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Nature Playgardens as Sites for Early Childhood Education in a Tropical City

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ABSTRACT

Educators' perceptions play a crucial role in shaping children's experiences. This exploratory study aimed to gather feedback from preschool educators who had conducted lessons at a natural play space in Singapore. The study site, known as a Nature Playgarden, is a green space within a public park. Created mostly with natural materials, the Nature Playgarden offers a fun and enriching learning environment for children. Six preschool centers located within 10 kilometres radius of the site, consisting of 13 educators and 108 children, had lessons there. During the study period, a total of 22 sessions were carried out and data capturing educators' reflections of the children's outdoor experiences was collected after each session. The educators reported that the natural environment in the Nature Playgarden stimulated children's imaginations and encouraged exploration. The site offered affordances that supported children's wellbeing, social interactions, connection to nature and other aspects of children's learning. Additionally, the educators personally appreciated the site's natural surroundings and sense of calm.

Keywords**:** nature play; affordances; outdoor learning; educators' perceptions; preschool education

Early childhood is a phase of major physical growth and cognitive development. During this period, a typical day for a child comprises sleep, routines, sedentary interests, and physical activities (PA). The World Health Organisation has developed an integrated 24-hour guideline on the duration of these activities: 3 hours of PA, 10–13 hours of sleep including nap time, and a maximum of 1 hour of screen media time (World Health Organisation, 2019). Undeniably, adequate PA in young children is important. It improves bone health (Carson et al., 2017) and helps to maintain a healthy weight (Pate et al., 2019). On the other hand, a high level of sedentary behaviour, particularly screen time, is positively associated with obesity (Ghasemirad et al., 2023).

Extensive research has shown that environmental factors affect a child's PA level, and hence the likelihood of the child becoming overweight. A systematic review of 20 studies conducted in China on children and adolescents showed that residing in higher-density residential areas increases the chance of childhood overweight (An et al., 2019). The same review found that having access to green spaces was associated with increased levels of PA and

reduced sedentary behaviours (ibid.). Other benefits of nature exposure in children have also been reported, such as improved vision when Vitamin D is received in sufficient quantities (Knoop et al., 2020), enhanced immunity due to exposure to natural elements such as biodiverse soil (Deckers, et al., 2021), a more relaxed mental state (Chawla, 2015), higher levels of creative thinking (Wojciehowski and Ernst, 2018), enhanced problem-solving skills, perseverance, and resilience (Elliott and Krusekopf, 2017), as well as improved cognitive, social, and emotional development (Ardoin and Bowers, 2020).

Purpose of Current Study

Notwithstanding the various reported benefits of outdoor or nature play, educators must be willing to take the first step in enabling learning outdoors. Moreover, the perceptions of educators play an important role in affecting children's experience. Hence, an exploratory study was conducted to gather feedback from preschool educators who conducted lessons at a natural play space in Singapore.

The present study was conducted in Singapore, a country that places significant emphasis on human resource development, particularly the social and emotional development of its young children (Alzahrani et al., 2019). While playgrounds are commonly found in residential developments and public parklands, there has been an increase in the number of young children with excessive screen viewing time (SVT), with nearly 50% of children under 3 years of age engaging in SVT for television, games and music at least once a week, as well as for learning and games (Yueng et al., 2020). Relatedly, high SVT may be mitigated by frequent outdoor play (Sugiyama et al., 2023). The Early Childhood Development Agency (ECDA) of Singapore therefore envisions outdoor learning to be an integral part of children's everyday life and advocates for preschool educators to incorporate outdoor learning experiences for young children's development.

Correspondingly, Singapore is slated to be transformed into a "City in Nature" where nature is restored as part of the urban environment (Er, 2021). Fostering people's connections with nature becomes key to laying the foundations for the development of positive people-nature interactions that bring about well-being benefits. National urban horticultural programs such as community and allotment gardens function as platforms for adults to engage with nature through gardening activities (Sia et. al., 2022). An initiative that targets young children is the Nature Playgardens (NPG). Created mostly with natural materials, NPGs are conceptualized based on design principles relating to the provision of play affordances, providing opportunities for a fun and enriching learning environment, and enabling users to connect with nature. Currently, there are 26 such NPGs in Singapore. They are frequently used by preschool centres in the immediate vicinity for outdoor play. The NPG initiative is funded and implemented by the National Parks Board, a government agency overseeing the provisioning and management of green spaces.

STUDY DESIGN

Study Site

The study site was an NPG in a public park established in 2019. Home to nine distinct play spaces – Sand and Gravel Play, Big Fig Adventure, Log Valley, Secret Den, Kitchen Play, Stream, Treasure Trail, Magical Woods and Singing Seeds, each play space was planned for unique play opportunities (Figure 1). The Sand and Gravel Play comprises two large pits filled with natural sediment materials of different textures. The Big Fig Adventure features a set of log cookies arranged in order of height to create an incline of stepping stones. The Log Valley is a drain decked over with wooden logs with planted shrubs on both sides, designed to encourage big physical movements. It leads to the Secret Den, which has a wooden platform shaded by bamboo where a child can sit, rest and contemplate. The Kitchen Play space has a wooden table and loose play materials (such as rice husks, small clay pellets and small wooden sticks for utensils) and is designed to encourage imaginative and interactive play. In the Stream area, a tap and hollowed out wooden planks below it creates a "stream" effect, allowing children to enjoy water play. The Treasure Trail has many fruit trees and resembles a small forest, facilitating nature exploration. It is installed with signages to help children identify different species of fruit trees. The Magical Woods is designed with clusters of trees to form a maze. Last, the Singing Seeds is equipped with instruments made from natural materials to offer a myriad of musical experiences. Visuals of some of the play spaces are presented in Figure 2.

Figure 1. The layout of the study site.

Figure 2. Examples of play spaces at the study site.
Top (Left to Right). Nature Play Garden is set in a natural environment. Log crossings across the Log Valley. A tunnel within the Magical Woods.
Bottom (Left to Right). View towards the Secret Den. The Big Fig Adventure features an incline of stepping stones made with log cookies. The Kitchen area for pretend play

Participants

Six preschool centers located within 10 kilometres of the NPG were invited to conduct lessons at the site. A total of 13 educators and 108 children took part in the field trips. Twenty-two sessions were carried out in total. All the educators, children and their parents provided consent before participating in the study.

Study Procedures

Upon enrolment in the study, the educators were given a briefing on the features at the NPG, along with suggested activities for the lessons. They were invited to pre-visit the NPG before the actual sessions with the children. The educators followed up to develop their own lesson plans, by contextualising indoor lessons for the outdoor space (such as reading a book to children outside), adapting indoor lessons to incorporate natural resources found within the garden (AB patterning exercises to sort artefacts found in the NPG) and using the natural environment as a stimulus for unstructured learning based on children's interests (allowing children to explore the garden and having class discussions based on their questions, interests, or activities as they arise).

The educators carried out the sessions between July to October 2022. All centers held four sessions during the study period except for one center which had two sessions. All the sessions took place on weekday mornings, and our research team provided transport to ferry the children from the respective center to the NPG.

Data collection

The educators provided feedback and reflections after each session through an online survey. The survey questionnaire (Annex 1) was designed to capture their reflections on the children's outdoor experiences. It comprised rating statements that covered different aspects of the NPG, namely its physical environment, potential for supporting learning, and perceived benefits for children. Educators indicated their level of agreement using scores on a scale of 1 to 5 - strongly disagree (1), disagree (2), neutral (3), agree (4) and strongly agree (5). In addition, we gathered qualitative feedback on educators' experiences by using open-ended questions.

Data analyses

The mean scores of the rating statements were computed. A score of more than 4 were considered strong agreement, 3.5 to 4 considered moderately strong agreement, 3 to 3.5 considered general agreement, and less than 3 considered disagreement. The qualitative data from the open-ended questions were analysed thematically, according to the items in the rating statements.

RESULTS

The mean scores of the rating questions are summarised in Table 1.

Physical environment of the NPG

The educators strongly agreed that its physical environment was conducive for group activities (4.07 ± 0.70) and that the play materials present, such as loose parts like leaves, twigs, pebbles and petals, were appropriate for their lessons (4.03 ± 0.52). There was moderately strong agreement that the site provided a variety of play and learning settings (3.73 ± 0.70), there were adequate features (3.72 ± 0.84), shade (3.62 ± 0.84) and sitting areas (3.58 ± 1.12).

The strong agreement on the appropriateness of the play materials corroborated with the qualitative feedback captured in the open-ended questions, with some examples described below.

"*There are a lot of natural resources around.*"

"*There were plenty of items to be found on the ground, from leaves to twigs to pebbles and petals.*"

"*There was a wide variety of nature items to collect for the lesson.*"

Table 1. Mean rating scores of various aspects of Nature Playgardens by educators

Items	Mean	SD
Physical Environment		
Conducive for small group	4.07	0.70
Appropriate play materials	4.03	0.52
Adequate variety of play and learning settings	3.73	0.70
Adequate features	3.72	0.84
Adequate shade	3.62	0.84
Adequate sitting area	3.58	1.12
Potential in supporting learning		
Supports language and literacy learning	4.40	0.46
Supports learning that leads to discovery of the world	4.38	0.45
Supports motor skills development	4.36	0.60
Contributed to the children's learning	4.26	0.48
The learning objectives of my lesson plan are achieved	4.12	0.58
Supports numeracy learning	4.11	0.61
Provides opportunities for various levels of child's physical activity	3.97	0.86
Supports learning that leads to aesthetics and creativity	3.81	0.63
Benefits for children		
Encourages social interactions between children and educators	4.37	0.56
Contributed to the children's connection to nature	4.36	0.60
Encourages social interactions among children	4.33	0.64
Contributed to the children's connection with one another	4.27	0.45
Contributed to the children's physical wellbeing	4.08	0.52
Supports social and emotional development	4.07	0.53
Contributed to the children's social wellbeing	4.04	0.52
Contributed to the children's mental wellbeing	3.94	0.65

Notes: Educators indicated their level of agreement using scores on a scale of 1 to 5 - strongly disagree (1), disagree (2), neutral (3), agree (4) and strongly agree (5). A score of >4 represents strong agreement, 3.5 to 4 represents moderately strong agreement, 3 to 3.5 represents general agreement, less than 3 represents disagreement.

Does the NPG support learning?

The educators expressed strong agreement on most of the statements related to the potential of the NPG in supporting learning, from language and literacy (4.40 ± 0.46), discovery of the world (4.38 ± 0.45), a characteristic that relates to children's everyday experiences and interactions with their environment, motor skills development (4.36 ± 0.60) and numeracy (4.11 ± 0.61). Overall, they agreed that the sessions contributed to children's learning (4.26 ± 0.48) and that the learning objectives of their lesson plans at the NPG have been achieved (4.12 ± 0.58). On

the other hand, the agreement that the NPG supported various levels of children's physical activity (3.97 $\pm$ 0.86) as well as aesthetics and creativity (3.81 $\pm$ 0.63) was moderately strong. These findings were also reflected in the qualitative feedback (Table 2).

Table 2. Qualitative data reflecting educators' perceptions on how the NPG supports various aspects of learning

Item	**Data extracts from qualitative feedback**
Language and literacy	"The children were able to describe the differences between each leaf such as 'spots', 'lines' and 'lemon shape'."
	"The NPG creates a different mood and ambience for storytelling time."
Discovery of the world	"The different facilities and different environments in the NPG allow children to have opportunities to explore."
Motor skills development	"The children were able to demonstrate movement styles in every corner of the place."
	"They moved sideways in narrow areas and jumped over big puddles."
	"The children exhibit a good sense of balance and control while performing a combination of locomotor and non-locomotor skills at varying speed and body level."
Children's learning	"The outdoor surrounding encouraged children to observe and enquire."
Numeracy	"The children were able to create repeated AB patterns using natural materials."
Aesthetics and creativity	"The children picked stones, twigs and leaves to recreate the spiral line formation on the wooden platforms."
	"They picked materials from the NPG and created appreciation cards."

Perceived Benefits on Children

In addition to supporting learning, the educators strongly agreed that carrying out lessons in the NPG contributed to their interactions with the children (4.37 $\pm$ 0.56). One educator commented that she enjoyed *"the process of looking for flowers in the park together with my children."*

There was strong agreement on various direct benefits on children, from connection with nature (4.36 $\pm$ 0.60), physical wellbeing (4.08 $\pm$ 0.52), emotional development (4.07 $\pm$ 0.53) and social wellbeing (4.04 $\pm$ 0.52). There was also moderate agreement on the contribution of the NPG to children's mental wellbeing (3.94 $\pm$ 0.65).

Educators observed social interactions (4.33 $\pm$ 0.64) and connections among the children (4.27 $\pm$ 0.45). This is supported by a qualitative comment *"I see a lot of mutual help among the children when they climb the wood frame."*

How did the Educators feel about the NPG?

When asked about whether there were any concerns about conducting outdoor lessons at the NPG, a few educators expressed concerns related to insect bites:

"I was slightly worried about the insect bites; children may get bitten."

"Some parents are particular about insect bites."

Another concern raised was fall risks caused by wet weather:

"Maybe because of the weather, some of parts of the park is wet and muddy, and the ground is a little slippery, resulting in dirty shoes."

"The wet leaves were covering the logs. As children were climbing up and stepping down, the area was slippery."

"I was worried that lesson could not be conducted due to the wet weather."

There was also the concern that the NPG may be unsettling for some children since it is a new environment:

"*My only apprehension was to consider how to support children in a space that is new to them*".

Notwithstanding the concerns, educators' sentiments towards the NPG were positive. They found the environment calming and visually appealing, with abundant variety animal life:

"*The NPG offers a relaxing place and environment."*

"*The natural environment is beautiful."*

"Seeing the living things living around the garden and surprise us: mushroom, snail, ant colony, moth etc."

One educator also stated that the place brought back fond memories of childhood days:

"Watching the children playing with the streams of rainwater reminded me of my favourite moments during my childhood."

DISCUSSION

Despite the research literature providing evidence of the advantages of nature-based play, findings in the global south are limited. This study provides preliminary insights on the perspectives and experiences of educators regarding outdoor learning in the geographical region. Overall, the results corroborated much of the positive findings from studies carried out in other cultures and contexts.

According to the theory of affordances (Gibson, 2014) on child-environment interaction, an affordance is what the environment offers an individual and what it provides or furnishes. The study provided strong evidence that the physical environment of the NPG stimulated children's imaginations and encouraged exploration, through its variety of nature play features that incorporates the use of natural materials. Natural environments can be beneficial for children's learning and development. The findings showed that the educators agreed that the natural environment in the NPG supported various aspects of children's learning. A previous study, which compared the quality of communication between parents and preschoolers in natural and indoor environments, found that children were significantly more talkative in the natural environment, with significantly longer parent-child connected communication episodes (Cameron-Faulkner et al., 2018). In the same vein, educators in the current study found that the children were able to describe what they had observed, and the environment provided a supportive ambience for storytelling.

Larrea et al. (2019) reported the importance of available affordances in the outdoor environment for children's play, learning and social interactions. Overall, the findings from the study demonstrated good affordances in the NPG and

support the conclusions drawn from previous studies, including contribution to children's wellbeing, social and emotional wellbeing, and connection with nature.
The educators in the study expressed appreciation for the beautiful surroundings and the calming atmosphere that encouraged interactions with nature. The open space and abundance of natural materials were also noted as positive features and the outdoor environment provided opportunities for the children to experience different weather conditions that are not possible in an indoor setting. This is a positive outcome considering that educators' perceptions play an important role in affecting children's experience.

One preschool educator reported concerns about how to support children in an outdoor environment. This was consistent with the observation by Van Dijk-Wesselius et al. (2020) and could be addressed by providing educators with adequate training on conducting outdoor lessons. This will help to enhance their confidence to teach in outdoor settings. Notwithstanding that, they would also need to build their own experience conducting lessons outdoors and improve their ability to plan for and facilitate learning outdoors over time. Therefore, the provision of accessible and conducive natural environments such as NPGs, provides the opportunity for educators to start.

Another concern reported by educators was about insect bites. Biodiversity workshops targeting educators may be developed to expand their knowledge, interest, and acceptance of various fauna groups. Educators also expressed concern about wet weather. One possible solution is to provide for sheltered areas or indoor classrooms that could enable children to engage in passive observational learning even during inclement weather.

Limitations of this study

The small sample size of the educators surveyed could limit the results of this study. Notwithstanding this, studies on the efficacy of natural spaces like the NPG on the development of children are rare and difficult to conduct, and more so in the global south where there is less awareness of nature play. Hence, this study provided useful preliminary insights on NPGs for early childhood education, which could form the basis for future research.

Conclusion

The NPGs in Singapore are purposefully designed spaces for children's nature exploration and learning. These spaces are meant to be safe environments with some form of structure, within which children explore unstructured nature play. Such environments offer children ample learning opportunities to achieve the objectives of pre-school education.

The open, unstructured, and dynamic nature of the NPG provided many new learning angles not available in a preset classroom environment and creates conditions for the children to be more engaged in learning. The educators in the study believed that the NPG promoted the children's cooperation, their language and literacy learning, their awareness of different natural materials available at the NPG, and problem-solving and critical thinking.

This study also showed that risky play could be important for building resilience, with anti-phobic effects that could prepare children for encounters with real and probable adversity as adults (Sandseter & Kennair, 2011). A new angle for educators to consider in the future is to tap into NPGs to support children in developing their gross motor skills, such as running, jumping, balancing, and climbing. Along with such activities, educators may assess and incorporate appropriate risky elements.

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Ethics Approval

The research design was reviewed and approved by the Singapore's University of Social Science (SUSS) Institutional Review Board (APR-0120-V1.0-27042021).

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