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# Children's preferences for schoolyard features and understanding of ecosystem service innovations – a study in five Swedish preschools

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#### ABSTRACT

This study was carried out within a project to promote health and ecosystem services, 'the benefits people obtain from ecosystems', in preschools in Sweden. The paper applies the concept 'affordance' to capture the functional meaning that children assign to different material aspects of their schoolyards before and after the installation of additional environmental features. The findings from walk-and-talks with 23 preschool children highlight what features children preferred in their yards and why. Few children showed spontaneous attention to the installed features, e.g. insect hotels. This might be more because children were not enough involved within the schoolyard development and experienced little guided exploration of environmental affordances, rather than a lack of interest per se. Given this, we suggest that development projects to upgrade schoolyards for improved ecosystem services should involve children in the design of the ecosystem services promoting features throughout the development work, and thereby, integrally, promote ecological literacy.

#### **KEYWORDS**

Outdoor environment; affordance; schoolyard; ecosystem services; preschool

# Introduction

Green outdoor environments are widely recognised as promoters of children's health, physical activity, well-being, learning, cognitive development, and ecological literacy (Adams & Savahl, 2017; Boldemann et al., 2006; Chawla, 2015; Cosco, 2006; Gill, 2014; Hartig, Mitchell, de Vries, & Frumkin, 2014; Rosenow & Bailie, 2014). These benefits for children and their learning have led to a growing societal interest in developing and greening school grounds in urbanised and densely populated parts of the world. There are also other reasons to promote the greening of urban areas. The life-supporting safety net created by biodiverse and healthy ecosystems is deteriorating more rapidly than ever, and one of the main reasons for this is the change in land use, in both urban and rural areas (Díaz et al., 2019). Through a multifunctional approach to land use in urban areas, the health department of Jönköping region in Sweden intends to contribute to both, better environments for children's play and learning and a more biodiverse and resilient local as well as global environment. The first initiative has been a two-year research-based collaborative project for the development of the yards of nine preschools, with children and teachers as the most important actors. A key concept in the project is ecosystem services defined as 'the benefits people obtain from ecosystems' (Millennium Ecosystem Assessment, 2005), the broader definition that we have adopted in this article. Ecosystem services can be augmented to contribute to more resilient urban

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This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (http:// creativecommons.org/licenses/by-nc-nd/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. environments by the provision of habitats for pollinating insects, carbon sequestration, UVprotecting vegetation, fruit production, among others (Bolund & Hunhammar, 1999). Including children in projects aimed at strengthening ecosystem services in school yards, can also simultaneously develop children's play and ecological literacy (Hammarsten, Askerlund, Almers, Avery, & Samuelsson, 2019; Orr, 1992; Stone, 2017), a crucial component in education for sustainability (Assadourian, 2017). Ecological literacy includes caring for other organisms and their environment but importantly, also understanding and acknowledging connectedness and interdependence of ourselves and others within natural systems and responsibility to sustain life on earth (McBride, Brewer, Berkowitz, & Borrie, 2013).

In planning a schoolyard environment, knowledge about children's perspectives on spaces and features within play areas is essential (Clark & Moss, 2001; Holmes & Procaccino, 2009; Moore & Wong, 1997). Children's preferences vary during their childhood, across generations, and in different cultural contexts. For example, Castonguay and Jutras (2009) suggest that children's preferences for natural settings have declined in favour of formal play and sport settings over recent decades, explained by a lack of experiences of natural places. Other studies propose that school-age children (Loukaitousideris, 2003; Lucas & Dyment, 2010; Samborski, 2010; Sancar & Severcan, 2010) as well as preschool children (Norðdahl & Einarsdóttir, 2015; Zamani, 2016) are still attracted to natural settings, given a choice where to play. Many researchers have claimed the diversity of affordances for play in natural environments makes them more attractive to children than man-made contexts (Chawla, 1992; Dowdell, Gray, & Malone, 2011; Fjørtoft, 2001; Fjørtoft & Sageie, 2000; Kuh, Ponte, & Chau, 2013; Samborski, 2010) in line with the suggestion that natural objects provide more creative possibilities compared to predetermined affordances of man-made objects (Elliot, 2010).

Merewether (2015), using a multi-method approach, found that 3- and 4-year-olds preferred features and places that allowed them to pretend, move, observe, and be social, while Holmes and Procaccino (2009) focused on preferred specific features in their observations of 3- and 4-year-olds' play areas. They noted that jungle gyms were preferred slightly more than swings. Jungle gyms and swings were followed by open spaces, sandboxes, and wheeled vehicle areas, while castles and slide areas were the least visited. Swings were valued for providing thrill and relaxation (Holmes & Procaccino, 2009).

In the study at hand, 4- to 5-year old children's preferences were investigated as preferred features, such as swings and sandboxes, and also as affordances. As suggested in previous research (Änggård, 2012; Norðdahl & Einarsdóttir, 2015) different people interpret what features like rocks, trees, and bushes offer differently. Similarly, a jungle gym can be used for many activities such as climbing, pretend playing, and resting. Affordance, the concept introduced by Gibson (1979), describes the functional meaning of the material environment to an animal, i.e. what the environment has to offer. Heft (1988) developed the concept further into a taxonomy for children's outdoor environment containing lists of features, affordances, and activities. Lerstrup and van den Bosch (2017) adapted Heft's functional taxonomy in their observational study of two groups of children aged 3–6 years during free play in a traditional schoolyard vs forest. In response to their observations, they modified and renamed classes of outdoor features: open grounds, sloping terrains, shielded places, rigid fixtures, moving fixtures, loose objects, loose material, water, creatures, and fire.

The aim of this study is to give voice to preschool children to find out their preferences in the schoolyard and explore the functional meanings the children attribute to new features installed for promotion of ecosystem services during the collaborative development project. The latter aims to find out to what extent the new features fulfil a multifunctional purpose to also stimulate play and ecological literacy.

Our research questions were:

- (1) What are preschool children's favourite features in their schoolyards and their associated affordances?
- (2) What meanings do children make of the new features installed in schoolyards to promote ecosystem services?

# Method

#### The context

The two-year collaborative development project with preschools for improving their yards began in 2016. The staff from nine preschools were invited to participate in two meetings a year on topics like UV-protection, physical activity, forest gardening, permaculture, and ecosystem services, where they also shared their plans, progress, challenges, experiences, and inspiration.

The following five preschools took part in this sub-study of children's preferences. Schoolyard features were identified through site visits, discussion with staff, and walk-and-talks.

*Cat*—preschool in a small town with an adjacent forest. It has a large, mainly south-facing, courtyard (c. 4000 m<sup>2</sup>) and a smaller area by the school building, enclosed by a wooden fence. There is a lean-to building on the east, a large lawn merging into a mature deciduous forest, and a hill with an exposed bedrock to the southwest. A brook runs about 10 metres inside the forest. The lawn has two sets of swings, one multiplay unit (modular play equipment that combines different features), two playhouses, one fireplace, and two stores. Four pallet collars (a wooden edging that keeps soil in place for planting) and one insect hotel were established between the two walk-and-talks.

Ant—inner-city preschool near a park. The yard (c. 500 m<sup>2</sup>) faces east. Heavily worn lawns, with 10 medium-sized deciduous trees and two newly planted small trees, are encircled by a paved cycle path. There is a large sandpit, a playhouse, two multiplay units, and a swing. They also have a balance trail. To the west is a store, and just outside the boundary, is a large oak. Pallet collars, bird boxes, and insect hotels were established between the first and second walk-and-talk.

*Bear*—preschool in a small town. The schoolyard (1570 m<sup>2</sup>) is mostly oriented to southeast and north. A lawn slopes steeply towards the boundary in the south with two climbable deciduous trees and a multiplay unit with slides. Another lawn and sandpit are situated to the east. A greensward with three birch trees, a lilac shrubbery, and another deciduous tree lie to the north. One birch was felled but retained for climbing and jumping. Between the two walk-and-talks, an insect hotel was established, and the lilac was provided with root protection, but other planned changes; such as the plantation of edible perennials, bushes, and trees; were not yet implemented.

*Elk*—inner-city preschool whose schoolyard forms part of a courtyard shared with apartment tenants (c. 1300 m<sup>2</sup> with an enclosure of  $26 \times 31$  metres within that). It is surrounded on three sides by four-storied houses with a one-storied building to the south. The fenced area contains two sandy areas with 'play kitchens', a playhouse, a climbing frame, and a multiplay unit. In one sandy area, there is a bamboo shrubbery, a non-climbable tree, a newly planted tree, a piece of well-worn lawn, and a small well-worn grass/soil hill. There are seven pallet collars within and beyond the fenced area.

Jackal—It is a suburban preschool on the edge of a biosphere reserve. A lawn covering most of the 1000 m<sup>2</sup> schoolyard with a smaller asphalt area house a multiplay unit, long U-shaped bench, swings, obstacle trail, water play unit, and two large sandpits. There are several birches and one apple tree, with a few bushes along the surrounding fence.

#### Data collection

In previous studies, preschool children's preferences for outdoor environments have been investigated through multi-method data collection mixing child-led photography, conversation, and observation (Merewether, 2015) as well as by observation only (Lerstrup & van den Bosch, 2017). In view of the embodied nature of the children's engagement with outdoor environments, their young age, and Swedish not being the first language for many of them, we decided to let them show us places physically, take photos, and demonstrate different activities, while using walk-and-talk conversations (Hammarsten et al., 2019; Klerfelt & Haglund, 2015; Merewether, 2015).

Twenty-three children, about 4 years old were in March-April 2017 engaged in 21 audio-recorded walk-and-talk sessions, usually one-to-one with a researcher, except in two walk-and-talks (Ant and Cat), where two children accompanied the researcher. All 4-year-old children with their own and parental consent participated. The numbers of the participating children were five (four girls) from Cat; eight (five girls) from Ant; three (no girl) from Bear; four (three girls) from Elk, and three (no girl) from Jackal. The children were first asked to show and photograph their favourite place. They were encouraged to explain what they like about it, how they use it, and whether they mostly spend time there alone or with others. Often, the children took command of the walk-and-talk sessions and enthusiastically ran ahead of the researcher and also showed other places and things that they liked.

The walk-and-talks were repeated one year later after preschools had implemented some changes to increase the biodiversity with the same children and researchers, with a few exceptions. On the second occasion, children were asked the same questions, but additionally, at the end of the visit, they were asked directly about the features installed to promote ecosystem services in schoolyards. As no one spontaneously showed any of the ecosystem services installations, they were asked questions like 'What is this?' or 'Who put it here and for what purpose?' Examples of installations for promotion of ecosystem services were insect and bat hotels. However, mini-forest gardens had only just started, and edible fruit and berries, shades, shelters, or fauna were not yet fully established.

#### Ethics

The study's purposes and methods were described to parents, both orally and in writing, with letters of consent. Children were reminded before walk-and-talks that their participation was voluntary and that they could stop whenever they wanted. To ensure confidentiality, we altered preschool names and selected appropriate pseudonyms for the children. Children were instructed not to take photos of other children as some were not allowed by their parents to be photographed.

#### Analysis

The recordings were transcribed verbatim and combined with the photos taken by the child in a document for each child. A table was constructed for each child displaying each feature photographed and described by the child. In the analytical procedure we noted the number of children that had mentioned a feature according to the taxonomy developed by Lerstrup and van den Bosch (2017). We further explored whether our data yielded any features not previously mentioned and added a new class *Plants* for vegetation that was neither bushes (*shielded places*) nor trees (*rigid fixtures*). *Fire* was the only class of outdoor features described by Lerstrup and van den Bosch (2017) that we did not observe. We established the association of affordances with features by analysing the transcripts and listening to the recordings to examine what activities and feelings the children described or demonstrated for each feature. For instance, in one of the preschools there was a balcony at the right height to be perceived as a ledge/spur creating a small space that the children used as a cave, affording hiding and pretend play (Figure 1).

#### Results

#### **Favourite features**

Generally, children did not rank their preferences for different features or activities, despite being asked to do so; instead, they gave multiple examples of favourite features or activities. Most children started the walk-and-talk with the prefabricated multiplay unit. In Table 1 below, we provide an overview of the similarities and differences between preschools, listing how many children liked a feature and noting whether this feature was available or not. The multiplay unit was mentioned most across all five preschools, followed by the swing, chosen in all four preschools that had them.





Open ground was the next most frequently mentioned. Shielded places, taken together, were also often mentioned, but the form they took varied. For example, although both were available, Elk children used bushes rather than their playhouse. Children from Cat, the preschool with the most natural environment, reported the greatest diversity of features.

# Associated affordances

Several features afforded movement, especially climbing, but also provided other movement such as swinging, running, and rolling. Children also frequently mentioned pretend play, hiding, nesting, and resting.

#### Climbing

During walk-and-talks, some children ran around and explained things while climbing on the elevated features such as rocks, spring swings, and obstacle courses; however, children presented the multiplay unit or climbing frame as a favourite schoolyard place (Figure 2). Indeed, Nellie (Elk), never left the climbing frame throughout our walk-and-talk but sat high up, hung by her knees, and did acrobatics, while commenting on various features of the yard. The children photographed, explained, and physically demonstrated many conventional and unconventional, sometimes daring, ways of using he yard. Besides using the pre-designed stairways, ladders, and climbing walls, some children explained they scrambled to the rooftop to sit at its highest point.

Climbing also occurred on features not designed for that. During one walk-and-talk, Yaser (Jackal) swarmed half-way up a lamp post, saying, 'I do this all the time'. Other children showed how the playhouse afforded climbing inside and over its roof.

Trees were present in all preschools but were not always climbable. Where there were climbable trees, as well as climbable prefabricated features, children demonstrated climbing bushes and small and large trees (Table 1, Figure 2). At Cat, Klara led the researcher to a fallen tree in an adjacent forest, clambering to its highest point.

Sometimes children explained rules and regulations of tree climbing. At Ant, they could reach branches as the trees were still small, and so children jumped from nearby benches to dangle from a branch. Although they could have continued climbing, they never did, explaining that their teachers did not allow them. Children at Bear mentioned its several large trees as their favourite features, adding that climbing was permitted. Teachers there initially helped children to learn to

| Classes of outdoor features | Features, specified              | Cat | Ant | Bear | Elk | Jackal | Total |
|-----------------------------|----------------------------------|-----|-----|------|-----|--------|-------|
| Open ground                 |                                  | 3*  | 4*  | 2*   | 2*  | 3*     | 14    |
| Sloping terrain             | Hill/slope                       | 4*  |     | 2*   | 3*  | 1*     | 10    |
|                             | Other sloping terrain            |     |     |      | 1*  |        | 1     |
| Shielded places             | Playhouse                        | 2*  | 6*  |      | *   |        | 8     |
|                             | Bush/Shrubbery                   | *   |     | 3*   | 3*  | 3*     | 9     |
|                             | Other nests and nooks            | 1*  |     | 2*   | 3*  | 1*     | 7     |
| Rigid features              | Climbing frame/Multiplay station | 4*  | 7*  | 3*   | 4*  | 3*     | 21    |
| 5                           | Tree                             | 3*  | 2*  | 2*   | *   | 1*     | 8     |
|                             | Store/Shed                       | 2*  | *   | *    | 1*  | 1*     | 4     |
|                             | Large rock                       | 3*  | 3*  |      |     | 1*     | 7     |
|                             | Log/Fallen tree                  | 3*  |     | 2*   |     |        | 5     |
|                             | Balance track                    |     | 6*  |      |     | 3*     | 9     |
|                             | Sandpit                          | 1*  | 2*  | *    | 2*  | 1*     | 6     |
|                             | Bench/Table                      | 1*  | 1*  | 2*   | 2*  | 3*     | 9     |
|                             | Tire                             |     | 1*  |      | 3*  |        | 4     |
|                             | Fence                            | *   | 1*  | 2*   | 1*  | *      | 4     |
|                             | Wooden horse/car                 | 1*  |     | 2*   | 1*  |        | 4     |
|                             | Other Rigid features             | 2*  | *   | 1*   | 2*  | *      | 5     |
| Moving fixtures             | Swing                            | 4*  | 7*  | 3*   |     | 2*     | 16    |
| 5                           | Spring swing                     | 2*  | 3*  | 2*   | 1*  |        | 8     |
|                             | Decoration/Mobiles               |     | 3*  |      | 1*  |        | 4     |
| Loose objects               | Wooden stick                     | 2*  | *   | *    | 1*  | *      | 3     |
| ,                           | Тоу                              | 1*  | *   | *    | 4*  | 1*     | 6     |
|                             | Bike                             | 1*  | 1*  | *    | 1*  | 1*     | 4     |
| Loose material              | Sand                             | 1*  | 2*  | 3*   | *   | 3*     | 9     |
|                             | Soil                             | *   | *   | *    | *   | 1*     | 1     |
| Water                       | Brook                            | 3*  |     |      |     |        | 3     |
|                             | Water play unit                  |     |     |      |     | 1*     | 1     |
| Creatures                   | Ant                              | 1   |     | 1    |     |        | 2     |
|                             | Squirrel                         | 1   |     |      |     |        | 1     |
|                             | Birdsona                         | 1   |     |      |     |        | 1     |
|                             | Spiderweb                        |     |     | 1    |     |        | 1     |
|                             | Birdbox                          | 2*  |     | *    |     | *      | 2     |
| Plants                      | Pallet collar                    | *   | *   | *    | 2*  | 1*     | 3     |
|                             | Flower                           | 3   |     |      | -   | 1      | 4     |

Table 1. Outdoor features shown by preschool children during the walk-and-talks<sup>a</sup>.

<sup>a</sup>Numbers show the number of walks-and-talks in each preschool during which the outdoor feature was shown to the researcher. An asterisk indicates the presence of a feature in the preschool yard (not shown for italicized features under Creatures and Plants).



Figure 2. Features affording climbing.

climb, but children subsequently had to get up and down independently. Einar (Bear) showed us his favourite branch to 'sit and ... eh ... rest'. Asked when he liked to sit there, he replied, 'every day'. He spoke about his first climb: 'Miss Sue, [...] helped me a bit with my bum ... to get up. Then, the next

morning, she didn't help me at all. Hardly anything.' He liked it, 'Because the tree is *very* good to climb.'

Viggo at Bear admitted that he fell once in summer but that he never climbed trees in winter because of the increased risks of slipping. He asserted that climbing was not scarier in trees than multiplay units but rather more joyful because 'it is easier'.

Nellie, Joelle, and Charbel also particularly appreciated trees and tree climbing, although it was forbidden at Ant. Conversely, at Elk, Estelle showed the school's spiderweb climbing frame as fun at our first visit, but in our next visit, she described it as dangerous 'because you can hurt yourself when you jump down'.

# Swinging

Swings were amongst the first features that children showed us, demonstrating how they used them, often with friends. Several children also reported that they used the spring swings where available (All but Jackal, Table 1). Swinging was generally found fun and exciting. However, swinging made Joelle at Ant calm; she usually lay down once it had got going and had even fallen asleep. Some children at Bear mentioned rules about not standing or kneeling while swinging, adding that 'you can fall off if you do not follow the rules.'(Hjalmar).

# Running and rolling

Children whose yards included a hill or slope (All but Ant, Table 1) appreciated this feature. In winter, they went sledging, and one boy reported constructing jumps for snowboarding. In summer, they ran up and down them. Indeed, children did this while explaining their activities to us, shouting 'uuuup' and 'dooooowwwwnnn' and demonstrated rolling down. During walk-and-talks, many children rapidly crisscrossed their schoolyard, sometimes jumping from rock to rock or from benches to tables. Every preschool had an open space, often a grassy area but occasionally paved. Some used this for running competitions, and in Jackal, Ant, and Elk, children reported playing football there. However, open space was rarely the favourite.

#### Pretend play

Samer (at Ant) reported playing Spiderman and Ironman on a multiplay unit. Multiplay units were sometimes used as boats; children pretended they were at sea, usually on a pirate ship. Playing pirates involved shooting and killing 'enemy' (Yaser at Jackal) or hoisting 'gold' or 'money' (sand) into the 'ship' (lvar and Samer at Ant).

The ever-present sandpit also invited pretend play. Several children (Elsa, Moa, Klara) said they cooked and baked cakes there, with Klara utilising twigs as cooking implements. Saleh mentioned building sandcastles. Nellie liked to dig 'super deep holes' in the sand to find a 'shining treasure'. In contrast, Beata said she used to play in the sandpit when she was four but was now too old to do it. Ivar found playing in the sandpit extremely boring, 'as boring as going for a stroll'.

Natural elements like rocks, sticks, and mud, where available, were important for some children's pretend play. Such elements were especially abundant at Cat, the only preschool with adjacent forest. Disa's (Cat) imagination was particularly stimulated by natural objects. She objected when the researcher put his foot on her 'armchair', a small crevice in the bedrock, and pointed at a large rock covered with moss as 'a crocodile' that ate poisonous snakes, commenting 'which is good so that you get rid of them!' The only sign of snakes was their poo (pile of twigs). A moss-covered log was envisioned as 'an elephant', which she considered boring 'because it sleeps all the time, it doesn't want to play', and another mossy rock was a 'moose'. Disa's tendency to fantasise about rocks and logs was much more evident during the second visit. Previously, she only mentioned the hill on which she liked to slide or roll down. Disa was not alone in using natural objects as sources for pretend play; her friend, Klara referred to the bedrock 'armchair' and both independently mentioned a 'police car' log in the forest. Vera and Liv (Cat) described playing witches using branches as brooms (Figure 3). On both walk-and-talks, Klara reported visiting a forest hut with her teacher, where they played pirates and pretended it was someone's birthday. Nellie



Figure 3. Features affording pretend play; a police car (left) and a witch broom (right).

(Elk) decorated her sand 'cakes' with bamboo leaves and buds; while others explained that mixing water and soil could make something 'almost as chocolate' (Saleh) or 'soups' and 'volcanoes' (Viggo).

The playhouses were favourite spots for pretend play with friends, such as 'mummies and daddies', described by Einar 'as a family, you know. They go out shopping and so on'. Vera and Liv (Cat) liked to make buns and ice-cream in the little house, but Samer (Ant) reported that although it is fun to play-cook there, they are not supposed to do it as it brings in sand. Beata (Ant) found it boring and dirty. Some children played 'mummies and daddies' and 'shop' underneath the multiplay unit. They thought it was fun and cosy but did not like getting sand in their eyes.

Several children played 'mummies and daddies' at other places as well, including 'in a car' made from wood (Alice) and inside a lilac bush at Bear (Hjalmar, Einar). Children at Bear showed multiple pretend play affordances of their lilac bush: baking sand cakes and making 'rooms'.

#### Hiding/nesting/resting

Children at every preschool described favoured shielded places that afforded hiding, nesting, and resting activities, although different features were used depending on availability (Table 1). At Ant, the preschool with playhouses but no bushes or other hiding places, the children mentioned the playhouse as a preferred place. At Elk, where there were both playhouses, bushes, and a balcony to hide under, nobody mentioned the playhouse; whereas at Cat, the children showed the playhouse, other nests and nooks, or both (Klara, Cat).

In the four schoolyards with bushes and shrubbery (Table 1), the children used them in different ways, including playing hide and seek and hiding (Figure 4). Also, when someone had said that they could not be part of a game, or if someone had pushed them, children might go to this 'sad corner', as Yaser at Jackal described it. Children also used bushes simply to be alone and contemplate for a while. Although most children liked to play in the bushes, Yaser said it could be somewhat dangerous for one may get twigs and sticks in one's eyes. The teacher did not allow them to play with sticks, he added. The bamboo-bush at Elk was Nellie's favourite and the cosiest place to nest and hide.

Other features such as benches, spaces under balconies and a pushchair ramp, and crawl tubes were used as shielded places (Other nests and nooks, Table 1, Figure 4) for resting and contemplation, alone and/or with a friend, and for sitting and talking. Vera and Liv (Cat) showed us a spot on the hilltop where there was a depression in the ground and explained that it was their nest where they sometimes slept (Hill/slope, Table 1).

#### Children's meaning-making of new features to promote ecosystem services

As newly installed features were not spontaneously mentioned by the children, and since the promotion of 'health, ecosystem services, and sustainability' was the wider aim of our collaboration



Figure 4. Features affording hiding/nesting/resting.

project, we prompted their views on planted pallet collars, berry bushes, fruit trees, insect hotels, and bat and bird boxes.

# **Relations with plants**

The children diverged greatly on how they related to recently introduced and more longstanding plants in their schoolyards. There were marked differences between and within the preschools. For example, at Cat, the only preschool next to natural forest, children's accounts varied from descriptions of the forest as a 'boring place' (Milton) to a deep involvement with the forest's stones, trees, and plants in pretend play (Disa). Some children showed no interest in plants, while others named several and talked about their taste and/or beauty. Children held differing views on who had set up and planted in pallet collars and plant boxes and for what reason.

When asked about pallet collars installed to grow edible plants, some children said that they did not know what they were or why they were there. On the first visit, Samer (Ant) reported children were not allowed to jump or sit on them when growing strawberries and blueberries, but during the second visit, he had no idea what grew there. Some children (Moa, Ivar, Ant) recalled planting them with their teacher and explained, 'there will grow strawberries and chives' (Ivar) or 'there will grow raspberries' (Elsa, Ant). Elsa also suggested they were 'to grow strawberries, flowers, and such things.' Asked if that was fun, she answered, 'It is fun to eat strawberries.' Conversely, Beata (Ant) said that 'other children had planted them' while Stella (Ant) reported that the 'Misses' had planted them. Thus, it was apparent that not all children felt involved in gardening. Joelle (Ant), once prompted, was keen to talk about plants. She liked 'tulips' (pansies) and 'grass' (thyme) and enjoyed watering them but wished there were more strawberries and 'rhubarb, so that I could bring some home and bake a rhubarb pie'. In all preschools, strawberries were the most well-known plant, although a few children were not sure what they were.

Most often, children mentioned the edible aspect of plants, together with their aesthetic qualities. At Jackal, Saleh pointed out gooseberries, calling them 'blueberries'. He described them as green and sour while the taste of wild strawberries was 'very good,' adding that he and Charbel liked chives' flavour. Saleh recognised an old apple tree, reporting that its apples were very tasty. Lemon balm was mentioned by some children, and Saleh (Jackal), Charbel (Jackal), and Alice (Elk) commented on the beauty of violets, columbine, wood anemone, crocus, hepatica, and daffodils.

# **Relations with animals**

Most children spoke of animals only if one happened to appear during the walk-and-talk. When asked about habitat installations, some children said they did not know what they were or why they were there. Samer (Ant), for instance, had no idea of what the birdbox might be or who had put it up, while Rasul said 'a house for bees, I think' and suggested it was probably set up by teachers.

In other cases, the children creatively offered explanations for new features. Joelle (Ant) ventured to explain a bat box's purpose (Figure 5).

Joelle: I think it is a bench for flies.

Researcher: Why do you have a bench for flies?

[...]

Joelle: We don't like having animals flying around here at our preschool.

Regarding an insect hotel (Figure 6), Joelle surmised 'it is a fly's nest' but also suggested that 'the cones are for squirrels to chew on.' She suggested the top floor was a wasp's nest for catching baby birds.

Joelle: We put their favourite food in there [...] and then we shut the door whilst they have entered.

Researcher: What do you do with them then? [...]

Joelle: I think that we will let them out. ... We will let them out through the gate there.

Joelle explained why the birds were captured, 'They *sound* too much if the children yell. We do not want to hear quack, quack quack in our yard'. Apparently, some ducks had previously come in, but she added, 'The Misses don't want them here. *I* want them here.'

Children at Elk (William, Alice, Estelle) also seemed puzzled about the insect hotel, reporting that they had not been involved in its construction, while Einar at Bear is certain when he answers:

Einar: It is an insect's nest [...] No, insect hotel!

Researcher: Who made it?

Einar: I have helped. And all the children.



Figure 5. Bat box at the Ant.



Figure 6. Insect hotel at the Ant.

# [...]

Researcher: But why did you make it?

Einar: So that the wasps and bees will keep themselves there and be safe in their hotel.

Einar was one of the few children who spontaneously talked about play with insects. He pointed out ants living in a birch in the lilac shrubbery (Figure 7) and removed a piece of bark from the birch tree to create a 'cave' for the ants.

# Discussion

# Diversity

As the findings of Zamani (2016, 2017)), our study emphasises the importance of providing a range of affordances in the schoolyard if children's preferences are to be considered. Our findings show a huge diversity in children's preferences, but there were also commonalities. In line with previous research (Elliot, 2010), children with more access to natural environment (Cat) reported and took advantage of the greater diversity of features. Of course, differences in what the schoolyards afforded affected the reported preferences. In preschools where playhouses were missing, the children, instead, showed us bushes and other features that afforded similar activities (Table 1). When added together, shielded places like playhouses and bushes affording hiding and nesting, were the most frequently preferred features; although if counted separately, they were surpassed by multiplay units, swings, open ground, hills and sand, in this order (Table 1), which supported movement and pretend play. The popularity of swings noted by Holmes and Procaccino (2009) is in line with our walk-and-talk study, although the multiplay unit with its combination of affordances



Figure 7. Lilac shrubbery with ants at the Bear.

of climbing, sliding, jumping, and pretend playing, attained higher priority in our study, possibly owing to the lack of swings at one preschool. Different ethos and rules governing the use of schoolyard features in preschools also shaped the children's activities. For example, at Bear, teachers encouraged children's tree climbing whereas at Ant, children claimed it was not allowed. Despite this, children at both schools appreciated tree climbing, showing that rules and school culture do not always define children's preferences.

#### Adaptability

Our research reveals that rather than specific features, children's expressed preferences focused more on the forms of play made possible and their affordances, such as being able to pretend, move, and being social (Merewether, 2015). The children accommodated some deficiencies in provision by using their imagination to extend features' intended purposes, such as when Joelle suggested the bat box was a 'bench for flies'. Overall, children seemed content with their yards. Even in guite unpromising environments, children seemed to find ways to do things they enjoyed, such as hiding or pretend play. They simply adapted to their context. This adaptability, however, does not justify neglecting the benefits of providing variation and richness in affordances. Several studies have proved the positive impact of a diverse outdoor environment on motor development and physical activity levels. For instance, Cosco (2006) showed that play areas with pathways and diverse natural elements stimulated 3-5-year-olds' physical activity most. Outdoor features' influence on play behaviours is significant (Heft, 1988; Moore & Wong, 1997; Zamani & Moore, 2013). A general pattern shown by Lerstrup and van den Bosch (2017) suggested that within each class of feature, children needed to experience variation and uniqueness; sizes and gradation; and novelty and change. In our own data, we noted children's preferences for aesthetic variation, such as colourful plastic mugs and ribbons in a tree (Moving fixtures: Decoration/mobiles, Table 1), colourful flowers, and different tastes of berries (Plants, Table 1). The children's appreciation of varied sizes and gradation was evident when they proudly told us about digging the deepest hole in the sand and climbing to and jumping from the highest level.

Novelty and change were not so evident, perhaps because our data collection did not include seasonal weather changes. However, we found Disa's fantasies about rocks and logs much more apparent during our second visit. This change could reflect a new interest in nature, stronger self-

confidence and trust in the researcher, developmental changes in her play, or several of these reasons combined. We had, however, expected to hear more accounts from children about the changes resulting from the collaborative development project, and we reflect on the possible reasons below.

# **Material resources**

Several studies have pointed to the importance of loose objects (Gibson, Cornell, & Gill, 2017; Kochanowski & Carr, 2014; Lerstrup & Refshauge, 2016; Ward, 2018). In our study, loose objects (sticks) other than ready-made toys were mentioned by only three children in two preschools and ready-made toys by only six children in three preschools (Table 1). One likely explanation for this discrepancy with earlier research is that when asked what they liked about their grounds, children mainly associated the questions with places and larger structures. It could also reflect a scarcity of loose natural materials in preschools and some teachers' restrictions on using sticks. From our walk-and-talk conversations, we were unable to confirm the conclusion from other studies that children prefer natural environments to man-made (Chawla, 1992; Elliot, 2010; Fjørtoft & Sageie, 2000), partly because there was still a lack of natural environmental features in several schoolyards. Carrying out the walk-and-talks early in the growing season may have influenced children's responses. However, we noted children's preferences for climbing trees compared with multiplay units in line with the generally accepted idea that natural objects provide greater possibilities for varied use than man-made artefacts (Dowdell et al., 2011; Elliot, 2010; Samborski, 2010). In line with other studies (e.g., Dowdell et al., 2011; Waller, 2007), we also witnessed creative imagination at the only preschool with access to a wilder natural area—mossy rocks and logs becoming animals and twiggy snake poo.

# Education for sustainability

This study was carried out within a collaborative development project to promote 'health, ecosystem services, and sustainability'. Within this wider frame, more than children's preferences should be considered when developing schoolyards like impact on biodiversity but also cultural ecosystem services providing recreation, child-nature contact and opportunities to learning. Thus, introducing insect hotels and plants was not only to increase pollination and fruit production but merely to involve children in interactions with, caring for, and learning about other organisms, their interconnectedness and interdependence, and the ecosystem services they provide, i.e. ecological literacy (Hammarsten et al., 2019; Orr, 1992; Stone, 2017). It is, therefore, noteworthy that children generally did not mention these features spontaneously and that when explicitly asked, most did not know why these features had been installed, or attributed them to the adults. However, at the preschool where, according to the children, all of them had been involved in constructing the insect hotel (Bear), awareness was much greater. Notwithstanding this, during other walk-and-talks, it became obvious that these innovations carried the potential to stimulate children's curiosity, creativity, and imagination besides encouraging ecologic enquiry, and reasoning. Our findings, therefore, indicate a strong need for frequent and ongoing adult input in showing and stimulating interest in such features. This emphasises the criticality of how environmental features are introduced, created, and maintained and, perhaps even more importantly, how attention continues to be drawn to them over time by other people to inspire and sustain children's interest, exploration, knowledge, and emotional engagement in them. Hence, where there is an educational purpose beyond the purpose of creating resilient and biodiverse physical environments, the way the innovations are mediated is plainly crucial (Dowdell et al., 2011; Raith, 2017; Sharma-Brymer, Brymer, Gray, & Davids, 2018; Waller, 2007). Ärlemalm-Hagsér and Sandberg (2017) have specifically pointed out that for preschool education to be 'for sustainability' (compare Sterling, 2001, about education as sustainability), education must include the children's agency, participation and ownership.

In other research (Askerlund & Almers, 2016), primary school children were actively involved over three years in creating nests, stonewalls, and dry meadows to serve insect needs in an edible forest garden. Here, the focus was not affordances for children but how children could create features for creatures. Thus, children got regular opportunities to improve the conditions for insects while discussing the insects' interactions with other non-human organisms and roles in providing ecosystem services (Askerlund & Almers, 2016). Children's reports from their involvement were often about joyful caring for other organisms and appreciation of the beauty of trees and other plants in the forest garden, appreciating them as a whole (Hammarsten et al., 2019). This may be partly because of the children's age (7–9 years old) but may also stem from repeated active engagement by the children, with a strong focus on co-creating the forest garden environment together with and for other creatures (Almers, Askerlund, & Kjellström, 2018). Building shelters, biodiversity, and aesthetic sensory experiences over time likely impacted children's preferences for the places and the organisms living there. As few preschools have access to similar natural outdoor environments, children's cooperation in designing environmentally focused schoolyards may encourage greater awareness of desirable features for other than oneself. In addition to providing features affording climbing, sliding, swinging, jumping, running, pretend playing, and installations for wildlife, we should consider how the entirety of the outdoor environment as a system is perceived and engaged with by children and other species.

#### Study limitations

This study has some limitations that need to be taken into consideration in the interpretation of the data. As acknowledged, since children's schoolyard activities tend to vary from season to season, and our data collection took place in spring both years, seasonal changes are not considered. Had walk-and-talks been carried out also in other seasons, the data could possibly have included also other examples of schoolyard activities. Also, our walk-and-talks were carried out early in the growing season and this might, as discussed, influence the children's responses vis-à-vis newly installed environmental features. Had the walk-and-talks been undertaken later in the autumn, after a full growing season, the children might have been more informed. However, the study focused on preschool children aged 4–5 years during their first walk-and-talk. During the second walk-and-talk the children were of 5–6 years. This was their last semester in preschool before moving on to a primary school placed at another location. Thus, while it would have been interesting to inspect these children's relations to fully grown installations at a later point, this was not practically possible.

#### **Concluding thoughts**

Children's focus in our study of their preferences was on what features of their schoolyards enabled them to do in line with the concept of affordance. Their inventiveness in assigning functions reinforced our awareness of children's capabilities and agency in reconfiguring designed features as well as open-ended materials.

Few children showed spontaneous attention to installed features to improve ecosystem services such as pollination and production of berries and plants for food consumption. However, the data suggest that this may be because children were not enough involved within the development of the yard and experienced little guided exploration of environmental affordances, rather than a lack of interest per se.

Given this, we strongly suggest that programmes of grounds improvement for sustainability should involve children at design, build, implementation, and evaluation stages, so that through exploration of environmental affordances, they may better come to recognise and appreciate their relationship with the non-human world. Taking the collaborative development project for improved outdoor environments for children a step further, beyond pallet collars and insect hotels, would demand creating biodiverse nature-like areas within or near schoolyards. Developing and evaluating 244 👄 E. ALMERS ET AL.

such environments in cooperation with preschool staff and children is an urgent and important mission for many reasons, including responding to and expanding children's preferences through promoting ecological literacy by diversifying ecosystem services with the children's input in the codesign of their neighbourhoods. This would provide a key component in preschool sustainability education.

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