perspectives and specific preferences. We argue in this article for the specific need to investigate children's perspectives on forest gardens, which is a new outdoor environment that can become available in urban areas. Consequently, the aim of this article is to gain a general understanding of children's perspectives on a forest garden and to investigate the following:

What aspects of the forest garden do the children appreciate?

What do they like or dislike?

What are their ideas of what aspects of learning that the forest garden can contribute to?

Children's perspectives

The tradition called Social Studies of Childhood has been used as an ontological framework for this study (James & James, 2012; Jenks, 2015). Within this tradition, childhood is perceived as a social

construction (James & James, 2004; James, Jenks, & Prout, 1998; Jenks, 2005; Leonard, 2016), and it is assumed that the way we expect children to act and behave depends on the social and cultural context. A further point of departure for Social Studies of Childhood is that children are regarded as participants in society: 'Children are not just the passive subjects of social structure and processes' (Prout & James, 1997, p. 8). Social Studies of Childhood thus stresses that what children do, say and think is not only the result of external social processes. Consequently, in this study, we have focused on children as capable of being able to present their own point of view, and we have used research methods that are in line with these assumptions. This does not mean that we assume that children are free and capable of doing just anything. As Corsaro (1997, p. 18) explains, when participating in society, children are 'constrained by the existing social structure and by societal reproduction'. However, as he also emphasises, children do not always simply accept, internalise and repeat what society and adults tell them. Rather, Corsaro (1997, 2005) argues that their participation in everyday life is characterised by processes of appropriation, reinvention and reproduction. Corsaro calls this creative process 'interpretative reproduction' to underline both the innovative aspects as well as the fact that the children take part in and use already existing societal structures while contributing to the re-construction, the maintaining and development of these in the very same process Corsaro (2005, p. 232).

Method

We use data from a research project in which we followed children during their visit to a forest garden in the south of Sweden. Participation was based on informed consent, and a total of 28 children aged 7 to 9 participated in the study, of which 11 were boys and 17 girls. One of the children who was present did not have parental consent to participate and was therefore not included in the study. All participating children were informed that they could withdraw from the study at any time without explanation, which one of the children did after having taken one photo. The names of the children used in the article are fictitious to protect their identity. Lists of the most frequent names for children of their age and ethnic backgrounds were used to randomly select the names. The majority of the children had been visiting the forest garden four times a year over a period of 3 years between 2013 and 2015 and were therefore familiar with the environment. The children came from two different primary schools, here called 'Copse' and the 'Sunny Glade', both situated in multi-ethnic, underprivileged neighbourhoods. For a few of the children, Swedish was a relatively new language. This limited communication in some cases, but both children and researchers used body language to enhance their mutual understanding. Being able to point and show was also helpful. One of the researchers knew French and Arabic in addition to Swedish and English. The children were told that they could use other languages if they preferred, but all stuck to Swedish. The data were collected in April 2015.

We used material from walk-and-talk conversations supported by photos taken with tablets (Änggård, 2015; Klerfelt & Haglund, 2015). When the walk-and-talk ended, the researcher conducted an informal interview with the child to follow up on the conversation from the walk. During the walk-and-talk conversations, each child was accompanied by one researcher. The children were asked to take photos of places that were important to them, places they wanted to remember and places they liked or disliked and to explain why. They were also encouraged to document other things by taking photos with a tablet. The children were instructed not to take photos of other children because some of them were not allowed by their parents to be photographed. Examples of questions posed to the children were as follows: What do you usually do when you are here in the forest garden? What can you learn from being in the forest garden? How does it feel to be here in the forest garden? Is there something you did not like in the forest garden?

Qualitative research methods, such as open-ended interviews, are widely used in social science in general. However, many researchers have discussed the difficulties associated with conducting interviews due to inequalities between the researcher and the research participants. Such inequalities may be even more pronounced when interviewing children, given the age difference (Caputo, 1995; Punch, 2002). Various suggestions have been offered on how to create a more comfortable situation and to encourage discussion when conducting research with children. Previous research using the walk-and-talk method and using tablets underlines that it is easier for children to communicate their use of place (Änggård, 2015; Klerfelt & Haglund, 2015) and to remember physical and social aspects and experiences when they are in these very places (Änggård, 2015; Cele, 2007). Given the chance to show how they use the place 'in action', the children have the possibility to communicate embodied memories and to communicate in a non-verbal manner, thus increasing their possibilities to express their views of a place to the researcher (Änggård, 2015; Cele, 2006; Halvars-Franzén, 2007). An additional advantage is that by being there with the child, the researcher gets to share the experience in a different way (Cele, 2007). This can provide the researcher insights into the ways that children view a place and their ways of using and perceiving it, which might differ from how adults perceive the place or how adults think a place should be used (Änggård, 2015). By contrast, conventional interviews, often performed out of context, can lead to problems for children in recalling their memories of the place, and many of the above-mentioned perspectives might be lost.

Our objectives for using walk-and-talk conversations with tablets were multiple. By handing out tablets, we hoped to obtain pictures to use as research material. We also hoped that the use of this material would create an atmosphere in which the participating children, based on their own pictures, would talk more freely (Cele, 2007; Green, 2012). It was hoped that this might create a more open atmosphere than if we, as researchers, had posed questions out of context (Pole, Mizen, & Bolton, 1999; Rasmussen & Smidt, 2003). We anticipated that the chance to take pictures might stimulate the children, during the walk-and-talk conversations and during the informal interview, to remember other things, which they might not have done in a more traditional out-of-context interview. Another advantage of the method adopted was to give the children a chance to take a more active role in the research process as it was the children who guided the walk and took the lead in where to go and what to talk about. The idea was that this might be one way of trying to transfer some power to the children to even up the unequal adult researcher/child subject relationship that might characterise research with children (Änggård, 2015; Cele, 2006, 2007; Christensen, 2004; Pole et al., 1999; Rasmussen & Smidt, 2003). The children were informed that they would get the photos of their memorable places sent to them by the end of the school term, and the children's teacher reported later that the children greatly appreciated receiving their photos. For us as researchers, it was an important part of enhancing a reciprocal situation in which the children felt that their pictures were not just collected by us but also given back to them as memories.

The walk-and-talk conversations and interviews were recorded and transcribed, and the analysis began shortly after the fieldwork period. We analysed the collected material using a qualitative thematic analysis method (Taylor & Bogdan, 1984). We read the material several times to identify themes. We also returned to the audio-recordings several times to correct the transcriptions. This analytical process was carried out independently. At times, we disagreed on interpretations. When this happened, we returned to the transcriptions and the audio-recordings and tried to agree on a collective interpretation. In our search for themes, we looked for things such as conversation topics, recurring activities, meanings and feelings (Taylor & Bogdan, 1984). The English translation of excerpts closely follows the Swedish wording, but to improve readability, hesitation expressed by 'hmm' or 'ahh' has been removed. The excerpts from the children's answers, explanations and remarks used in this article were selected with the intention to offer a range of variation.

The Holma forest garden

The setting of this research was an educational project for children during the period 2013–2015 called 'the Stinkbug' [in Swedish: Bärfisprojektet] in Holma forest garden (Figure 1) in the south of Sweden (Almers et al., 2018; Askerlund & Almers, 2016). Inviting school classes to outdoor educational environments such as Holma is not explicitly connected to the Swedish national curriculum, although outdoor education is generally well established in the Nordic countries.

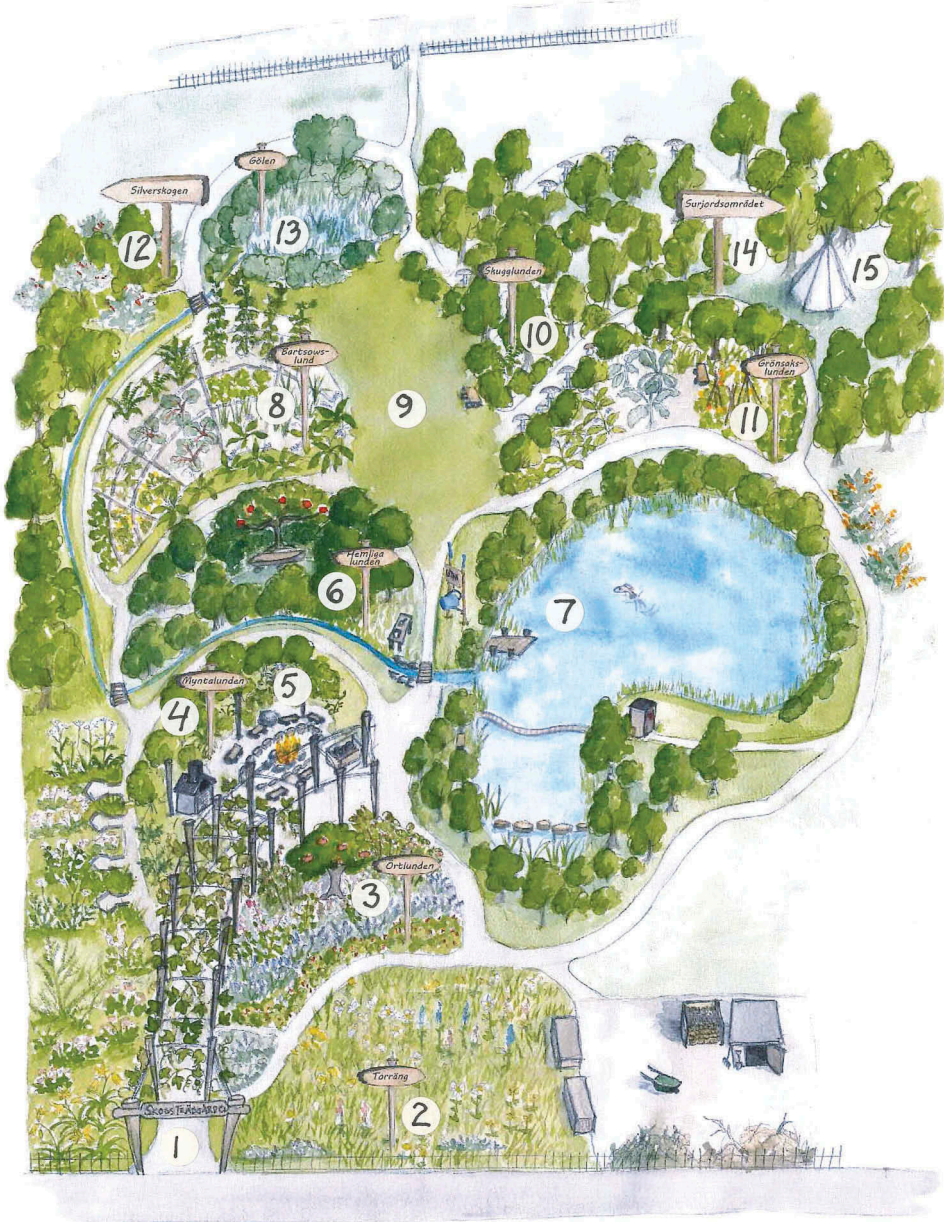


Figure 1. Map of the forest garden in Holma with locations indicated. The core area consists of six cashew-shaped groves of fruit and nut trees, berry bushes, and perennial herbs. All groves have different characteristics: 1. Entrance; 2. Dry meadow; 3. Herb grove; 4. Menth grove; 5. Fireplace; 6. Secret grove; 7. Large pond; 8. Barstow's grove; 9. Meeting place; 10. Shade grove; 11. Vegetable grove; 12. Nut forest; 13. Little pond; 14. Acid soil area and 15. Teepee. Illustration by Katarina Månsson.

The forest garden at Holma is used by schools for educational purposes but is managed by an independent not-for-profit association. Educational activities received funding for the period from the Swedish Inheritance Fund. The ideas underpinning the forest garden as an educational project are expressed in the funding application that was made in 2012 (Wandt, 2012). Among the key concepts in the application were ideas relating to permaculture, innovative thinking, meetings, the joy of discovery, enjoyment, co-creation, interaction, humanism, engagement and belief in the future. The document also describes a future characterised by ecological and social challenges, which may give rise to feelings of despondency and anxiety, particularly among youth and children. The overall intentions of the forest garden project were to constitute 'counterforces' that could lead to faith in the future and foster a sustainable and active society. The overarching aim of the project according to the funding application was thus to equip 'children and young people to be active participants in building a sustainable society and creating a life of dignity' (Wandt, 2012, p. 4 our translations). According to the document, the children would be trained in observing, using all their senses, learning about meaningful contexts in nature and feeling a sense of community—in other words, becoming ecologically literate.

A day within the educational forest garden project

The forest garden is located almost a 1-h bus ride away from the schools of the children participating in this study. As part of the educational forest garden project, classes from different schools in the region were invited to participate in activities in the forest garden and to contribute to its development. There was a common structure for all activity days within the project. Upon arrival at the forest garden, before the other activities began, all children and forest garden educators gathered in a circle holding hands at the 'meeting place', an open space almost at the centre of the forest garden. As a greeting ceremony, everybody then introduced themselves by saying their name while performing a self-chosen movement or gesture, such as jumping up and down or stretching their arms to the sky. Everyone else in the circle repeated the name of that person and tried to mimic the movement. After everybody had introduced themselves, each forest garden educator presented the activities he or she was responsible for so that the children knew where to join in. The forest garden educator-led activities could, for instance, be about creating a butterfly bed, building a stone wall that would benefit both insects and heat-requiring plants, or creating a dry meadow to attract pollinating insects. The forest garden educator-led activities lasted approximately 1–1½ h, after which everybody gathered at the fireplace to have lunch. The children brought their own food, but often, the forest garden educators and children suggested that vegetables and fruit from the forest garden were included in the meal. After the lunch break, everybody gathered at the meeting place again, and the children could choose between free time or optional forest garden educator-led activities such as feeding the compost, observing bugs in the soil observatory, sawing wood, constructing a swing or picking berries. The children were also allowed to pick berries by themselves or water the plants. The forest garden educators had placed signs to indicate which plants were most in need of getting water.

The forest garden educators

On average, four forest garden educators were actively engaged during each activity day in the forest garden. Forest garden educators are people who are employed to lead children in educational activities in a forest garden. No formal qualification is required, but they are all experienced in cultivation and gardening. The participants were employed in the project between 25% and 75% of full-time, for 2–3 years. Their educational and professional backgrounds vary, and only one of them is formally trained as a teacher, although all have an interest in permaculture and environmental education and are gardeners with varying degrees of experience. The head of the Stinkbug project is a folk high school teacher¹ with studies in humanities, natural sciences, behavioural

studies and human ecology and more than 20 years of teaching experience. In addition to the forest garden educators, one or a few of the children's school teachers and other school staff accompanied the classes. The school teachers participated in the activities and sometimes watched over individual children, but otherwise, they took a more passive role than the forest garden educators, who were in charge of the activities.

Findings

In the data analysis, we found the following themes: appreciation of place, physical work, relations to animals and plants, aesthetic and edible aspects, food and friends, practical competence, learning to co-exist and care, biological knowledge and ecological understanding. The data show that individual children have a variety of perspectives and different preferences, which will be exemplified more in detail below. The overall picture, however, is that with few exceptions, the children were clear about that they would like to continue visiting the forest garden even after their 3-year period coming to the forest garden was over. Individual preferences varied greatly, and the children's positive attitude to the garden was motivated by different reasons.

Appreciation of place

Several children mentioned that they liked to be out in the forest garden, that it was fun and exciting, that they liked the trees, the birds and the sight of the garden, and that they thought the forest garden had a lovely smell.

When asked how it feels to be in the forest garden, one child said it felt 'Very, very good' and added that 'To be in the nature feels very good to me' (Josef, 8 years). Ervin (8 years) said that he liked 'places with a lot of nature' and that 'it would be nice to live here'. Some of the children expressed a strong sense of place, as in Alice's description of what it feels like being in the forest garden:

It feels good because I've been here before, and I can recognise it. That is why it feels so good to be in the forest garden. It feels good that the trees can grow, birds are twittering, and there is a pond and a bridge. Yes, that's it. (Alice, 8 years)

Physical work

When asked what they usually did in the forest garden, the children mentioned that they usually engaged in different kinds of work. As described above, the work activities before lunch were led and managed by the forest garden educators. After lunch, the children either had free time, where they were free to do what they pleased within the forest garden, or took part in optional educator-led activities. The children mentioned that they liked to work, to dig, to plant and to water the plants. The majority of the children were positive about active participation in the organised activities. One of the children (Elif, 8 years) recalled from a previous visit that it was fun to dig paths in the sand at the meadow but also difficult since the edges needed to be cut straight. She said she wanted 'to work all the time' and that working did not make her tired; rather, it made her 'alert'.

Relations to animals and plants

The relation to animals was mentioned by almost all of the children. The children described diversified emotions in relation to different groups of animals. Several children said that they appreciate animals like ladybirds and ants. On the other hand, some children commented that they did not like some of the animals they encountered at the forest garden, such as worms, snails, bees

and spiders. Many of the children described a change in their approach to the animals in the forest garden over the years when they visited the place. Some of them said they feared the insects and spiders at their first visit to the forest garden, but that they were no longer afraid. The children were quite specific about what animals they liked and did not like in the forest garden, which is exemplified in the following excerpt (Gabriel, 9 years):

- Researcher: How do you feel about collecting insects?
 Gabriel: It's scary. I don't like insects.
 Researcher: Why?
 Gabriel: OK, I like some because they help, but I don't like the way they look.
 Researcher: You don't like the way they look?
 Gabriel: I like how some insects look, but not all. Ants, for example, are not scary.

Gabriel described his first visit to the forest garden as frightening, a feeling that at least partly had to do with him catching a dragonfly in a net. He mentioned how the dragonfly's enormous eyes astonished him when he looked at it inside a glass jar. When we asked how he would feel if a dragonfly showed up now, he said it would be a 'jittery' experience, but he would be less frightened now that he had visited the forest garden several times. He continued to describe how he on the same occasion caught a butterfly, a very rare one, which he also described as a 'jittery' experience since he was afraid of hurting it. Some of the children described in adventurous and exciting terms a snake they had either seen themselves at the pond or heard the other children talk about.

Several of the children mentioned that they liked the plants in the forest garden. One girl (Zahra, 8 years), when asked why she chose to photograph a specific plant, said it was because it felt nice and soft and that she wanted to pick it and have in her bed. Elif (8 years) knew the names of several plants in the forest garden. She said she liked lemon balm (*Melissa officinalis*) because if you rub it, there is nice smell of lemon. She explained that she likes colourful plants such as lungwort (*Pulmonaria obscura*) because they wake up her body and make her happy. Stinging nettles were mentioned as a negative experience by several children.

Aesthetic and edible aspects

Many children described the things they liked in the forest garden in aesthetic terms. One boy expressed his appreciation for the creepers along the footpath (Josef, 8 years). Olivia (8 years) said she chose to photograph the flowers because she liked their colours and it reminded her of summer, which she liked very much. There were exceptions to these entirely positive views about the forest garden, however. Emina (9 years), who first claimed that she liked all the activities in the forest garden, modified this view when she was specifically asked to give examples of what she did not like. Referring to the educator-led activities before lunch, she explained that they 'have to do almost the same things all the time' and that 'that's not so fun'.

The edible aspects of the forest garden are commonly found in children's descriptions of what they liked in the forest garden. They mentioned they liked that the forest garden contains fruits that you can eat and that you get to taste different berries and leaves. According to Mona (9 years), 'You can eat almost, everything/...and most things taste really good'. When asked if she remembered what she liked most with the forest garden the first time she visited the place, she also referred to the edible aspects of the forest garden. She described how on that occasion, they got to make their own apple juice from produce in the forest garden. One boy said that they almost always made some kind of soup from the berries and that sometimes, the children got to take home tomatoes, berries and mushrooms that they had grown (Gabriel, 9 years).

Food and friends

Several children explained that their favourite part of the visits was that they got to play and hang out with their friends. They mentioned in particular the time after lunch, which is free time when the children get to decide themselves what to do. Gabriel (9 years) said, 'The best thing with gathering at the fireplace is that you get to be together with your friends and eat after a long day'. In an enthusiastic tone, he continued to describe the kind of food he liked the most (cheese buns, doughnuts and crackers), which he brought to the forest garden for lunch. This kind of foodstuff, he explained, was not allowed at the school back home. Many children said that they continued to work after lunch, but others used this part of the day to socialise and play, to chase each other, or just to walk with a group of friends to their favourite special places in the forest garden. One child specifically remembered the beginning of the first visit as joyful. When they played, she got a chance to scream out during the introductory activity (Nina, 8 years).

Aspects of learning in the forest garden

When asked what can be learned in a forest garden, the children's answers covered three different aspects: *practical competence; learning how to co-exist and care; and biological knowledge and ecological understanding*. Some children's answers covered more than one aspect in one sentence, such as Haydar (9 years), who mentioned that he thought the forest garden was a 'fun place' and said that it was fun because 'you get to water plants and you learn how nature works'.

Practical competence

The possibilities for learning that were most frequently found in the children's statements of what can be learned in the forest garden were associated with the different activities the children had taken part in during the project. The children explained that they had learned practical skills such as planting, picking herbs for their lunch salad, cooking food, digging and building a stone wall. Even more abstract skills, such as learning to live in a different and more simple way than they were used to, were mentioned by some of the children. Mona (9 years) reflected on the contrast between being in the forest garden and being at home immersed in the modern and digital society, saying the following:

you learn that you/.../you can live without computers and/.../and the Internet and things like that/.../yes, and it's not so difficult to make things now/.../nowadays, you have electrical things, but in nature, you don't have a network, and then/.../then it's better to make a fire and/.../you can sort of do things by hand instead of buying things and stuff.

What Mona said expressed thoughts about other possibilities for activities than consumerist behaviour and showed her thoughts about sustainability from the point of view that you do not have to be constantly on-line. Even emotional learning, for instance, realizing that you do not need to fear nature and other organisms, is a kind of practical skill mentioned by some children. However, Gabriel (9 years) talked about having some fear of animals, such as 'here I saw one time a giant/.../big spider/.../right there/.../I was scared/.../here I was afraid before/.../before I saw a snake there/.../I was scared and just ran out'.

Learning to co-exist and care

Some of the children stressed that important learning in a forest garden included learning how co-exist with living organisms and how to avoid disturbing them. They gave examples such as watching your step so you do not destroy the plants or not running around, breaking off branches or picking berries before they are ripe. One girl (Mona, 9 years) explained the importance of making sure that leaves, fruit and berries are edible before tasting them, either by looking for a sign next to

the plant or asking a grown-up. Some also talked about how many berries and fruits were fair to pick so that there would still be some left for other children. Sometimes, the children just made normative statements about what you should do or not do, and sometimes, they motivated their statements with the consequences of the actions for other people or organisms. For example, Mona (9 years) explained that instead of snatching a whole plant, one should always taste a small piece of it first to see if one likes it because otherwise, it would be wasted. Learning to care was a frequent aspect of learning in the children's answers to the question about what can be learned in the forest garden, as exemplified in Nina's (9 years) answer: 'To be in nature and help the insects to get a nest and everything'.

Learning to co-exist and care is also an obvious aspect of Mona's explanation of why one should not shout in the forest garden:

Because this is not our home; it's the animals' home. And one can come here, but one can't disturb them and such...what if they sleep and eat or something...//So one mustn't shout, because then they feel pain in their ears, and then they get angry and go to another place. There is no forest garden without them. (Mona, 9 years)

Sometimes, the children even linked what they learned about how to co-exist with ecological knowledge: 'It is important not to litter because it will destroy nature, but if it is an apple-core, you can throw it because then the ants will eat it' (Mona, 9 years). Learning to co-exist also had, in a few rare examples, a dimension of fear. Elif (9 years) said she feared making mistakes in the forest garden that would make the teacher angry with her, although this had not yet happened. However, on one occasion, she upset her parents by coming home with muddy shoes and trousers after having worked in the forest garden.

Biological knowledge and ecological understanding

Many children highlighted the possibility of learning descriptive biology in the forest garden, such as Maja (9 years), who stated, 'You can learn about animals and nature'. Some of those children also gave more complex examples of what could be learned in the forest garden, such as Aron (9 years), who mentioned that plants are important because 'without the trees and flowers, we would not exist because they take up the carbon dioxide and make air of it that we can breathe. What we breathe out the trees breathe in'. Others mentioned that it is good to plant new crops so we do not run out of food. Some of the children talked about understanding and appreciating that insects are useful and that plants need watering. Some children explained that you can also learn about what bugs do with food scraps in the compost and why the stone wall was significant for the insects. Only a few children touched on the role of insects in plant reproduction. Alice (8 years) said that bumblebees fly from flower to flower and 'that is what makes plants grow'. Gabriel (9 years) said that insects are useful for humans because they assist in producing fruit 'and stuff'. The insects do this by transferring pollen from one plant to another, he explained. Some children stated that the forest garden gave opportunities for learning that they would not get back home, such as George (8 years), who claimed the importance of the forest garden was to learn about organisms:

but there is no fun there [at home at the Sunny Glade]. Here [in the forest garden], there are things you can learn. There [at home at the Sunny Glade], you can just play with your friends.../but one of the good things here [in the forest garden] is that you can learn about plants and insects and what they are called.

One boy explained that 'also the bugs below the ground are important' and that 'if, for example, a root has got a disease.../they can eat it away' (Aron, 9 years).

Discussion

The children's answers covered three different aspects of learning: *practical competence; learning how to co-exist and care; and biological knowledge and ecological understanding*. These aspects reflect Orr's (1992) description of ecological literacy as involving 'knowing, caring and practical competence'. Central to ecological literacy is a holistic view where humans are part of, rather than separate from, the natural world (Capra, 1996; Orr, 1992).

Many children in our study expressed strong positive feelings about spending time in the forest garden, and some of them also talked in more general terms about their appreciation of spending time in 'nature'. Research shows that students' perceptions of the term 'nature' depend on socio-economic factors, gender, previous experiences of nature, age/cognitive development and influences from media (Collado, Iñiguez-Rueda, & Corraliza, 2016; Rickinson, 2001). Children mostly see themselves as separate from the natural world (Payne, 1998; Phenice & Griffore, 2003), but at the same time, they often have a clear sense of the connection between themselves, natural processes and other aspects of the natural world (Bonnett & Williams, 1998).

Research also suggests that attitudes about the environment may depend on the degree to which people believe that they are part of the natural environment (Schultz, Shriver, Tabanico, & Khazian, 2004). Furthermore, Keliher (1997, p. 241) found that 6- to 7-year-old urban children perceived nature similarly to what has been described for adolescents and suggested that 'these perceptions are developed early in life and may not change significantly without intervention'. Sandell and Öhman (2010), using examples from studies on 'all weather' outdoor schools in Sweden, show that being outdoors regularly affects children's feelings in that nature is no longer 'another place' but an aspect of everyday life. Sandell and Öhman (2010) underlines the usefulness of the integration of outdoor activities in daily life, rather than as isolated and exceptional events. In our study, although it is not possible to conclude that the children perceive themselves as part of nature after 3 years of regular visits to the forest garden, several of them expressed an understanding of human dependency on the natural environment. Aron, for example, described how plants make 'air' for us to breathe, and Gabriel explained that insects help us in producing fruit. In this way, the children's statements, at least partly, correspond to the intention of forest garden educators to give children opportunities to experience that they 'are part of some kind of whole' (Almers et al., 2018).

It is likely that many different experiences in addition to visits to the forest garden, including holidays with family and friends as well as vicarious experiences such as nature TV shows, have had an impact on the way the children in our study expressed their relationship with 'nature'. However, it is not far-fetched to suggest that the time spent in the forest garden contributed to the children's perception about the natural world. When the children refer directly to the forest garden, the influence of their time spent in this particular environment on their identification with it becomes even more evident.

In agreement with our observations, Kalvaitis and Monhardt (2015, p. 13) found that 6- to 12-year-old children have 'a positive deep-seated appreciation for nature' that is directly tied to their lived experiences in nature. Furthermore, they found that children described their relationship with nature as a 'friendship' and suggested that they did not see themselves as separate from nature. Sandell and Öhman (2010, p. 121) describe how primary school children identified themselves with the living beings of nature, such as salamanders, and how they adopted the animals they caught and gave them names. Moreover, the children used 'lots of emotional and aesthetic expressions' when they talked about 'their' animals. Linzmayer and Halpenny (2014) reported the experiences of children 6–10 years old who took part in a summer camp in a botanical garden for 5 days. Inductive analysis of data revealed several themes, one of which was being attracted to nature. They reported that children demonstrated empathy and concern for nature, including birds and butterflies, and one child showed sensitivity and hesitation towards catching a frog. In our study, Gabriel expressed similar feelings about the butterfly he caught and was afraid of hurting. The children

also said they were helping nature through planting, irrigation, harvesting and replenishing the compost with food leftovers. These types of experiences, where children make emotional contact with different animals and plants in the forest garden, are likely to be helpful in developing respect and a caring attitude toward the environment (Adams & Savahl, 2017; Chawla, 2007; White, 2004) and ultimately ecological literacy (Mitchell & Mueller, 2011; Orr, 1992).

The children's relations to the different organisms in the forest garden during the walk-and-talk conversations and interviews gave examples of both positive and negative emotions. Children frequently mentioned how much they appreciated the plants in the forest garden, indicating that forest gardening can be helpful in preventing plant blindness, as described by Nyberg and Sanders (2014). Additionally, several children mentioned that they were afraid of insects and other 'bugs' when they first came to the forest garden but that they were no longer afraid. Other children said they still did not like certain bugs. Nevertheless, the insect hotels and restaurants that the children were involved in building were frequently mentioned. Moreover, the wish to help insects and other animals in the forest garden, which was strongly pronounced in the children's expressions 2 years earlier (Askerlund & Almers, 2016) and was referred to as a humanistic value of nature (Kellert, 2002), can still be found in the interviews with some children, albeit probably less frequently. In our earlier study with younger children (Askerlund & Almers, 2016), fear about nettles was one of very few negativistic values detected in children's expression of the forest garden. This view has clearly not changed and may represent functional and adaptive benefits such as the development of respect for nature and the avoidance of harm and injury (Kellert, 2002).

Some of the children mentioned that the best part of the day was when they had the opportunity to hang out with their friends, to play and to eat treats that are not allowed back in school. These types of answers indicate that at least for some children, the main focus of the day is not the nature experience or the learning but, possibly, a chance to socialise and spend time with their friends in a less constrained environment than what the traditional school offers (Carr, 2011; Lai, 1999; Larsen & Jenssen, 2004; Merewether, 2015) or at least to relax and be with friends. Then again, some of the children's comments show that learning about, e.g. planting and socialising often go hand in hand (e.g. Emina, 9 years). Also notable is that many children expressed that they liked to physically work and that they even continued to work during the latter part of the day when they could choose other activities. This work can also be a way to share time and have fun with friends. Moreover, this might imply a genuine interest in physical work and/or in the garden as such, indicating that urban children with little previous experience can develop an interest in these kind of outdoor activities if given the chance. Finally, as in previous research (Änggård, 2015; Norðdahl & Einarsdóttir, 2015), our findings also indicate that some children liked to explore the area and find their own secluded places where they could spend time with their friends. This, what Merewether (2015, p. 104) calls 'the importance of social spaces' and the value children put into having a chance to socialise, may represent valuable aspects to keep in mind when planning future forest gardens.

Several children in our study mentioned that it is important not to tread on plants and to stick to the paths. When compared with our previous study of forest garden educators (Almers et al., 2018), it is interesting to see how many statements in this study are about learning how to interact with the forest garden in a sustainable way. One of the challenges forest garden educators have struggled with has been how to organise activities and places to ensure that 'the gardens sustainable productivity is protected, without hindering children's interaction with plants and animals' (Almers et al., 2018, p. 13). Linzmayer and Halpenny refer to signs that constrain interaction with nature. Do forest garden educators sometimes function as 'Gatekeepers to children's repulsion to nature' (Linzmayer & Halpenny, 2014, p. 418) when they point out where to walk and not to walk? As the forest garden is neither 'nature' nor a 'garden' in a traditional way, there is a lack of a well-established praxis of how to interact with the forest garden. When and where is it fine to dig, to break a twig, to pick berries and to step? These are questions with flexible answers according to forest garden educators who stress the need for knowledge to be able to interact in a

sustainable way with the plants and animals living there while simultaneously being their co-creator and harvester (Almers et al., 2018). The children's accounts about what can be learned about how to co-exist in a forest garden indicate that some children adopted a rule-based type of reasoning about the behavioural code in the forest garden. Other children expressed an approach based on care and reasoning about responsibility for others and understanding the consequences of their actions for others, which is in line with forest garden educators' intention of promoting ecological literacy. It is important for future research to investigate how the latter, less context-specific and more general approach to acting and interacting with the environment is promoted by different outdoor education activities.

Note

1. A folk high school is a Swedish non-academic school system for adults.

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Notes on contributors

Maria Hammarsten, PhD student at the research school in pedagogy with a focus on didactics. She is lecturer in pedagogy and specialised in outdoor education. Her research interests concern how children make meaning in outdoor places. Maria is a member of the research group Sustainability Education Research (SER). Jönköping University, School of Education and Communication Box 1026, SE-551 11 Jönköping, Sweden.

Per Askerlund is an associate professor in plant biochemistry and a senior lecturer in biology. His current research interests lie in the field of education for sustainable development. He is deputy leader of the research group Sustainability Education Research (SER). Jönköping University, School of Education and Communication Box 1026, SE-551 11 Jönköping, Sweden.

Ellen Almers, PhD in Education and her research interests within sustainability education include action competence, value systems and emotions in relation to learning and science education. She leads the research group Sustainability Education Research (SER). Jönköping University, School of Education and Communication Box 1026, SE-551 11 Jönköping, Sweden.

Helen Avery, PhD in Education has a background in applied linguistics and education. Her research interests include intercultural pedagogy, organisational development, as well as various dimensions of planning and educating for sustainability. Helen is a member of the research group Sustainability Education Research (SER). Jönköping University, School of Education and Communication Box 1026, SE-551 11 Jönköping, Sweden.

Tobias Samuelsson, is a professor in social science. His research interests include sociology of childhood, children's use of place and child culture. Tobias is a member of the research group Place, Identify and Learning (PIL). Jönköping University, School of Education and Communication Box 1026, SE-551 11 Jönköping, Sweden.

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