Designing an outdoor learning environment for and with a primary school community: A case study in Bangladesh

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Abstract

In Bangladesh, school grounds are usually barren areas devoid of any designed features. This study explored children's, teachers' and parents' views of what would constitute an effective school ground for learning, socialising and play at primary schools in rural Bangladesh. Working within the theory of behaviour settings to design school grounds, several methods were applied: focus groups with children, teachers and parents, a drawing session with children and a child-led/teacher supported model-making workshop. The results suggest that children want to connect with nature, to explore their environment, to challenge themselves, to be physically active and to socialise with friends. They also wanted their school ground to be more attractive. The parents highly valued gardening whereas teachers preferred an area with loose materials where the children could learn by themselves. None of these ideas were mutually exclusive and the subsequent design was able to incorporate elements from all groups.

Keywords: primary school ground; children's preferences; learning; loose materials; teachers' views; affordances; behaviour settings

Introduction

Over half a million children globally drop out of school, the rate being pronounced in developing countries (UNESCO Institute for Statistics & UNICEF, 2015), in part through a lack of stimulating learning environments, both indoor and outdoor. An effective outdoor learning environment that can fulfil children's developmental needs and foster enjoyable learning experiences, may help to motivate children to stay in school. In Bangladesh more than 10 million children receive primary education in 38,033 Government primary schools (BANBEIS, 2015). The poor classroom environment of rural primary schools provides few affordances for innovative teaching and learning (Khan, 2009; Khan, McGeown, & Islam, 2018). School grounds also tend to have unfulfilled potential for effective teaching and learning. To date, guidance on the design and use of school grounds for learning is neither readily available from practice nor generated from empirical research, resulting in poor quality outdoor spaces (Nicol, et al 2007). Although Nicol et al's research pertains to Scotland, this situation is universal (Khan, 2017).

While considerable work has focused on the design and quality of classrooms (Barrett, Davies, Zhang, & Barrett, 2015), the outdoor school environment has received comparatively little attention (Armitage & Burke, 2005). One possible explanation for this may be the popular belief that learning happens indoors and is separate from play. However, it can be difficult to distinguish learning and play in young children. In this study, learning refers to learning of the curricula under the direct supervision of teachers, while play refers to informal learning that happens in the school ground outside teachers' supervision. In order to develop school grounds as effective places for learning and play, it is useful to not only draw upon existing theory and research, but to listen to the principal stakeholders of that environment – the children, teachers and parents. The study reported here was conducted as part of the development of a primary school ground in Tuatoli, Bangladesh, where the authors worked collaboratively with children, teachers and parents to develop a design which met their needs.

The impact of the outdoor environment on children's learning, health and well-being

Following growing concerns in the developed world about children's increasingly sedentary behaviour and an appreciation of the positive influence of the natural environment on health and wellbeing, there has been an increase in research on children's outdoor environments (Adams, 1990; Fjørtoft & Sageie, 2000; Fjørtoft, 2004; Titman, 1994). Exposure to outdoor environments in schools has been found to have an impact on children's attention restoration and recovery from stress (Bagot, Allen, & Toukhsati, 2015; Chawla, Keena, Pevec, & Stanley, 2014; Kelz, Evans, & Roderer, 2013). In several studies in the USA (Lieberman, Hoody, & Lieberman, 2000, 2005) and the UK (O'Brien, 2009) it has been found that children showed improved achievement in cognitive and affective domains when nature is used as an integrated context for learning. Learning in the school ground may also enhance children's botanical knowledge, science conceptions and mathematical skills (Cronin-Jones, 2000; Harvey, 1990; Maynard, Waters, & Clement, 2013). Finally, children have been found to be more engaged in their studies and attain better test scores after being taught in an outdoor classroom as part of a quasi-experimental study conducted in Bangladesh (Khan et al., 2018).

School grounds with access to nature provide more opportunities for physical activity, play and environmental learning (Dyment & O'Connell, 2013; Fjørtoft & Sageie, 2000; Herrington et al, 1998). Children are often attracted to features of the environment which may have many possible functions, such as to sit on or step in (Ward-Thompson, 1995). This can be explained by the concept of affordances, those possibilities that an environment has to offer for the user and which are independent of their perception or capacity (Gibson, 1979). Heft

(1988) derived a functional taxonomy of affordances for children's outdoor play based solely on the physical affordances of environments. However, the concept can be extended to non-physical affordances (Kyttä 2004), for example for socialising and learning. Closely related to the concept of affordance is the theory of behaviour setting which Barker (1968) defined as ecological units where the environment and behaviour are linked in time and space. The concept of behaviour settings has been used for analysing human behaviour in diverse environments (Moore & Cosco, 2007). It has been used by Refshauge *et al.*, (2013) to identify the settings in the design of a playground in Copenhagen. This can enable the identification of specific behaviour settings in, for example, school grounds and their association with children's activities and learning.

Children's participation in research and design

Participation by children in research concerning them and in the design and planning of places for them to use (such as playgrounds) has attracted increased attention (Francis & Lorenzo, 2002; Samborski, 2010). The United Nations Convention on the Rights of the Child stresses engaging children in design of spaces concerning them : *'State Parties shall assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child...'* (UNICEF, 1989, p.5). These perspectives have influenced national policies too; Bangladesh's National Child Policy (2011) states: *'The opinion and participation of children in all programmes shall be stressed for ensuring child rights and development in the agencies/institutions which are involved with this issue'*(MoWCA, 2011). Children can participate at various levels in the planning and design of places; the degree of participation depends on adults' views of children, their knowledge and experience (Francis & Lorenzo, 2002; Khan, 2018). Children's spaces are often designed from adults' perspectives, whereas children's views of landscape are very different (Sebba, 1991). This study therefore adopted the proactive approach of children's participation (the "seventh realm of participation" of Francis & Lorenzo, 2002) relying on the opinions of both children and adults, in this case the students, teachers and parents of the school.

Children's preferences for different elements in the school ground

When designing a school ground for children's learning it is necessary to focus both on what children want in the space and on how they perceive and actualise the affordances it offers. Studies have found that young children value the outdoors for physical play with friends and for environmental learning (Cosco, 2006; Fjørtoft & Sageie, 2000; Malone & Tranter, 2003), while adolescents associate good health with spending time outdoors (Woodgate & Skarlato,

2015); thus both children and adolescents associate positive experiences with the outdoors.

Children's preferences for different elements in the outdoor environment have been found to vary little with respect to context. Christidou and colleagues (2013) examined children's views and preferences in a Greek primary school where most children (approximately 80%, aged 9-10 years old) wanted more green space, trees and plants, while the second most popular suggestion was a bigger playground for ball games. In a project to elicit design ideas for two primary schoolgrounds in Scotland, climbing equipment/trees were most desired by children, followed by an area for running, places to sit and vegetation (Ward-Thompson, 1995). However, younger children (three to four years old), in a study of day care centres in Australia (Nedovic & Morrissey, 2013) expressed more interest in plants, rocks, trees and other organic materials in their garden than manufactured materials and equipment.

Children's desires and preferences are influenced by their developmental needs, physical and social factors and gender (Aziz & Said, 2012). Children want areas where they can explore (Malone & Tranter, 2003; Noradahl & Einarsdóttir, 2015), be connect with nature (Christidou et al., 2013; Jansson, Gunnarsson, Mårtensson, & Andersson, 2014; Noradahl & Einarsdóttir, 2015), be physically active (Bland & Sharma-Brymer, 2012; Christidou et al., 2013; Merewether, 2015; Noradahl & Einarsdóttir, 2015) and socialise with their friends (Clark, 2007; Merewether, 2015; Noradahl & Einarsdóttir, 2015). Younger children also prefer places where they can engage in imaginative or pretend play (Clark, 2007; Merewether, 2015; Nedovic & Morrissey, 2013). Nevertheless, many of these themes are interdependent and are desired at the same time in a single space. The aesthetics or beauty of the school ground setting is also a quality desired by young children (Noradahl & Einarsdóttir, 2015). What seems to be missing from previous research is clarification of the design features which can be used for formal curricular learning as well as, or instead of, play.

Children's perspectives have been sought in some studies of school grounds as play spaces, but few have explored their preferences for outdoor learning. Moore and Wong (1997) reported interdisciplinary action research in an elementary school in California, where an asphalt playground was transformed into a diverse outdoor educational setting with the involvement of children, teachers and the community. The authors also provided general guidelines for planning outdoor learning environments. The present study takes a step forward from previous research by involving all the stakeholders in the design of a school ground to foster teaching, learning and play in combination.

Aims and Objectives

With the focus on how an outdoor primary school environment can be designed to accommodate teaching, learning and play, the study aimed to explore the views of children, teachers and parents in the design of a school ground. The research addressed four questions −

1) What are children's preferences for activities and elements in a school ground?
2) What elements do teachers find helpful in a school ground for teaching purposes?
3) What elements do parents think should be in a school ground to attract children to school?
4) Which elements could be included in a school ground to support children's learning and play?

Methodology

Participants and study setting

The study was conducted with 29 children (16 girls and 13 boys), nine teachers and five parents in a rural Government primary school in Bangladesh. Children between the ages of 8 and 12 were included, as at this age children explore their environment and develop their own preferences for places to use and activities to perform (Aziz & Said, 2012). They also have the cognitive and language skills necessary to engage in the research process (Greig, Taylor, & MacKay, 2007). Government primary schools in Bangladesh are all built to a basic standard design ─ a simple single storey building with several classrooms and an office. Almost all schools have a small open space – the school ground –which normally lacks any designed features and is not used for any curricular activity.

Methods and data collection

Three methods were applied in the study: focus groups, including drawing activities, with the children; focus groups with teachers and parents; a model making exercise with children and teachers. Ethical approval was granted by the University of Edinburgh and permissions were also obtained from the headmaster and the parents to record, photograph and video-record the children during the research; they were assured that all data would be anonymised. It is important to gain assent from the children themselves to participate in the research (Dockett et al., 2009, Mahon et al., 1996), which was done at the beginning of each activity.

Each focus group comprised four or five children to ensure everyone participated in the discussions (Krueger & Casey, 2009). Six focus groups with

children, including the drawing tasks, were conducted. The discussion in each group started by asking children about their daily use of the school ground. They were asked whether it was used for any formal learning and if there was any scope for it to be improved. They were then asked to make a combined drawing of their ideal school ground: what would they like to have in it for learning and play? What activities would they like to do with their peers and/or alone? At the end of each session, the children explained what the drawings meant to them and why they drew them.

Two focus groups with teachers (four in one session and five in the other) and one with parents (five) were held. They were asked the same questions as the children. However, the focus groups with teachers emphasised elements which could be installed to help them teach curriculum subjects. At the end of each teachers' focus group the elements they suggested were grouped into learning areas following the theory of behaviour settings (Barker, 1976), after which the teachers brainstormed possible locations of all the settings on the school ground.

Finally, in a child-led model making workshop, teachers and children worked together to build a model of the school ground. Five children (three girls and two boys, elected as representatives of the focus groups conducted earlier) and two teachers participated. The children were provided with a variety of materials (e.g. cardboard, coloured paper, egg boxes, sticks, leaves, twigs, small toys, cork sheets and foam boards); some materials allowed great flexibility in their use (e.g. clay and thick foam boards) so that the children could try different methods. The children were asked to build their ideal school ground for learning and play on a model base of 1:50 scale. They could discuss and make things which they had already drawn or devise new things out of the materials provided. They were also asked to consider where in the school ground those elements should best be located. Though the principal performers were children, there was some negotiation between children and teachers about the location of some settings.

Data analysis

The qualitative data generated from the focus groups with children, children's conversations during the drawing and model making activities and the focus groups of teachers and parents were subjected to thematic analysis in order to capture the complexities of meanings (Guest, MacQueen, & Namey, 2012). The data were analysed by combining the matrix and template process within the thematic analysis (King, 2010), through which the main themes elicited were presented hierarchically.

A quantitative analysis of the number of different elements included in children's drawings followed Christidou et al. (2013) in providing 'a measure of the complexity and accuracy of children's visual representations' (ibid p. 63). The percentage of different elements out of the total number in the drawings from six separate sessions gave an indication of which were the most preferred. The analysis of the model making exercise included a thematic analysis of children's and teachers' conversations and a content analysis of the model prepared by children and teachers.

Results

Elements of school ground in terms of affordances

From the analysis of all research activities, six main themes emerged. The children's drawings revealed themes based on their desire for elements to be functional for both play and learning.

1) Natural learning area ─ to connect with nature, to explore and to learn from nature

The children drew different trees, such as large shade trees and fruit trees; flowering plants and grass and various animals such as birds, fish and butterflies. This demonstrated their desire for nature. Around 20% of the elements in their drawings were these natural elements with flowering plants representing 52%, fruit trees 16% and shade trees 32%. Teachers suggested that as the school ground was not large enough for a small woodland, a green fence or hedge could be an alternative. Children wanted large trees to be able to play in the fresh air under their shade. According to the teachers, besides shade, trees and plants are valuable for teaching science: *'Most contents of the science curriculum are related to nature - learning about animals and plants' (Science teacher).*

Children also spoke of learning about different plants. The drawings revealed their awareness of plants' capacity to attract wildlife (e.g. butterflies, birds and bees); one girl showed her understanding of this relationship by drawing a beehive and bees in one of the trees (see Figure 1). Children showed preferences for plants with which they can interact ─ picking flowers and fruits or smelling the fragrance of flowers.

Figure 1: Children's drawing of the school ground showing interdependence of plants and animals

Further aspects of the natural environment were rivers or ponds with fish, boats and water lilies. 8% of the drawn elements were water bodies to explore and enjoy: *'I want to play with fish and ducks in the water' (Girl 2)* (see Figure 2). According to the teachers, a waterbody in the schoolyard would not only be enjoyable and entertaining, but also educational. It has the potential to teach children about the flow of water and the water cycle.

Teacher Ms R: *Children love water*

Headmaster: *It would be really wonderful if there was a waterbody in the schoolyard. We did not consider it before.*

Maths teacher: *Children can learn buoyancy easily.*

Headmaster: *They can learn about gravity and flow of water if we can use water tubs of differing height.*

Science teacher: *Children themselves can put fish and plants into water and observe how fish live in water.*

Figure 2: A drawing showing children exploring natural and manufactured play elements and engaged in solitary play or in groups

2) Gardens – growing for aesthetics, imagination and agency

Children associated gardens with aesthetics of their school environment. 13% of the elements of children's drawings included flowers and floral patterns and

more than 50% of plants were flowering varieties; all drawn using bright colours. The teachers had the same opinion as the children: *'The beauty of the school will increase. This will not only enlighten the children but also enrich others.'* Alongside aesthetics, being able to explore and interact with different species was also important to the children. While adorning themselves with flower ornaments children wanted to engage in pretend play with their friends.

Girl 1: *The school would be beautiful if there was a flower garden.* (while drawing a garden, see the drawing)
Girl 2: *We can come inside the garden, sit under a flower plant and have fun. We can play, play tag and chase with our friends. We can play with flowers. We can wear flowers in the ears.*
Researcher: *Do you think there is any educational benefit of the garden?*
Girl 4: *I think so. We can learn how to grow plants and take care of plants.*

Figure 3: A child's drawing of the school ground having a fenced flower garden

Children's conversation indicates their awareness of the educational benefits of a garden in the school ground. According to teachers, gardening would bring benefits to children in two ways. Firstly, engaging children in growing plants can make them motivated towards learning: *'The children will participate. They will have fun this way' (Science teacher).* The parents also agreed: *'When we were kids we used to do gardening in school. There were more opportunities for fun in the school through different activities which is rare nowadays. I think that is a reason for losing children from school. There should be gardens in school*.*'* Secondly, the children would be able to learn through this process, '*Students can be engaged in sowing seeds, so they can learn how plants grow from seeds' (Maths teacher).* Most children in rural primary schools come from a farming background, where knowledge of sowing seeds and planting is important.

3) Play area and play objects ─ being physically active

Children wanted playground equipment like swings, slides, see-saws and different animal figures to ride on; swings appeared the most frequently, followed by slides. 12% of their drawings included some type of play equipment.

Most of the children did not know the names of equipment like a slide or see-saw and tried to explain them by describing how they are used, indicating the fascination of rural children in developing countries for equipment which they generally do not have in schools or parks but might have seen in television or when they visited towns.

This was echoed by parents who found the Government primary schools in Bangladesh lacking sufficient opportunities or elements to keep students in school: *'The school lacks play equipment that can keep students there. My child wants to go to the private school – they have a slide and swings' (Mrs T).* According to teachers, providing playground equipment can help ensure that children stay in school all day: *'There must be something to attract children, so that they don't leave school during the lunch break. The playground equipment can be there for their recreation' (Headmaster).* Though the playground equipment is not directly related to learning, the teachers thought it necessary for children's physical development and school retention.
17% of the drawn elements were objects used for organised rule and folk games played individually or in groups. Play objects e.g. footballs, cricket bats and balls, rackets, shuttlecocks and nets indicated their desire to play team games with rules. The children also drew playground markings for hopscotch and *dariabandha*[1] in the open yard. The teachers also wanted a designated space for daily assembly and physical education classes. From conversations with children it emerged that they read about different folk games in a text book: *'We can learn how to play different games,' (Boy 1)*.

4) Places to be with others and places to be alone

12% of the drawing elements showed children, emphasising the fact that they are the principal users of the school ground, playing singly or in small or large groups. Children wanted equipment which allowed two or more children to play together and their drawings of different rule games in the open yard included four or five children (see Figure 2).

While children mostly mentioned activities they could enjoy with friends, they also felt the need to spend time alone or with friends in an intimate place, as indicated in Girl1's explanation of the house she drew, *'I want to read story books in the house... I want to chat with my friend inside the house too.'* This was echoed by teachers who thought it was important to have a quiet place where a child can take refuge if tired or needing time out: *'If someone wants to be alone or to be in a quiet place [they] can go here and contemplate.'; 'A place*

[1] *Dariabandha* is a court game involving two groups of players. The court is drawn on the ground where each of the players from one group stand inside the court and try to stop the players from the opposite group from passing through.

is needed for them to sit outside… There is no place in the school ground where children can sit and chat after coming to school.'
The teachers suggested that: *'It would be really beneficial if there is a gathering area. Sometimes we can take a whole class there' (Headmaster).* Teachers suggested that an outdoor classroom could have a platform for children to present their work and a blackboard for displaying their work. *'This is necessary to build leadership quality in children,'* said the headmaster. The teachers also suggested that the outdoor classroom could also be used for *ma somabesh* (mothers' meeting) or a book award ceremony.

5) Area with loose materials ─ imagining, building and learning by themselves

The children wanted manufactured and natural loose materials for imaginative and pretend play. One girl wanted plastic ducks and fish in the small water body. The teachers also found loose materials useful for teaching maths and science; they thought they could use these materials in a designated area outside where children could be creative and build things. The headmaster suggested that the area for loose materials be called the "self-learning area" as *'children can learn here by themselvesoutside class hours.'*

6) Bringing all themes together ─ rich and diverse elements to arouse curiosity

The teachers considered that most children's school experiences are boring, lacking any variation or surprise: *'There is nothing new in their school experience. They come to school, have their classes in the classroom and go back home. There is nothing here to attract them'.* They emphasised that a school ground should be rich in different elements to arouse curiosity and encourage children to explore; as the maths teacher said: *'A child should feel "I want to come here and discover what these things are"'.*

Layout of the school ground

The precise layout of a school ground and the location of different elements and settings depends on its size, shape and existing features. During the model-making both children and teachers negotiated their points to ensure a satisfactory final version of the school ground. For example, the children initially placed the flower garden in the middle but their teacher suggested that they might like to have the fragrance of flowers indoors. The children liked this idea and moved the garden nearer their classrooms. Analysis of the model-making exercise revealed that children were more concerned about the individual elements rather than the overall layout. They made play equipment, gardens, seating and shelters with care and utmost detail; one girl even made food for the hens and ducks they wanted to have in the school ground (see Figure 4).

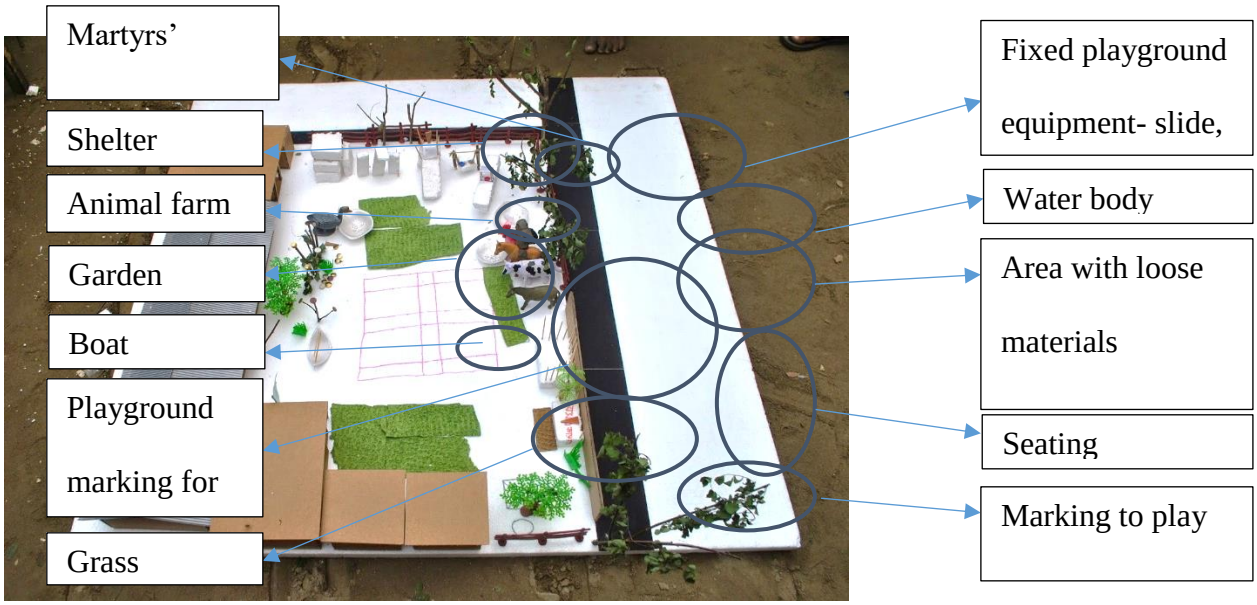

Figure 4: The model of the school ground developed through child-led model making exercise

Identification of Behaviour Settings

All the elements extracted from the above findings were grouped according to their functionality and landscape characteristics based on the theory of behaviour settings. The elements were grouped under eight primary types: a natural learning area, gardens, an outdoor classroom, a water area, a loose materials area, an open yard, huts and a play area with a path to connect them. Figure 5 shows the as built drawing of the school ground as a combination of these behaviour settings. A summary table (see Table 1) was prepared with the associated affordances of these behaviour settings for learning and play.

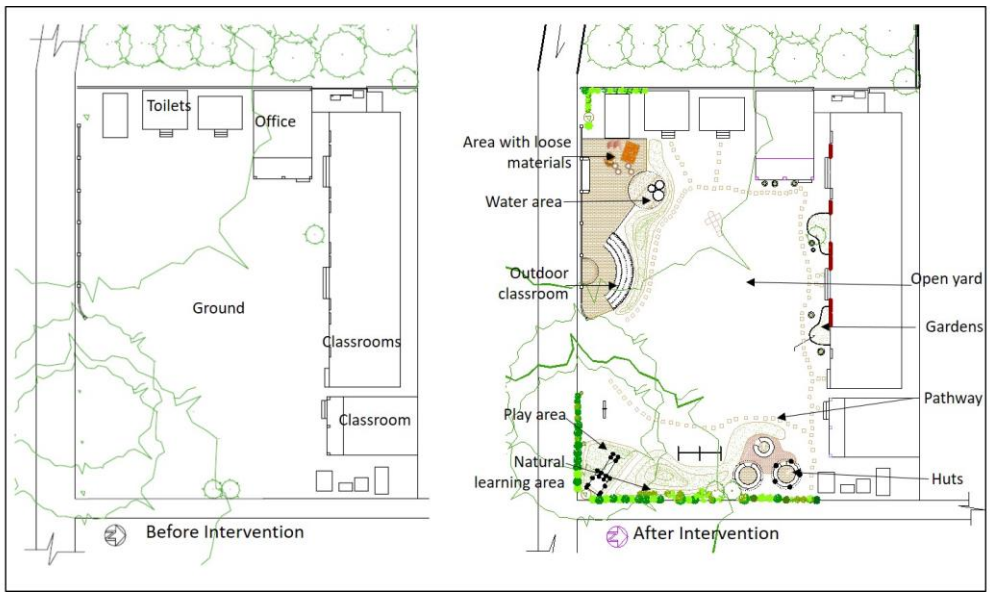

Figure 5: The plan of the school ground, before and as built

Table 1: Behaviour settings in the school ground with their affordances

Sl	Settings	Elements	Affordances for play	Affordances for learning	Functional Taxonomy of children's outdoor environment (Heft, 1978)
1	**Natural learning area**	Trees Plants Grass	Exploring Connection with nature	Collecting leaves for counting Learning about interdependence of plants and animals Building knowledge of plants and trees	**Non-rigid attached object** Swinging on
2	**Gardens**	Garden with seasonal vegetables, medicinal and ornamental plants Compost pit Tyre garden	Connection with nature Enjoyment of beauty or aesthetics Interaction with peers Pretend play/dramatic play	Participation in the process Building knowledge on how plant grows from seed, gives flower and fruits and reproduces Knowledge of different types of plants Learning about interdependence of plants and animals	
3	**Outdoor classroom**	Seating Platform/stage Display/blackboard	Interaction with peers and teachers Sitting on Meeting of teachers and parents/community people	Context for learning through interaction with peers and more mature adults in any area of curriculum	**Attached object:** Sitting on Jumping on/over/down/from
4	**Water area**	Water tubs Fish Water plants	Connection with nature Pretend play/dramatic play ─ floating objects Exploring ─ swimming, diving, boating, fishing	Learning water cycle Learning life cycle of aquatic plants and animals Learning pressure and flow	Splashing, pouring Floating objects Swimming, diving, boating, fishing
5	**Area with loose materials**	Plastic play materials, fruits and play stuffs made of clay, marble, seeds, tennis ball,	Role playing Building of things Learning by oneself (through working on objects)	Collecting loose materials and learning numeracy ─ addition, subtraction, multiplication and division	**Graspable/detached object** Drawing, scratching Throwing Hammering, batting

		different models made of wood, animal figures	Lateral learning (from other kids playing nearby) Construction of objects Painting		Spearing, skewering, digging, cutting Tearing, crumpling, squashing Building of structures
		A store for loose materials		Learning about different soil type	**Mouldable material: dirt, sand** Construction of objects (e.g. pottery) Pouring Sculpting
6	**Open yard**	Smooth surface Playground marking for hopscotch	Rule games Assembly/physical education Plays that use marking Physical development through running, walking, cycling	Learning numeracy from playground markings	**Flat, relatively smooth surface:** Walking, running Cycling, skating, skateboarding
7	**Play area**	Swing Slide See-saw Gymnastic ring	Physical development/exercise/mastery Sliding/passage from one place to another Swinging Attracts children to school	Informal learning	**Climbable feature:** Exercise/mastery Looking out from Passage from one place to another
8	**Huts**	Sheds Seating	Taking protection from adverse climate Refuge or contemplation Interaction in an intimate scale	Context for working in groups on curriculum contents	Microclimate Prospect/refuge Privacy
9	**Path**	Stepping stones	Movement from one place to another	Learning numeracy from inscription on stepping stone	Locomoting from one place to another Looking and listening into adjacent place

Discussion

The children who participated in the study clearly value outdoors and appreciated a well-designed outdoor environment for a range of learning opportunities, especially as the poor indoor environment may limit their learning. The study was conducted in a school in rural Bangladesh, where the diverse surrounding countryside provides a stark contrast to the dull school environment, which may deter many children from going to or staying there. An inviting outdoor environment with shady trees and attractive plants being desirable by children accords with previous research (Clark, 2007; Tranter & Malone, 2004). The children who participated in this study valued natural features for both physical comfort and opportunities to explore and connect with nature, echoing findings by Merewether, (2015) and Noradahl & Einarsdóttir (2015).

The teachers also recognised many affordances of natural elements for teaching science and other curriculum content. This opportunity, not always fully explored, has also been found in Europe and the USA (Dismore & Bailey, 2005; Moore & Wong, 1997). It is a particularly relevant finding, since design of outdoor environments is often given little attention, considered as places only to release energy (Malone & Tranter, 2003).

We found that children wanted an attractive outdoor environment. Children's aesthetic fascination has not received much landscape research attention, although Billmann-Mahecha & Gebhard (2009) and Titman (1994) reported that children find flowers necessary for aesthetic (beautiful), atmospheric (smelling nice) and restorative reasons (making people happy). The affordances of gardens for learning by sowing seeds and growing plants have been researched by Graham et al (2015). Dewey (1963) defined this as experiential learning, meaning learning through experience and experiment. In addition, using the school garden as a place for teaching the curriculum can influence children's academic performance positively (Berezowitz, Bontrager Yoder, & Schoeller, 2015).

The children's interest in playground equipment and play objects relates to the developmental needs of this age group (8-12) and the importance of both natural and built features in their environment (Noradahl & Einarsdóttir, 2015). Schoolyards designed with a focus on environmental and curricular learning should not ignore children's desire to be physically active. School-aged children of 6-12 years develop an interest in rule games and pretend play (Bell, 2008) and wish to be social and interact with others, also echoing findings by Ward-Thompson, (1995).

While children showed their desire to be with others, they also sought opportunities to be alone, which accords with other evidence for the need for smaller-scale, more intimate places in children's outdoor environments, where they can reflect and relax either alone or with friends (Malone & Tranter, 2003; Noradahl & Einarsdóttir, 2015). The findings also reflect children's innate interest for imagining, building and constructing in their outdoor environment, as found by Merewether, (2015). Pretend play is important for the development of intelligence, creativity and social skills (Malaguzzi, 1993) and the provision of natural elements and loose materials can increase opportunities to be imaginative and creative (Malone & Tranter, 2003; Moore & Wong, 1997). Variation and diversity can be created by providing loose materials or 'loose parts' (Nicholson, 1970).

An effective outdoor learning environment is thus one which provides children scope to connect with nature, explore, participate, be physically active, be with others, contemplate, imagine, create, learn and build. Thus, the emphasis should be on creating a mixed outdoor environment including both natural and man-made features providing diverse affordances for children, as proposed by Cosco (2006) and Noradahl & Einarsdóttir (2015). It is also important to note that a single setting can supply several affordances, e.g. a water feature can offer opportunities to learn, play and socialise. A range of educational benefits provided by different settings such as a natural learning area, an area with loose materials or gardens were also reported by children, teachers and parents participating in the study. Table 1, showing affordances for functional, social and cognitive activities, can be used as a checklist for designers creating outdoor learning environments for children. The possibilities of different settings identified in the table can be termed "learning affordances" or "cognitive affordances"; this taxonomy may be developed further in order to understand the full potential of an outdoor environment for children's learning.

The novelty of the study is its use, for the first time in Bangladesh, of modelling for understanding children's preferences for elements and how they might be arranged in a school ground. This yielded useful information for designers. While drawings by children is an established method, employing it within a focus group liberated children's ideas and triggered greater discussion among them. Additionally, involving teachers in the design process from the beginning created the opportunity for them to consider the potential teaching-learning affordances of the same outdoor environment. While some teachers might intuitively see the potential of the environment, others may not (Horne-Martin, 2006).

It is important to note that the study was conducted in a single rural primary school. The preferences of children in an urban school within Bangladesh

might be different. Nonetheless, the school was typical of all Government primary schools, so the findings might be broadly applicable. In addition, the findings may lead to greater discourse about the design and development of children's outdoor environments in educational settings.

Conclusions

Creating appropriate outdoor environments is crucial for children's learning, and of particular importance in contexts where indoor environments are relatively poor. Having considered the benefits of outdoor environments for all ages, but particularly children, this study set out to explore what elements of a school ground offer opportunities for learning and play, as identified by different groups. This exploration was non-linear and complex; however, using the theory of behaviour settings and concept of affordances, it was possible to frame the inputs from three different groups (children, teachers, parents) for design. At the same time, answers to the different research questions help distinguish the views of these different groups.

With regard to children's perspectives, children wanted to connect with nature and explore and learn from elements of nature; imagine, create and build; be physically active, socialise and be alone. They also wanted their school ground to be aesthetically attractive. With regard to teachers' perspectives, teachers felt that the science and mathematics could be taught effectively using elements of nature (e.g. buoyancy and the water cycle from water features) and loose materials (e.g. numeracy), and gardening (e.g. knowledge of plants) . They also found settings that afford interaction with others helpful for collaborative learning. With regard parents' perspectives, parents suggested that gardens and play equipment can offer children opportunities to connect with nature and be physically active, thus attracting them to stay in school.

The final research question examined the feasibility of a transformed school ground developed by stakeholders and informed by theory and research. We argue that a school ground designed as a combination of different behaviour settings comprising a mix of natural and manufactured elements and providing many affordances, may enhance children's experience of learning and play.

Participatory research which involves engaging children and teachers in the design of the space of which they are the principal users, is vital to create an effective user-friendly outdoor environment combining learning and play. By working with adults in the decision-making process, children can learn how to compromise and convince others. The voices of children from a context completely different to that of other research (mostly conducted in the developed world) told us that their preferences are universal. Therefore, guidance emerging from this research could be applicable to other primary

schools and provoke discussion around the design of outdoor learning environments in other contexts.

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