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Can playscapes promote early childhood inquiry towards environmentally responsible behaviors? An exploratory study

R. Alan Wight[a]*, Heidi Kloos[b], Catherine V. Maltbie[c] and Victoria W. Carr[d]

[a]*Arlitt Child & Family Research & Education Center, Educational Studies, University of Cincinnati, Cincinnati, OH, USA;* [b]*Department of Psychology, University of Cincinnati, Cincinnati, OH, USA;* [c]*Evaluation Services Center, University of Cincinnati, Cincinnati, OH, USA;* [d]*Arlitt Child & Family Research & Education Center, University of Cincinnati, Cincinnati, OH, USA*

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This paper investigates young children's exploratory play and inquiry on playscapes: playgrounds specifically designed to connect children with natural environments. Our theoretical framework posits that playscapes combine the benefits of nature and play to promote informal science exploration of natural materials. This, in turn, is expected to lead to environmental science literacy, which in turn is likely to strengthen a child's ecological identity and lead to environmentally responsible behaviors (ERBs). The following questions are of specific interest: to what extent do children go beyond observations and explorations and use science-specific representations and language during their play on playscapes? What locations on the playscape afford science-specific activities? And how do these activities relate to their play on the playscape? In an attempt to answer these questions, we describe data obtained from a video analysis of preschoolers visiting a playscape. As a means of initial comparison, we also analyzed data obtained from a traditional playground. We examine the intersection of children's play and inquiry within specific areas of interest at the two sites. The two sites vary in many dimensions, including size, familiarity, and access to natural materials. Nevertheless, our data provide initial support for our hypothesis that natural environments promote explorations and inquiry, fostering ERBs.

Keywords: early childhood environmental education; playscapes; inquiry; nature; environmentally responsible behaviors

Introduction

Since the mid-20th century children are spending less time playing outside in natural environments. Reasons for this trend include urban and suburban design, the increasing availability of attention-capturing electronics, parents' safety concerns, and time constraints imposed by homework and afterschool activities (Clements 2004; Copeland et al. 2012). In fact, our culture socializes children to associate nature with a lack of safety and feelings of uncertainty (Wilson 2008). It is no surprise then that many children spend only a very small proportion of their overall playtime in natural outdoor environments, thus having fewer opportunities to interact and connect with nature.

*Corresponding author. Email: wightra@ucmail.uc.edu

As environmental educators have demonstrated, this lack of connection to nature, which Louv (2008) labeled 'nature-deficit disorder,' has important ramifications for our children and society (Clements 2004). Outdoor play in nature (OPiN) not only supports healthy physical development, but also stimulates cognitive and emotional development, namely by providing physical and mental challenges that encourage problem solving, critical thinking, team work, creative play, and risk taking (Cole-Hamilton, Harrop, and Street 2002; Fjørtoft 2001; Frost 2006; Heft 1998; Moore 1985a, 1985b; Sallis, Prochaska, and Taylor 2000).

In an effort to address the problems of decreased OPiN, a new kind of playground has been developed, one that combines the best of natural environments with the safety and convenience of enclosed: the playscape. Playscapes are intentionally designed play areas that aspire to connect children to water, soil, trees, and loose parts typically found in nature (Carr and Luken 2014; Fjørtoft 2001; Talbot and Frost 1989). They encourage creativity, imagination, and an affinity toward nature (Ernst 2014; Luken, Carr, and Brown 2011; Moore 1985a). Here we focus on yet another benefit of playscapes: their potential to foster inquiry and exploration, a prerequisite toward environmentally responsible behaviors (ERBs).

Environmentally responsible behavior

Pro-environmental and ERB promotes ecological sustainability through a relationship with nature (Nisbet, Zelenski, and Murphy 2009). It captures an ecological ethic of sorts that translates into respect, appreciation, and an understanding of nature that can foster a love of place (Eagles and Demare 1999; Ewert, Place, and Sibthorp 2005; Gruenewald and Smith 2014; Jensen 2002; Sobel 1996; White 2004). Free play in a natural setting can strengthen positive motivations for ERB and reduce negative associations toward nature, especially if their experiences with nature are positive (Cohen and Horm-Wingerd 1993; Malone and Tranter 2003).

To promote ERB in children, a crucial factor is an exposure to nature that provides them with opportunities to explore, understand, and participate in the world on their own terms (Ballantyne and Packer 1996, 2005; Kaplan 2000; Wells and Lekies 2006). In the current study, we investigate the extent to which playscapes can elicits play and inquiry relevant to science and environmental learning. Indeed, the intersection between free play, science-related inquiry, nature, and ERBs taps into children's innate curiosity, self-motivation, enjoyment, and fun (Falk 2005). Thus, rather than measuring children's attitudes toward nature (cf. Leeming et al. 1997), we chose to observe their science inquiry and explorations related to nature. Figure 1 shows our theoretical framework about how the benefits of both nature and playgrounds promote a kind of exploration that is likely to support ERB and the development of a child's environmental identity (The following references align with the specific arrows and domains in Figure 1: Wells and Lekies 2006; White 2004; Ballantyne and Packer 2005; Falk 2005; Luken, Carr, and Brown 2011; Falk 2005; Nisbet, Zelenski, and Murphy 2009; Ballantyne and Packer 1996; Jensen 2002).

Measuring preschoolers' science inquiry

Documenting the degree of knowledge acquisition, inquiry, and learning that occurs during OPiN is challenging. There are proven methods for describing and analyzing types and duration of play (e.g. Miller and Almon 2009; Parten 1933; Piaget 1962;

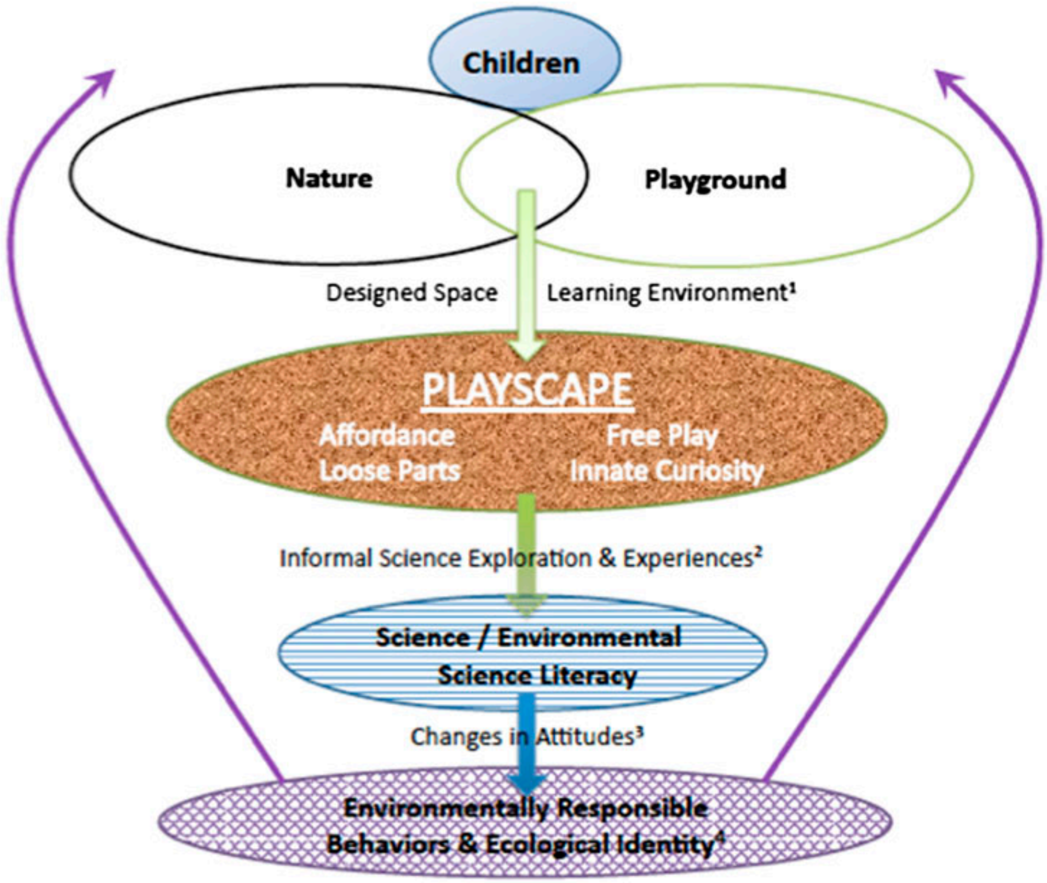

Figure 1. Theoretical framework of how playscapes support ERB through informal science exploration.

Rubin, Watson, and Jambor 1978; Sandseter 2009; Smilansky 1968). Yet, for our purposes, a deeper understanding of content requires qualitative measures that provide rich details into behaviors. We thus turn to video and audio recordings to capture play and code behaviors from numerous perspectives (cf. Hart and Sheehan 1986).

There are several science-based assessments for informal learning environments (Chermayeff, Blandford, and Losos 2002; for a review see Kloos et al. 2012; Martin 2004; Orion et al. 1997; Worch and Haney 2011). These methods enable scholars to evaluate the degree of relevant behaviors that occur during play (Hickling and Wellman 2001; Kurth et al. 2002; Vantaggi 2011). Building upon these studies, we compared children's behavior on a playscape environment with children's behavior on a school playground. Differences between these two sites are at the heart of this study, as we seek further insight into how these distinct settings impact the type of children's play, science exploration, and ERB.

Overview of activities

We observed one group of preschoolers on a playscape and another group of preschoolers on their school's playground. Teachers at each location were asked to let the children play freely, with minimal adult interactions. Trained videographers recorded children's free play and exploratory behaviors at both sites, focusing on documenting activities that were suggestive of science inquiry into nature. We then coded and analyzed the video footage.

Methods

Study participants

Our sample for this project was drawn from four classrooms at a Midwestern University laboratory preschool in the United States. The preschool serves low to medium socioeconomic status families, with income at or below the poverty line being eligible for Head Start education. The sample consisted of 64 children between the ages of 3 and 5. One group of 32 preschoolers (ten qualifying for Head Start) was observed three times on the playscape. Another group of 32 children (19 qualifying for Head Start) was observed three times on their playground. Table 1 contains the demographic details for both groups.

Research sites

There were two different data collection sites for this project: the Charles and Marge Schott Nature PlayScape at Cincinnati Nature Center (CNC) and the playground at the laboratory preschool. The CNC PlayScape is a 1.6 acre, fenced area within a 1000 acre nature preserve. It contains a natural forest, open prairies, a recirculating stream, a wetland habitat, small caves, several rock formations, a bridge, a teepee, sand and gravel pits, a bird blind, and circular paths weaving around and through the space (see Figure 2). The playscape is dotted with shrubs and vegetation, and there are two semi-constructed log forts in the forest area. Upon entering, there is a shaded terrace with wooden benches and a large child friendly map of the space. Visitors can interact with the features as desired.

Table 1. Demographics of participating children.

	Visitors to the playscape ($N = 32$)	Visitors to the playground ($N = 32$)	Total (%)
Gender			
Female	14	16	47
Male	18	16	53
Ethnicity			
Caucasian	17	14	48.5
Hispanic	4	4	12.5
African American	8	2	15.5
Asian	2	4	9.5
Middle Eastern	1	5	9.5
Other/Mixed	0	3	4.5
Age			
5.0 and older	3	5	12.5
4.0–4.11	18	13	48.5
3.11 and younger	10	14	37.5
Missing	1	0	1.5
Head Start Children	10 (31%)	19 (53%)	45

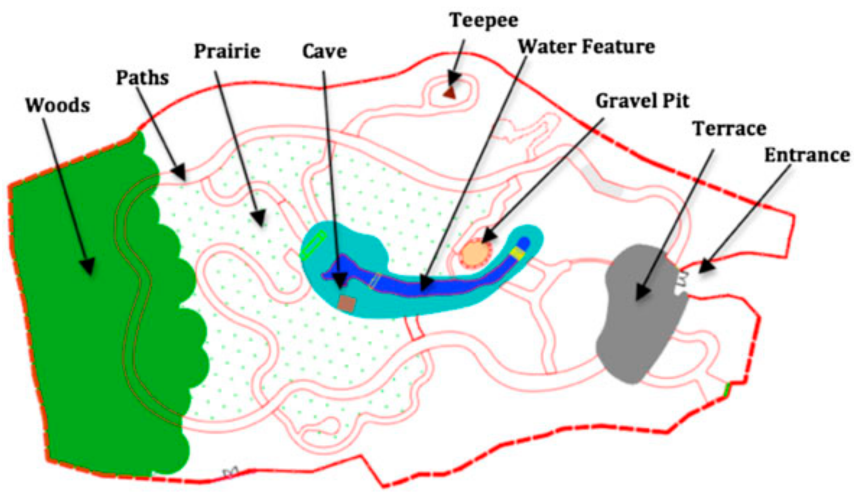

Figure 2. Areas of interest at the Cincinnati nature center playscape.

The playground at the laboratory preschool is a 0.01 acre, fenced area that sits on the corner of highly trafficked streets and is only accessible from the classrooms. The space is divided into four sections, each catering to different activities (Figure 3). One area features a wooden playhouse with a table and chairs, a steering wheel and sound-transmitting PCV pipe surrounded by rubber mulch, dirt, several small trees and shrubs with an intentionally uneven walkway entrance (Photo 1). Another area contains a large multi-level plastic structure with slides and a climbing wall, surrounded by rubber padding and a concrete edge (Photo 2). The third section has a large covered sandpit with concrete walls, featuring plastic shovels, buckets, and other toys (Photo 3). The last area is a concrete circular track used for tricycle riding, with smaller-scaled, movable plastic and metal climbing equipment in the center, also surrounded with rubber padding.

The playscape and playground differ in multiple ways, which are likely to affect children's play and level of inquiry. First, there is the difference in size and familiarity: prior to the start of the study, preschoolers had not visited the playscape. This difference in size and familiarity between the two sites made is possible for children to 'discover' new locations at the playscape, but not at the playground. Second, there is the difference in complexity of what the two locations afford. The features of the playground (e.g. bike track and sandbox) are far less complex in visual and

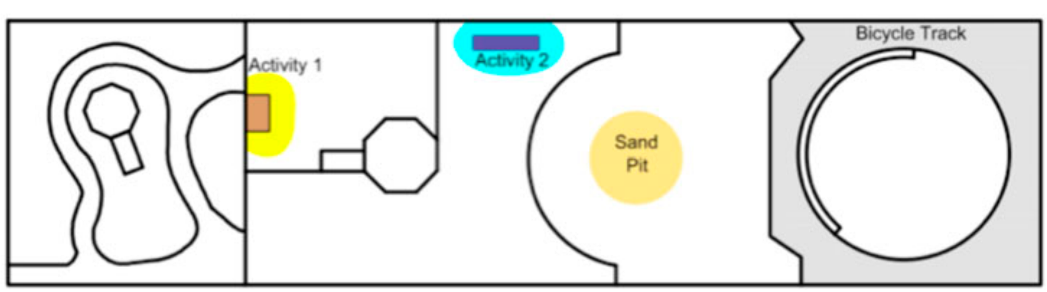

Figure 3. Areas of interest at Midwestern lab school.

haptic stimulation than the natural landscape and water features of the playscape. Given these differences, direct comparisons between the two locations need to be interpreted cautiously. The playground data serve as a baseline to test our measures and procedures and provides a starting point for helping practitioners relate our findings to various school settings.

Data collection

The same data collection procedures were used at both sites. Children were observed for three visits, about one week apart. A week prior to their first visit, children were introduced to the vests they needed to wear during the visits. The vests were Summit Backyard Safari Cargo Vest™, and each featured a number card, laminated and pinned to the back of the vest, in order to accurately identify individual children on the video footage.[1] During this initial meeting, children were also introduced to the idea of investigating the play area 'like an explorer would,' while wearing the vest. If children did not want to wear a vest during a visit, a laminated number was clipped to their clothes. Each of the three free-play sessions lasted between 30 and 50 min.

To document children's behavior during the sessions, two to three adults filmed ongoing activities. Specifically, videographers were instructed to follow children close enough to capture their actions (including language when possible). At the same time, videographers were asked to minimize intrusion into children's ongoing activities. They were asked to observe children who were actively engaged in and with the natural environment. Videographers paid close attention to those children and groups who were manipulating and collecting loose parts, building or deconstructing, and who were intently involved in exploratory play (i.e. looking under rocks, venturing off the worn paths, picking apart leaves, etc.). Thus, videographers were free to choose which behaviors to document and for how long. Video clips range from 30 s to over 10 min.

Coding

Following the recommendations of Heath, Hindmarsh, and Luff (2010), video footage was first cleaned to include only usable segments pertaining to the purposes and scope of our analysis. About half of the video footage captured at the playscape was removed because it contained transitions between locations, which were lengthy at times, given the size of the playscape. All playground video footage was usable. In total, we retained approximately 75 min of footage from both sites, 50 min from the playscape, and 25 min from the playground.

The clean video footage was then partitioned into shorter clips based on children's behavior (Heath, Hindmarsh, and Luff 2010). Clips were partitioned when a preschooler's interest in an activity changed, when they entered or left a group, and when their play or behavior changed substantially. For example, clips began or ended when a child started or stopped playing with loose parts, when they verbalized disinterest in 'play(ing) like that,' expressed boredom in the activity, or suggested another play activity.

Clips were coded according to the specific location on the site and the activity that a child was engaged in. Most clips were coded several times, to account for the fact that multiple children were present in each clip. Figure 4 shows the quantity of coded video footage for each child by site (playscape vs. playground). Notably, due

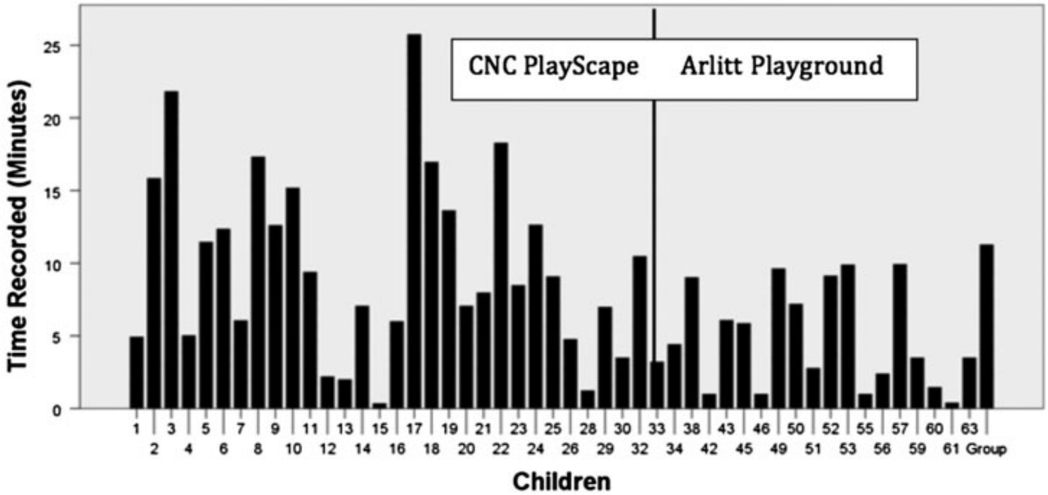

Figure 4. Amount of time recorded for each child, separated by research site.

to differences in the amount of video data from each site (50 vs. 25 minute), two children were not recorded on the playscape, while twelve children were not recorded on the playground. These discrepancies are also due to the fact that some children, more than others, caught the attention of the videographers, based on the play and inquiry activities in which they were engaged. These limitations are considered when interpreting the results.

Per Worth and Grollman (2003), we used four levels to describe children's type of science inquiry. They include *observation* (i.e. engaging, noticing, wondering, and simple questioning in open-ended exploration), *exploration* (i.e. investigating, testing predictions, collecting data, and pursuing questions), *representing and recording* (i.e. making simple drawings or charts, using objects to represent things or ideas, and engaging with site maps), and *language* (i.e. communicating ideas and identifying objects). To code for language, the audio was transcribed and analyzed for the presence of science-specific language, such as flora and fauna names, describing the physical attributes of an objects, using terms pertinent to science actions, and asking science-related why-questions.

The levels of inquiry-based activities are hierarchically organized, with one level nested within another. 'Observation' is nested within 'exploration,' which is nested within 'representing/recording,' which is nested within 'language.' The idea is that a child would need to observe before being able to explore; explore before creating a representation or recording an event; and create a representation of the event before talking about it. One could argue that this organization of activities is not always warranted; nevertheless, we use it here to be consistent with the previous literature.

Our codes for the type of play were based on the work of Piaget (1962) and Smilansky (1968), but were adapted from a previous study of children's behaviors on a nature playground at the Toledo Zoo (for discussions on play codes see Göncü, Mistry, and Mosier 2000; Sutton-Smith 1999; Worch and Haney 2011). Play codes include *functional play* (i.e. the use of senses and muscles to manipulate materials and learn how things go together); *constructive play* (i.e. creating, organizing, or building and deconstructing things); *dramatic play* (i.e. two or more children are engaged in make-believe play, which can involve roles or acting), and *games* (i.e. activities that follow agreed-upon rules). For the play dimension, functional play is nested within constructive play, which is nested within dramatic play, which is nested within games. For simplicity, only the highest level of each dimension was coded, given the nested nature of levels within each dimension.

Finally, we also coded the clips for area of interest (AOI), which refers to specific locations within the sites where children's activities occurred. In particular, we identified eight primary AOIs in the CNC PlayScape: water, woods, paths, cave, gravel pit, teepee, terrace, and prairie (Figure 2); and four primary AOIs in the playground: sandpit, Activity Zone 1, Activity Zone 2, and the bike track (Figure 3). Activity Zone 1 provided the opportunity for corn shucking during one of our three visits, and Activity Zone 2 provided the opportunity for bubble blowing during all of our visits.

To ensure reliability of video data coding, we followed the protocol laid out by Stemler and Tsai (2008). Once the entire data-set was cleaned and initially coded, a second rater independently coded 25% of each location's video. Inter-rater agreement for each dimension is as follows: 100% for play, 86% for inquiry, and 100% for the AOI within the research site. Disagreements in coding were resolved by consensus. A closer look at our inter-rater reliability for inquiry-related behavior revealed that the primary coder was more conservative in terms of assigning the highest level of science-related behavior, while the second rater had a more liberal interpretation of what constituted science-specific language use. When a consensus needed to be reached, the coders were conservative regarding the occurrence of science inquiry.

Results

We present, the findings related to the CNC PlayScape first, and then turn to the playground results. In each case, we first describe AOI and the type of play that were documented at each research site. We then examine the proportions of different kinds of inquiry-related activities and review several noteworthy quotes that provide insight into ERB.

CNC playscape

Broken down by AOI, most of the activity recorded was taking place in the water (42.7%) or the woods (33.6%), with substantially smaller proportions in the other locations (each of the remaining six areas had less than 7% of video clips). This distribution suggests that the water and woods areas are the playscape's most popular locations. In interpreting these data, note that the videographers recorded preschoolers in locations that were highly populated. These popular AOIs were also confirmed using other more systematic data methods in our study such as behavior mapping (Wight, Maltbie, and Carr 2014).

Overall, functional play was documented the majority of the time (61.8%), followed by constructive play (26.4%) and then dramatic play (11.8%). There was no documentation of games with rules. Typical examples of functional play include walking in the stream, climbing up the waterfall, splashing in the water, and running across the prairies. Examples of constructive play include building or deconstructing forts in the woods, collecting flowers, and making rock piles. Finally, typical examples of dramatic play include treating rocks, sticks, and algae as food that is being

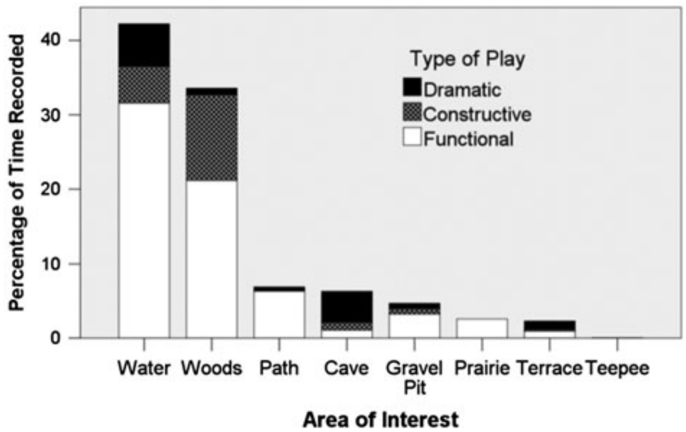

Figure 5. Percent of time for play, separated by AOI on the playscape.

collected, stored, and guarded in the cave area, while playing 'Lion King.' Figure 5 shows the occurrence of different types of play in each playscape AOI.

Regarding science inquiry, children were engaged most in observation (34.5%) and exploration (43%). Examples of observation include looking at plants, birds, worms, insects, and toads. Examples of explorations include interacting with loose parts, breaking sticks, throwing objects into the water, and looking under rocks and logs. These inquiry-related activities took place at almost all of the AOIs. Activities coded for representing/recording, on the other hand, occurred much less frequently (5.2% of the time) with most of the representing/recording being observed as children studied and referred to the site map located on the playscape terrace. Some children also collected pebbles in their pockets to represent 'medicine.' In the gravel pit, several girls were collecting and separating pebbles according to their color, referring to them as 'jewels.' Proportions of science-related activities, separately for each AOI in the playscape are shown in Figure 6.

The use of science-specific language took place 17.3% of the time and pertained to the proper naming of plants and animals, including slugs, ants, honeysuckle, butterflies, and woodpeckers. There were also some references to life concepts such

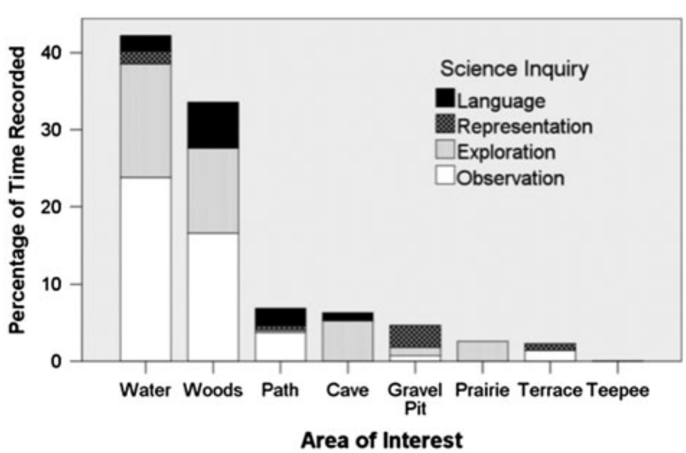

Figure 6. Percent of time for science inquiry, separated by AOI on the playscape.

living and non-living organisms. The majority of these activities took place in the woods, the water, and on the paths. One noteworthy excerpt of science-specific language use occurred during the following exchange between four preschoolers in the woods.

Child A: 'I found a slug, wanna see it?'
Child B: 'I think it's a baby, don't kill it'
Child C: 'I found an orange banana slug, it was this long but orange.'
Child D: 'It's slimy.'
Child B: 'Look, it's a yellow banana slimy slug, right?'
Child A: 'Don't move it, you're moving the slug!'
Child D: 'I don't care about slugs; they come in my garden and eat all my carrots.'
Child A: 'Don't move it, it's going to die.'
Child C: 'This is disgusting. I got orange fingers from a snail …'

Here the children properly identified and described characteristics of a slug: 'orange,' 'yellow,' 'banana slug,' and 'slimy.' Furthermore, one child drew upon prior experience, letting the others know that slugs eat the carrots in their home garden.

In another example, two children were collecting and picking plants to make a 'fire,' when one preschooler leaned in to smell a particular plant. She said, 'It smells like an onion,' and then held the top of the plant (which was the onion seed in development) toward the nose of her playmate. Once the other child had smelled it, the first preschooler proceeded to eat the onion seed, and said 'yummy.' This example illustrates a curious desire to further explore certain flora, first through smell and then taste, in the quest for proper identification.

Finally, we examined the relationship between type of play and inquiry. Specifically, we are interested in which types of play elicited which types of inquiry-related activities. Table 2 shows the respective proportions (with each type of play adding up to one). Three or four of the inquiry-related behaviors were observed during all types of play. Importantly, representing/recording and science-specific language use, the two most advanced types of inquiry-related activity, were present in two out of three categories of play.

Playground

Similar to the playscape data, the video footage obtained from the playground was not equally distributed. About half of it came from the sandpit (50.3%) and another third of it came from corn shucking in Activity-1 area (40.7%). The least amount of video footage was obtained from the bubble-blowing station in Activity-2 area (3.8%).

Table 2. Type of science inquiry as a function of type of play, separated by research site.

	Playscape			Playground		
Type of play	F	C	D	F	C	D
Behavior						
Observation	0.59	0.26	0.24	0.81	–	–
Exploration	0.19	0.55	0.67	0.19	0.78	1.00
Representing	0.09	–	0.09	–	–	–
Language	0.12	0.19	–	–	0.22	–

Notes: Types of play pertain to functional play (F), constructive play (C), or dramatic play (D).

Analysis of playground video revealed that constructive play was the most prevalent (55.2%), followed by functional (42.4%) and dramatic (2.3%) play. Again, there was no documentation of rule-based games. Constructive play was most prevalent in the teacher-directed Activity-1 area: it included cleaning the corn, separating the husks from the cob, and using a brush to remove the silks. Another example of constructive play occurred in the sandpit, where children were building mounds and placing plastic caps in between the layers of sand. Functional play consisted of bubble blowing, bike riding, and digging in the sand. An example of dramatic play was seen when children were 'making pies' in the sandpit. Figure 7 shows the occurrence of different types of play broken down by AOI.

In terms of inquiry-related activities, the two most prevalent types of behaviors were observations (39.6%) and explorations (46.3%). Observations were recorded as the children watched their bubbles blow away and pop, as they rode their bikes, and as they dug in the sandpit. Explorations were recorded during corn shucking and building sand mounds. Science-specific language use, recorded in 14% of the clips, was observed in Activity-1 area, as the children were correctly identifying the corn, the kernels, the silk, and commenting on the physical characteristics (i.e. 'juiciness') of the corn as they squeezed it. There were no examples of inquiry-related representing/recording documented on the playground (Figure 8).

The teacher who led the corn-shucking activity provided examples of science-specific language use within the playground setting. Children were introduced to terms such as 'shucking,' the corn, and 'silks' They were also provided with several small brushes to help remove the silks. One child called the silks 'hair' The following dialog between the preschool chef, a teacher, and several students highlights the children's acquisition and application of these concepts.

Child A: 'It's called silk' (speaking to other preschoolers in the group).
Child B: 'The corn is juicy' (as the child squeezes it).
Child C: 'Can we eat it … corn on the cob.'
Chef: 'After I cook it.'
Child B: 'I need the brush.'
Child C: 'This is a lot of work to get corn … look I did it by myself, now I can brush it … there … I'm going to brush it next.'

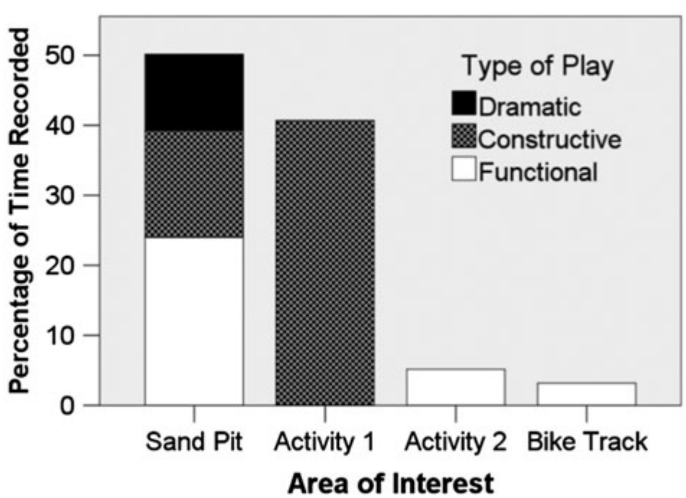

Figure 7. Percent of time for play, separated by AOI on the lab school playground.

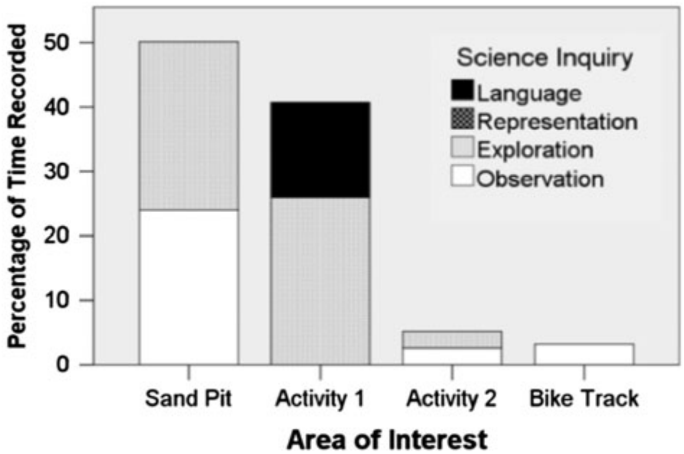

Figure 8. Percent of time for science inquiry, separated by AOI on the lab school playground.

Chef: 'This is a lot of work, which is why I was hoping you guys could help me.'
Child A: 'We can eat it.'
Teacher: 'Who is going to cook it for us?'
Group: 'Her' (referring to the chef).
Child A: 'Brush it, can I brush it?'
Teacher: 'Here, we have to finish peeling it first.'
Child C: 'I did this one by myself.'
Teacher: 'Good job.'

The quotes above illustrate the correct use of corn-shucking terminology and descriptive words such as 'juicy.' However, it is not from a child-led activity, and therefore does not speak directly to how the play environment informs the preschooler's informal inquiry.

Finally, we looked at the intersections of these two categories to examine which types of play elicited different types of inquiry-related activities. Table 2 shows the respective proportions (each type of play adding up to one). On the playground, the only inquiry-related activity documented on the three types of play was exploration. As previously noted, representing was absent in coded playground recordings.

Discussion

In this exploratory study, we sought to provide pilot data on the opportunities for science-based exploration and inquiry on playscapes, thought to be an important precursor of ecological identity and ERB. Footage of preschoolers visiting a local playscape was analyzed, using established codes for play (functional, constructive, and dramatic) and inquiry (observation, exploration, representing/recording, and science-specific language use). In what follows, we compare these playscape data to data obtained from the playground.

Comparisons across settings

Straightforward comparisons between the playscape and the playground are not without problems, for several reasons: Video footage differed in length between the two settings, our design was not experimental, and the novelty of the playscape

Photo 1. Midwestern lab school playground area 1.
Source and Rightsholder: Arlitt Child & Family Research & Education Center, University of Cincinnati.

environment, but not of the playground, was high. Furthermore, the demographics of the two groups were not the same (e.g. almost twice as many preschoolers observed on the playground vs. playscape qualified for Head Start). There is also the potential for observer bias, as our videographers were free to roam the spaces as they saw fit. We therefore offer only a preliminary comparison to address the questions of whether playscapes elicit more inquiry-based activities and different kinds of play compared to typical school playgrounds.

When considering children's type of play, there was a difference in the proportion of the types of play across the two research sites: Functional play was the most prevalent on the playscape (61.8%), while constructive play was the most prevalent on the playground (55.2%). However, this difference is largely attributed to the corn-shucking activity: This activity elicited only constructive play, possibly

Photo 2. Midwestern lab school playground sand pit.
Source and Rightsholder: Arlitt Child & Family Research & Education Center, University of Cincinnati.

skewing the distribution of the type of play on the playground. Without this special activity, the distribution of types of play is comparable across settings (with a high level of functional play, followed by constructive play, and followed by dramatic play). Dramatic play, a more complex level of play, was more widespread on the playscape (11.8%) compared to the playground (2.3%).

Regarding the AOIs, there was a greater diversity of activity within and across the playscape. At four AOIs (water, woods, cave, and gravel pit), all three types of play were documented. By contrast, the only location where all three types of play were observed was the playground sandpit. Thus, the playscape afforded a wider variety of natural locations for play to occur.

Now consider inquiry-related activities. While the playground did not elicit any representing/recording activity, this type of inquiry was present in four of the AOIs

Photo 3. Midwestern lab school playground children and researcher.
Source and Rightsholder: Arlitt Child & Family Research & Education Center, University of Cincinnati.

on the playscape. Similarly, while science-specific language was observed at four of the eight playscape AOIs, it was observed only during the corn-shucking activity on the playground. All four types of inquiry were observed on the path and in the water at the playscape, and three types of inquiry were documented in the woods and gravel pit. Thus, there were four AOIs on the playscape that elicited at least three types of inquiry. In contrast, none of the playground AOIs had such high variability in type of inquiry: of the four playground AOIs, three of them elicited two types of science inquiry. This suggests that the playscape affords a greater diversity of opportunities to explore nature and foster inquiry.

Contributions to environmental education and research

Which site promoted more ERBs? Our study suggests that the playscape offered a wider array of opportunities to develop positive inclinations toward nature. For example, as described above, one child advocated for not killing the baby slug. Another example of respect for nature was documented when a child found an insect while playing on one of the wooden forts. A small group gathered around and several children exclaimed, 'I need to look.' Then a child said, 'Don't kill nature, guys' (and tried to prevent the insect from being squished as several other preschoolers crowded around).

In another playscape example, a preschooler was handling a small slug and showing it to her playmate. During this interaction, the child took great care not to harm the slug. The playmate suggested moving the slug off of the child's hand, and provided her with a stick. Using the stick as a medium, the child placed the slug onto a rock. She called it 'a baby slug,' and proceeded to show other children. Next, the children devised a plan to 'care for the slug,' and began collecting grass and small sticks to make a fire for the slug (as in to keep it warm). The preschooler who found the slug then said, 'It's so cute,' and then positioned her vest camera to take a picture of it (see End note 1).

This last example illustrates several intersections of our main concepts. In children's play, they demonstrated respect for nature (as the children cared for the slug both in moving it and building a fire), science-specific language (properly naming it), and representation (as she maneuvered her vest camera to capture the slug on video). This conclusion does not mean that similar events are absent from playground environment. Rather, it speaks more to the affordances that a playscape offers. It is noteworthy that the two most frequented locations for play on the playscape, water and woods, are rarely available in typical school playgrounds.

Summary and take-away points

Our findings are very promising; several locations on the playscape elicited the highest form of exploration and inquiry for this age group: naming parts of nature and representing information. In contrast, on the traditional playground, children demonstrated the same level of inquiry only at a teacher-led activity. The main take-away point, therefore, is that playscapes constitute an important opportunity to provide young children with environmental education and help prepare environmentally responsible adults.

While our comparisons between playscape and playground are not without limitations, it is nevertheless encouraging to see that the playscape elicited a substantial amount of inquiry-based activities within the realm of informal play. As our examples show, it is through direct contact with ants, slugs, and insects that preschoolers were able to articulate to their peers 'don't kill nature,' 'care for the slug,' and 'I think it's a baby … don't kill it.' These early encounters set the stage for future ERB, and the playscape environment affords these important early childhood opportunities. Environmental educators can use these findings to further advocate for children's access to nature-oriented play areas.

On a theoretical level, our study adds to the conversation of how to promote ecological identities and ERB in young children. Traditionally, there is heavy reliance on formal classroom education to promote environmental literacy and conceptual knowledge (Kollmuss and Agyeman 2002; Wilson 1997). However, there are opportunities of informal learning in outdoor natural settings (Dillon 2003; Gough 2002). Our findings underscore this sentiment. Given young children's innate curiosity, excitement for discoveries, and abilities to learn about their natural environment anywhere, educators need to capitalize on both informal and formal learning environments to strengthen environmental education.

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Note

1. Each vest was also outfitted with a Veho muvi™ Pro mini video camera, in order to capture the child's viewpoint and their language use. However, the video and audio footage recorded by the mini cameras was not usable and thus is not discussed here.

Notes on contributors

Alan Wight has an MA in Sociology and is a PhD candidate in Educational Studies at the University of Cincinnati. He is an environmental sociologist and educator who study the Human–Earth relationship. His research agenda focuses on raising people's 'food consciousness,' by dialoguing about the personal health, economic, and larger ecological implications of our food system. He has worked as a market gardener growing food for a Community Supported Agriculture program to help communities and schools reintroduce sustainable agriculture into our daily lives. His dissertation research examines the types of learning and education that occur within the community-supported agriculture context. He is also interested in helping schools develop and modify their existing playgrounds to include more natural elements. His recent publications include Food Mapping: a psychogeographic method for raising food consciousness and an entry in the Encyclopedia of Action Research on Agriculture and Ecological Integrity.

Heidi Kloos is an associate professor at the Department of Psychology, McMicken College of Arts and Sciences, the director of the Children's Cognitive Research lab, and a member of the Center for Cognition, Action, and Perception (CAP) at the University of Cincinnati. She has a PhD in psychology from Arizona State University, with a focus in cognitive development and learning. Her research interests are in the area of children's learning about physical concepts and changes of misconceptions. She also has expertise in learning theory, cognitive development, complex systems theory, and the process of knowledge acquisition. She regularly publishes in experimental journals, and recently, she co-edited a volume on Children's Learning and Cognition.

Catherine Maltbie is a research associate at the University of Cincinnati, and has a joint position in the College of Education, Criminal Justice, and Human Services Evaluation Services Center and the Arlitt Child and Family Research and Education Center. She has 15 years of experience evaluating educational programs and projects funded by national agencies, state agencies, and foundations, most recently evaluation activities focus on STEM education in both PK-12 and higher education settings. Her research goal at Arlitt is to work with the early childhood researchers and practitioners to develop a center-wide research agenda that focuses on the continuous improvement of the educational practices leading to high quality student outcomes. She is especially interested in the cognitive and social effects of implementing new pedagogies in formal and informal educational settings.

Victoria Carr is an associate professor in Early Childhood Education and Human Development at the University of Cincinnati, and is a director of the Arlitt Child and Family Research and Education Center where she serves as executive director for the Head Start Delegate program at the laboratory preschool. She is co-founder of the Nature Playscape Initiative and Senior Editor for Arlitt Instructional Media. She studies teacher efficacy, children with challenging behaviors, and outdoor environments for play and learning. Her research on informal science learning in playscapes was supported by the National Science Foundation. Currently, she is expanding that playscape research to include a focus on additional aspects of early development and learning, including environmental education and social interactions.

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