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Attentive Allies: Landscape Architects as Facilitators to Promote Early Childhood Nature-Based Educational Programs

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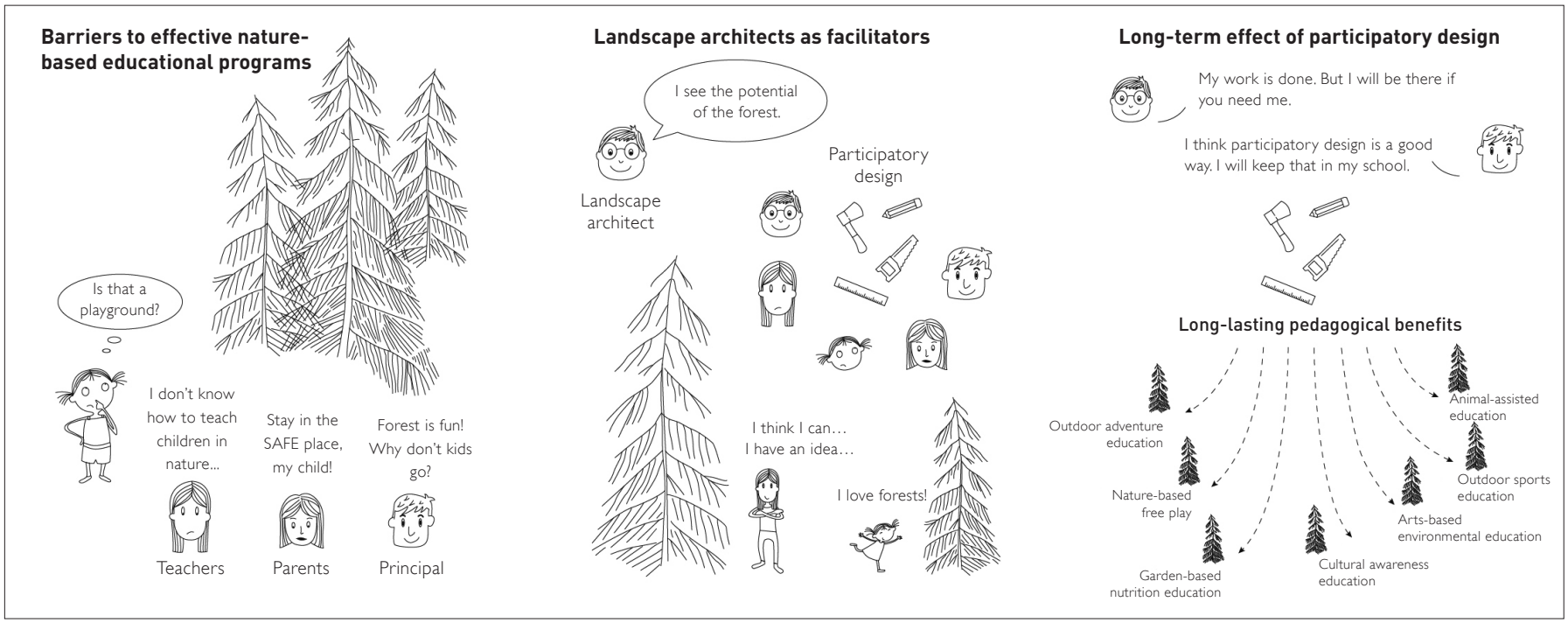
GRAPHICAL ABSTRACT



HIGHLIGHTS

- Presents how landscape architects can facilitate nature-based educational programs before, during, and after kindergarten renovation projects
- Participatory design is the primary strategy in the renovation of Miyano-oka Forest Kindergarten
- Prolonged collaboration between landscape architects and educators at a preschool context brings about pedagogical benefits

KEYWORDS

Participatory Design;
Nature-Based Education;
Landscape Architecture;
Forest Kindergarten;
Pedagogical Benefits

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ABSTRACT

In a forest kindergarten context, young children can get boost on their level of physical activity, motor skills, social skills, pro-environmental behaviors, etc. through structured and/or unstructured nature-based educational programs. Most studies mentioned teachers, parents, and researchers as facilitators in the early childhood outdoor learning programs, while landscape architects were rarely considered. However, beyond just being involved in the design and construction of the physical environment, landscape architects can play a more profound role in the long run. This study aims to show that involving landscape architects as facilitators in the nature-based educational programs can benefit the programs in many ways and the effect can be long-lasting. The study is based on the 16 years of collaboration between Miyano-oka, a forest kindergarten, and a team of landscape architects from Takano Landscape Planning in Japan to conduct nature-based educational programs to preschoolers. It presents examples of programs in Miyano-oka and the strategies applied to develop them. In this project, landscape architects employed various design strategies to improve the existing programs and help develop new programs. Among those strategies, participatory design is the primary one. During both the renovation (from 2006 to 2008) and follow-up (from 2009 to now) phases, active participation and collaboration between designers and the educators help achieve the sustainable development of both the outdoor natural environment and educational programs.

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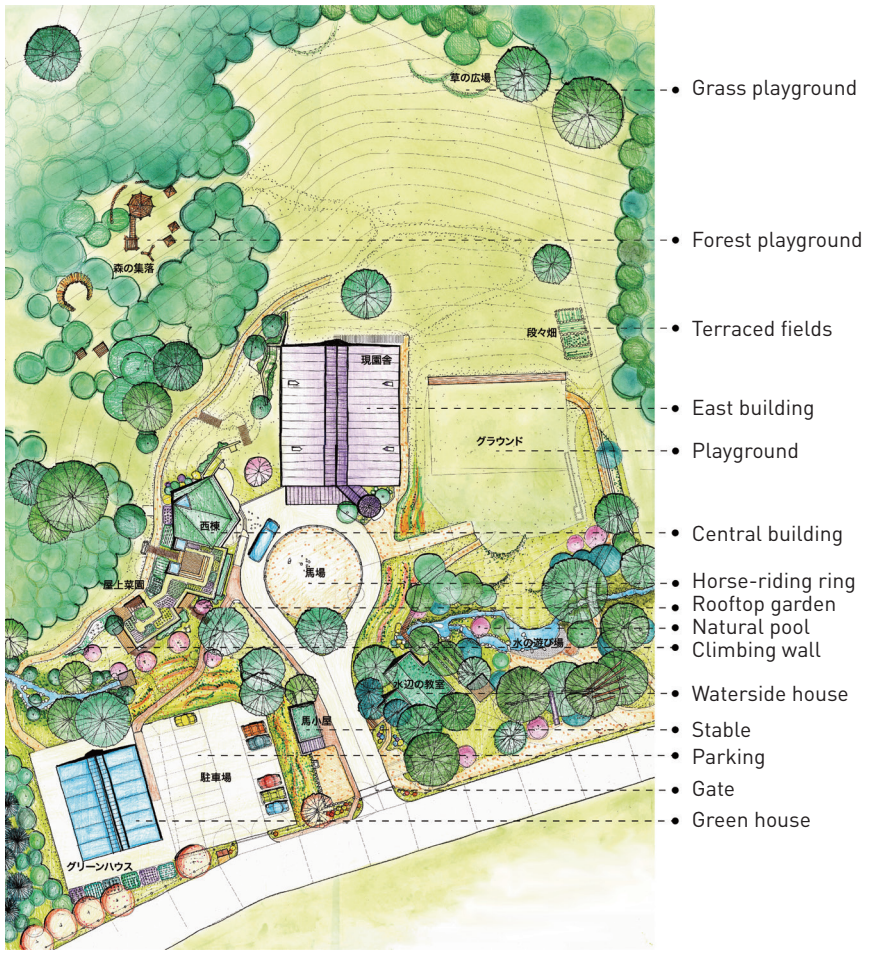
1 Introduction

By implementing nature-based activities, children can obtain various benefits through exposure to nature at multiple scales, such as developing their cognition and life-long healthy habits and behaviors[1][2], promoting gross and fine motor skills[3][4], and improving their self-esteem, mood, and self-efficacy[5][6]. Former studies found the positive relationships between childhood experiences with nature and adults' environmental beliefs (i.e., eco-centric or anthropocentric)[7], environmental attitudes[8], the selection of environmental-related career[9], pro-environmental action[10], etc. In this respect, the early childhood interactions with nature cultivate a close relationship between children and their environment, and thus can be regarded as a foundation for environmental education.

Despite these positive outcomes, children's outdoor learning opportunities are being deprived by screens[11]. Various barriers to effective outdoor learning have been identified, such as local policy support, accessibility, safety concerns, culture concerns, and more specifically, teachers' attitude, experience, and abilities.[12]~[14] Accessibility and safety concerns are the most frequently studied environmental barriers, among which the research focus is usually how to train more skilled and experienced teachers and gain support from government or policy[14]~[16].

Very few studies have sought for improvement through design approaches, and the studied projects were relatively small in scale with temporary and single effect. For instance, Mariana Brussoni et al. redesigned two childcare centers through adding natural materials to promote nature-based risky play[17]. It is common that landscape architects are not considered to be the facilitators of the nature-based educational programs. Nicole M. Ardoin and Alison W. Bowers found in their review study that nearly all the studies mentioned teachers, parents, and researchers as facilitators in the early childhood outdoor learning programs[18]. However, this paper holds that landscape architects have the potential to benefit the outdoor learning programs, not only through offering more appropriate spaces, but also through improving the programs by emphasizing collaboration with different stakeholders in the design process and even making design as part of the programs. Since the current studies have little focus on this respect, it is significant to study and draw lessons from such successful cases.

Miyano-oka Forest Kindergarten (Miyano-oka hereafter) in Sapporo, Hokkaido, Japan is a rare case that demonstrates the pedagogical benefits resulting from a prolonged collaboration between landscape architects and educators at a preschool context. The success of the collaboration proves that including landscape architects as facilitators in the nature-based educational programs is worthwhile and effective. Taking Miyano-oka as an example,



1. The plan of Miyano-oka Forest Kindergarten

this paper aims to present how landscape architects, in different roles, can facilitate nature-based educational programs in the long run, including before, during, and after phases of the kindergarten renovation projects.

2 Research Area and Methods

In Japan, there are two types of preschools, i.e., public nurseries (affiliated to social welfare institutions) and private kindergartens (affiliated to educational institutions). The former provides only childcare services and takes less responsibility for education, while the latter provides a variety of educational services.

Miyano-oka is a private forest kindergarten offering a variety of nature-based education programs. The cost, including transportation, tuition, and administration fees, is about five thousand dollars per year now. It is located at the foot of Mt. Teine with a creek flowing across the site, covering an area of 15 hm^2 with a height difference of 37.4 m. The principle of the kindergarten, originally built in 1986, was to enable children to stay close to natural elements as well as to be aware of the urban contexts they are living in. At that time, it was an uncommon type of preschool in East Asia and soon became one of those pioneer forest schools in Japan[19]. At the early stage, it aimed at offering preschool children (3 ~ 6 years old) with various nature-based educational programs; while since 2009, it has widened the age limit to 2 ~12 years old. Except the regular class for preschoolers, there are also every-other-day class for younger children (2 ~ 3 years old) and weekday-after-class for elementary students (6 ~ 12 years old). Most children commute to school by school bus, and on some special visiting days children can commute with their parents. The school bus covers a radius of about 7 km, taking about 45 minutes to arrive the kindergarten.

In 2005, Miyano-oka faced problems of attracting enough children to finance its maintenance partly due to the decrease of birth rate. As a result, the physical environment gradually became obsolescent and could hardly accommodate the nature-based educational program. And before its completion of renovation in 2009, the kindergarten was not considered to be an ideal place for outdoor education programs due to inadequate management of the natural environment and unsustainable use of the rich natural resources.

In 2005, inspired by the speech on landscape architecture design for children by Fumiaki Takano, founder of Takano Landscape Planning (TLP), principal of the kindergarten commissioned TLP to seek solutions through landscape architecture to adjusting and managing the natural spaces to be more attractive and comfortable for children. From 2006 to 2008, TLP launched a renovation project for Miyano-oka under the contract. The renovated kindergarten includes three natural playgrounds—the forest on the hill, grass on the slope, and a natural pool along the creek. There are also a rooftop garden on the central building, a horse-riding ring in the middle of the gate, and other buildings (Fig. 1). Since the renovation started, for more than 16 years, the kindergarten and the design team have kept a collaborative relationship in providing children with better nature-based educational programs, and diversified experiences were realized during this process.

In 2015, the author Tang Dongrui started to participate in this long-lasting project as a landscape architect from TLP; in 2019, the author worked in Miyano-oka as a preschool teacher to examine the project from an educator's perspective. Based on these two types of experiences, the author studied and investigated a large collection of historical documents and conducted interviews with people who participated in this project, including landscape architects, teachers, the principal, and former kindergarten children.

3 Nature-Based Educational Programs in Miyano-oka

There are both structured and unstructured nature-based educational programs in Miyano-oka, which are developed based on the geographic and cultural characteristics of the site. The structured programs are special events seasonally happens, while the unstructured ones are everyday free play time for students. All of them are developed and reformed through years.

3.1 Outdoor Adventure Education

Outdoor adventure education (OAE) usually involves intentionally using of risky and challenging outdoor activities in a wilderness-like settings (for example, the artificial rock-climbing wall) or through nature[20][21]. Weather, terrain, equipment, and other factors can create the feeling of uncertainty for participants and lead to various outcomes. Through outdoor adventurous activities, children will not only gain outdoor living skills, but also enhance social skills and connectedness[22][23], build self-esteem[24][25], and foster self-regulation for adversity[23][26]. Participating in outdoor adventurous activities during childhood can also have long-term effect on people's environmental knowledge and ethics[8][23].

In Miyano-oka, there are OAE spots, such as climbing walls and ropes, interspersed with the natural environment. In every July, children stay overnight in the kindergarten on the Sleepover Day, when they can explore the outdoor environment (forest, creek, and meadow) after sunset (Fig. 2).

3.2 Nature-Based Free Play

Daily free play, the unstructured and open-ended playful interactions with nature, is the most essential part of a forest kindergarten. Playful experience is fundamental and critical to early-childhood (0 ~ 5 years old) learning and development, aligned with active, physical, and sensory experiences[27]. As nature settings are diverse, changeable, and full of open-ended ways of interactions that challenge children, nature-based free play experiences have been associated with increased level of physical activity[28][29] and improved motor skills[3][30][31]. Moreover, the free play in forest kindergartens usually involves a group of children, which supports cooperative activities that may improve their social skills, creative thinking, executive function skills, and self-regulation[3][30][32][33]. Play and open-ended exploration can help children develop the affections and connections with nature, thus laying the root for taking protective and sustainable actions during their growth process[33]~[35].

Now children in Miyano-oka spend a certain amount of time each day playing freely outdoors, and the entire grounds are open to all, including the forest, grass, and natural pool areas (Fig. 3). During the play time, teachers will introduce some natural science knowledge, covering plants, animals, and weather phenomena. Sometimes teachers also provide some materials for children to dig, build, and perform. Children's interaction with nature also varies with seasonal changes, from collecting leaves and fruits in autumn to playing with snow in winter.

3.3 Garden-Based Nutrition Education

According to Food and Agriculture Organization of the United Nations, nutrition education aims to help people develop life-long healthy diets and eating behaviors, and childhood has been identified as a decisive stage of forming those habits into adulthood[36]. Habit, availability, and exposure are important factors to influence children's fruits and vegetables intake, for which garden-based nutrition education can be seen as a more effective and engaging way to help children form their healthy nutritional habits[37]~[39]. Specifically, compared with non-garden-based nutrition education, garden-based programs offer children the opportunity to understand seasonality, how plants grow, and

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2. Children exploring the creek on the Sleepover Day
3. Children playing in the natural pool at the free play time

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4. Children seeding and harvesting at the rooftop garden
5-1. Horse-riding ring in the kindergarten
5-2. Children riding horses during the regular horse-riding course
5-3. Children mucking out the horse-riding ring

where our meals come from[39]. When working in gardens, children's cooperative and communication skills can also be developed[40].

In Miyano-oka, the nutrition education takes place outside classrooms through hands-on activities including planting and harvesting. At the end of May, children seed in the rooftop garden of the central building (Fig. 4), where becomes the outdoor learning space for children, and regularly visit the rooftop for weeding and harvesting. Most of the harvested vegetables will be cooked for children's lunch. In some special events, for instance, the Sleepover Day in July, children will learn how to cook these vegetables.

3.4 Animal-Assisted Education

Horses have been used in educational and therapeutic interventions for children with and without disabilities over recent years. Studies have shown that horseback riding can benefit children with disabilities such as Autism Spectrum Disorder, Cerebral palsy, and Down syndrome, especially in improving their motor skills and balance[41]~[43], self-control, and self-image[44][45].

Miyano-oka is the only kindergarten offering preschoolers regular horse-back riding class in Japan. The class opens from May to the end of October to children aged from 3 to 6 years old, regularly on the horse-riding ring or on the grass and hill areas (children aged from 5 to 6 years old only). Besides riding classes, children aged from 5 to 6 years old, in groups of 5 or 6, will take turns to take care of the horses and ponies every day from June to October. Activities include grooming, feeding, and leading the horses, and mucking out the stables (Fig. 5).

3.5 Outdoor Sports Education

Outdoor sports emphasize its close integration with natural elements, rather than simply doing sports in nature. Examples of outdoor sports include hiking, trail running, swimming (in natural water bodies), skiing, and surfing. Intensive active experience with nature environment can benefit children's physical health[46][47] and mental health[5][47][48]. It is also critical to form children's future environmental awareness, attitudes, and behavior after they grow up[49]. Unlike adventurous and free play activities, outdoor sports are more physically demanding and low-risk scheduled activities that are not easy for preschoolers.

The outdoor sports activities in Miyano-oka are alpine skiing in winter and trail running in October. Alpine skiing (Fig. 6) is a traditional program taking place on the giant grass slope during

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6. Alpine skiing in the winter
7. Trail running in every October
8-1. Children making small sculptures in the Art Festival
8-2. Children drawing with naturals dyes in the Art Festival

the snow season and opens to every preschooler. Trail running (Fig. 7) is a yearly event for older children (5 ~ 6 years old). The full track is 800 m in length covering various topographies where the maximum height difference is nearly 40 meters.

3.6 Arts-Based Environmental Education

Arts-based environmental education (AEE) combines art education with environmental education. In this process, children learn about the environment through aesthetic and artistic approaches[50]. Arts-based activities always involves hands-on and collaborative practice that can stimulate imagination and interactions between children and the spaces. As AEE focuses mainly on environmental concepts and issues such as environmental protection and sustainability, it helps promote children's pro-environmental behaviors[51][52].

AEE is commonly seen in Miyano-oka. Weather permitted, children aged from 5 to 6 years old will observe and draw pictures of vegetables they plant in the rooftop garden, during which process they can discuss freely with classmates on the plants. In the daily free play, children are encouraged to collect materials from forest ranging from fruits, branches, and twigs, some of them saved for firewood and others used for art design in the November Art Festival (to make small sculptures with wood, fans with fall leaves, and paintings with natural dyes from flowers) (Fig. 8). In this process, children learn to clear the forest ground for better accessibility and to collect materials from the forest in harmless ways.

3.7 Cultural Awareness Education

With its unique history and geography, Hokkaido accommodates many distinct flora and fauna. But children of Hokkaido may not be familiar with the culture that is compatible with plants and animals living in other parts of Japan. Therefore, besides learning the native species and food culture, Miyano-oka provides children with the opportunity to engage with cultures from other regions of Japan.

Giant timber bamboo (*Bambusa oldhamii*), a type of tropical woody bamboo, has notable economic and cultural significance in Japanese culture. It is utilized as building and production materials, food source, and artistic image. However, due to the severe winter, *Bambusa oldhami* is not common in Hokkaido. Thus, in every summer, Miyano-oka holds a Bamboo Somen Festival (Fig. 9) for children to learn about the bamboo culture in Japan. Children will enjoy the flowing somen in the bamboo flume made by teachers and landscape architects with bamboo bowls and chopsticks. Sweet potato is also an important food and wine-making material in Japan, which is not easily grown in Hokkaido. In every November, there

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9. Bamboo Somen Festival
10. Baked Sweet Potato Festival

is a Baked Sweet Potato Festival (Fig. 10) for children to bake the sweet potatoes in the forest using a simple stove made from bricks and steel wires.

4 Landscape Architects as Facilitators to Realize Long-Term Educational Services in Forest Schools

In the Miyano-oka project, landscape architects employed multiple strategies to improve the outdoor space, with participatory design being the primary strategy. The design process involves active participation and collaboration between designers and the educators to achieve the sustainable development of both the outdoor natural environment and educational programs.

4.1 Participatory Design to Create Space for Educational Programs

Compared with other land use types, school environment design relies more on the collaborations between different stakeholders since they are acquainted with the school from their daily interaction with the physical environment[53][54]. Through participatory design process, landscape architects can better understand the school and the way it works[54][55]. Besides teachers, the main users of Miyano-oka are preschoolers aged from 3 to 6 years old (at the time of 2006). It is vital to take their needs of the outdoor playgrounds into consideration, balancing the excitement and boredom, the opportunity and the danger.

Before the renovation project started in 2006, several problems were found in Miyano-oka. First, after 20 years' natural growth of the forest since the foundation of the kindergarten, it had created a wild and uncomfortable environment (Fig. 11). Second, teachers held negative attitudes on outdoor learning and also lacked relevant experience—they were too worried to take children to play and learn outside. From the perspective of TLP, the change of teachers' mindset was as critical as the renovation of the physical environment.

Studies have identified a range of barriers toward outdoor learning caused from teachers' aspect, such as their inexperience of this type of learning model[13][14], excessive safety concerns and lack of confidence in managing risks[12][14], and lack of personal experience of outdoor learning[14][56]. Meanwhile, research also showed that participatory design can help change the attitudes and behaviors of users and make the physical environment compatible with the up-to-date educational programs[53][55][57]. Basing on these findings, TLP proposed to hold participatory workshops for teachers to better understand the natural environment of Miyano-oka and help change their negative perceptions of the environment and outdoor learning.

In October of 2007, TLP held a participatory workshop open to all Miyano-oka staff. They were asked to explore the fenced forest on the hill and clean up the ground for children to participate in adventurous activities in the future (Fig. 12-1). It was the first time for many of them to step into the forest and they were excited to find out that their workplace had such rich natural resources. During the exploration, they learned about the plants and small creatures, and enjoyed the different views of looking downward to the kindergarten and outward to the city of Sapporo. Many trees had their leaves turning stunning colors in the autumn and were hidden in the dense forest that teachers had never noticed them. They also discovered fruits such as chestnuts that were ripe and covered under the fallen leaves on the ground (Fig. 12-2). The workshop was effective to show the beauty and wonder of the nature environment of Miyano-oka and left a brand-new image in teachers' mind. After participants got used to moving and working in the forest, TLP led and encouraged discussions about future use of the place, such as marking trees to be climbed by children or needed to be removed. There were many vivid imaginations on how


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11. The condition of Miyano-oka in 2006 before renovation
12. Teachers stepped into the forest and participated in clearing
13. Participatory workshops led by TLP from 2006 to 2008
14. Participatory design workshops engaging teachers and children in the natural pool construction

children would use this place and how teachers would lead their outdoor learning classes during the conversations (Fig. 13).

TLP also applied participatory workshops in the design and construction process. Before renovation, the creek running across the site was not enjoyable neither for children nor for teachers. The original creek was formed by water coming from the hill to the west side of the kindergarten. However, without a tangible edge, the creek was mixed with mud and the grass growing on the bank was as high as a child. It created homes for mosquitos and covered the muddy and slippery ground which were dangerous for children. Teachers felt that it was burdensome to help children change their clothes after playing in this dirty place. Gradually, the water playground became obsolete and underused. To solve the problem, TLP decided to transform the slimy ground into a natural pool that would provide children with safer and lively water play. Considering that users' participation in the renovation process may help them better comprehend and connect with the site, TLP arranged a participatory workshop for teachers and children to work collaboratively in building the pool using naturally shaped stones (Fig. 14). These stones would assist in purifying the water and would not intervene the natural environment. Under landscape architects' guidance on inlaying stones in the roughly-marked pool area, teachers and children were encouraged to construct the pool on their own. In this way, participants gained a sense of achievement for their contributions to this original work, especially when noticing the obvious water quality improvement.

After the completion of a clean pond, TLP came up with the idea to build stone bridges for children to cross over the pond. Given



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15. Children using stone bridges in 2019
16. Participatory workshops led by Miyano-oka from 2009 to 2020

the fact that the main users of children at the year of 2006 were from 3 to 6 years old, their motor skills varied. Thus it is necessary to consider the size of and the gap between stones, which may bring about different challenges and recreational functions. TLP observed children's usage of the pond, collected their suggestions, and invited them to participate in the stone bridge construction. Basing on these preparations, three bridges of different sizes were finally constructed after adjusting the arrangement of the stones for several times (Fig. 15).

From 2006 to 2008, TLP organized several participatory workshops to engage the kindergarten staff and children and their parents in the design and construction process of the kindergarten, during which the way of thinking about the environment around us—that everyone has the capacity to make it better—has been successfully introduced by landscape architects to users of the site. After the completion of the renovation, the kindergarten staff will discuss any new idea for improvement at their monthly meetings. Due to their design-build experience from previous participatory design workshops, they can make more viable suggestions and invite TLP, a team of designers they are familiar with, to join when the ideas are almost ready (Fig. 16). By now, there have been several new educational programs continuously introduced to Miyano-oka, including the Night Adventure (2009) and the most recent Canopy Walk (2020) (Fig. 17).There are successful projects as well as those do not work so well, but this participatory design mode has been preserved after the completion of the renovation project (Fig. 18).

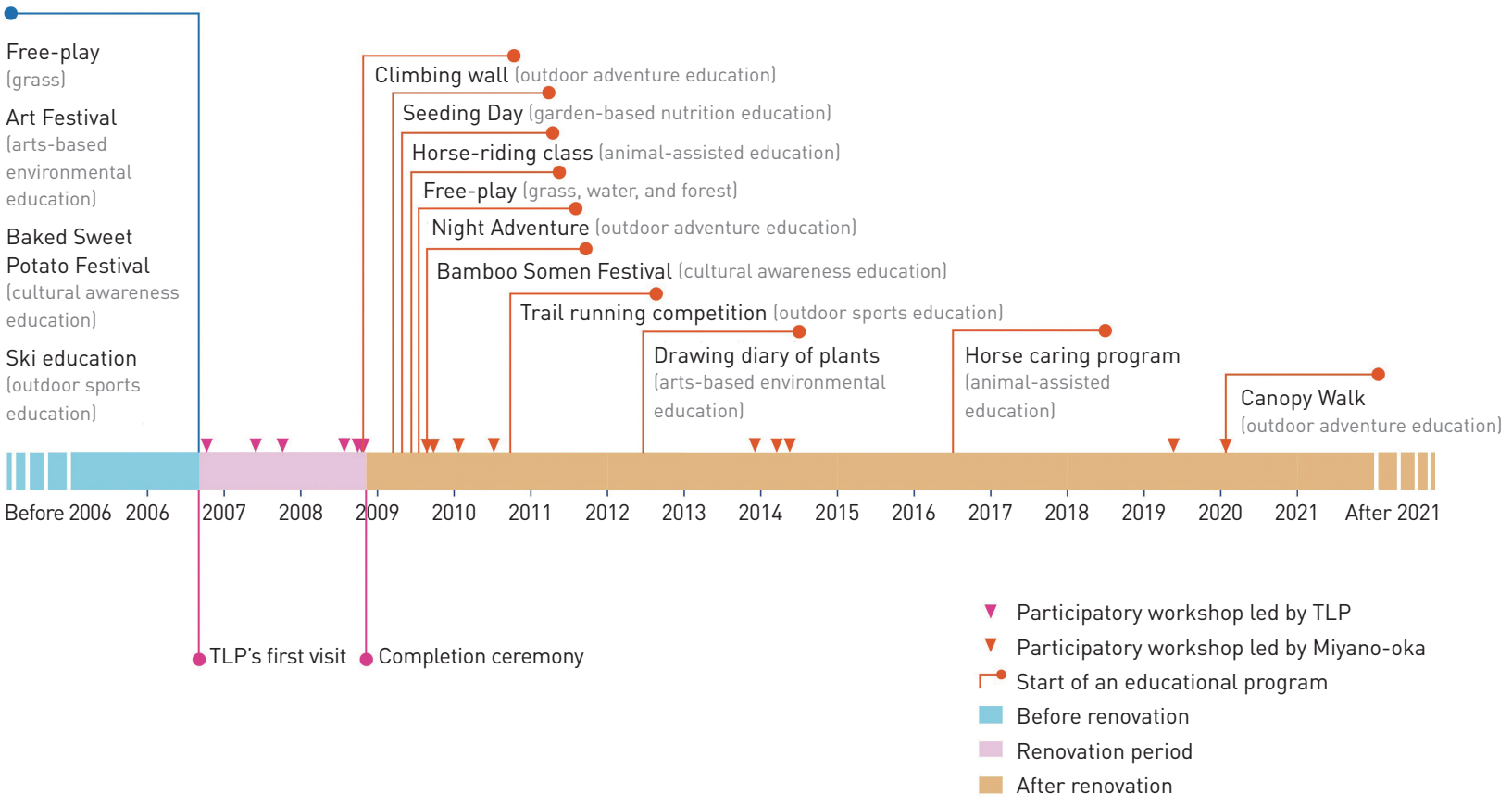
4.2 Transforming Educational Activities Into Daily Routines

Before the renovation project, Miyano-oka failed to provide opportunities for children to enjoy vegetables planted by themselves due to the lack of farmland—most of the land was designated as natural resources and only a terraced plot could be used to grow vegetables. The solution proposed by TLP was to make use of the roof space of the one-story central building, which stands right in front of the hill. The roof was adjusted to attach to the surface of the hill that was connected with the forest playground. After being covered by soil and grass, the roof becomes an extension of the forest. Fences were installed at the edge of the roof to protect children from falling. Thanks to the rooftop garden, unlike before, the harvest is enough for everyone to enjoy. Landscape architects also set the central building back against the hill behind by means of a retaining wall, which naturally extends westward to coincide with the high ground to the west. The part of the retaining wall extending from the west side of the building was transformed into a climbing wall, and the top was planted with raspberries to further blur the boundary. In this way, the climbing wall and raspberries combine into a very rewarding new adventurous activity (Fig. 19).

Although Miyano-oka started to keep horses from the 1980s, before TLP's landscape intervention, horses were free-ranging and occasionally involved in children's outside free-play time. In 2008, TLP constructed a horse-riding ring as a "classroom" in the center of different educational buildings, and the main entrance of the kindergarten (Fig. 5). It was made with wood planks and children can touch the horses through the spare spaces in between. Every morning, teachers will lead the horses to the ring from the stables and when children arrive at the kindergarten, they will have unavoidable greetings to the horses. The regular horse-riding class is conducted around the ring, allowing every child to have the similar riding experience (Fig. 5). Moreover, it has made some supportive programs become possible—from 2016, children will take turns to take care of the horses and collect feces of the horses to make fertilizer for the rooftop garden.

4.3 Realizing the Versatility of the Natural Resources

Although Miyano-oka provides a rich natural environment and free play time for children, they did not interact with nature as often



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as teachers expected before the renovation project of 2006. After the forest became accessible through participatory workshops, it was still too wild, making children feel lost when they stepped into the deep forest. Although Ingunn Fjørtoft states that nature features allow wider range of activities that are not available from other playground options[3], it is important to notice that children may have preferences for urban over natural settings[58]. The main users of Miyano-oka are children aged from 3 to 6 years old and most of the new preschoolers (3 ~ 4 years old) in Miyano-oka grow up and live in the city of Sapporo. Thus, their perceptions of playable places may be different from those who are used to playing in the natural environment. Without a proper guidance, young children may not perceive the forest as playable and explorable places and may show little interest in or stay away from it. There are many potential features, such as a climb-up-able tree, hiding in the disordered forest that children have not had chance to discover when looking from outside. If they could be naturally led to those features, their opportunities to enjoy and interact with them would increase as

17. Timeline of participatory workshops and the development of educational programs
18. Canopy Walk, the new nature-based educational program in Miyano-oka.
19. Climbing wall and the raspberries

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20. Adjusted pathways adding a feeling of navigation while enjoying naturalness
21. Children can use the pathways to hike in the forest after snow

well. TLP suggested that to actualize wider range of activities of the natural environment of Miyano-oka, it is vital to help children identify and realize more opportunities in nature.

TLP constructed and connected pathways on the ground of the kindergarten to create a loop which covers different topographies and areas. Arrangements of the pathways were well-designed to lead to interesting places for children to explore, such as a climbable-on tree or a fruit tree. The pathways are naturally shaped that adding a feeling of navigation and comfort to children's journey to the forest without destroying the feeling of naturalness (Fig. 20). Besides, children can move faster and stroll around the entire kindergarten, avoiding a dead end or backtrack using the path. In this way, the pathways also afford them opportunities to race with each other, which introduces the new program of trail running since the October of 2010.

The pathways also allow more seasonal uses of the forest and intrigue children's more interactions with nature. In autumn, children can access to the deep forest and collect the fallen leaves of more diverse species. In winter, children can go for a hiking after enough snow has been accumulated and explore the forest (Fig. 21). In the past, children only played snow on the grass slope since the condition of the ground of the forest might be too complicated under the snow cover.

4.4 Offering Opportunities of Close Contact With Natural Elements and Creatures

Besides promoting physical activities in the natural environment, TLP also designed the outdoor space to reinforce ecological education. The stream coming from the hill and flowing across Miyano-oka creates rich habitats for various species, which can provide vital educational opportunities. However, before the renovation project, it was naturally formed, some part was invisible to children and most part was hard to reach. Many creatures resided in the water and children could hear natural sounds from frogs and insects, but they could not get close to the source of the sounds and found out what they were. Thus, it was hard to perform ecological education in Miyano-oka because the children could not observe the creatures directly through their eyes. Responding to these problems, TLP proposed to balance the naturalness and the accessibility to the natural environment. For instance, TLP cleaned the superfluous dwarf bamboo (*Sasa kurilensis* for instance) to both make the water habitat more accessible to children and provide room for more diverse native species to grow. Then they used irregular shaped stones to create discernable and natural edge of the water. The varied shapes of stones together with the native plants could form small spaces along the banks to provide shelters for animals. Meanwhile, the stones make the banks stable enough for children to observe nature, such as the metamorphosis of dragonflies and butterflies, without damaging the habitats.

5 Discussion

Running a forest kindergarten generally involves a great deal of management of the natural outdoor environment and establishment of effective nature-based educational programs. Especially in a culture where such education is not the mainstream, kindergartens may face many obstacles if relying merely on educators' efforts. By working with landscape architects, a more sustainable use of the outdoor environment can be achieved, thus reducing the burden on the kindergarten operations and, notably, stimulating pedagogical developments. This collaboration is not a one-time, transient one, but a long-term, enduring one achieved through the participatory design approach, where there are two phases. The first is a focused renovation phase during which landscape architects led different users of the kindergarten in participatory design workshops on different sites. In this phase, landscape architects not only applied

their professional knowledge to renovate the outdoor space, but also provided opportunities for participants to understand the renovation process and learn how to better utilize the outdoor environment and live in harmony with nature. The participatory design in this phase will promote the intimate interactions between users and the nature environment and form a reciprocal way of working and living in the educational facilities. After that, the collaboration entered the second phase, a follow-up, during which staff from the kindergarten propose suggestions of collaboration to realize more improvements and develop new educational programs. In this particular case, first, the principal of the kindergarten, as the main decision maker, initiated and promoted the subsequent collaborations. Through his communication with Fumiaki Takano (chief designer of the renovation project), he realized that they shared the same philosophy about children's education (that children should have more exposure to nature, more risky activities, etc.). Miyano-oka hoped to achieve them, but lacked appropriate strategies and approaches, while TLP had done many similar practices with adequate experiences. Second, because the kindergarten did not close during the whole renovation process, changes has to happen gradually without impacting the daily routine. By the time the renovation ended in 2008, the kindergarten had gained a reputation and became famous, and the number of students had been boosted as well. Both encouraged the principal to have more trust and confidence in TLP and believe the concept of participatory design. Thus, he kept the participatory design happening in the kindergarten, working with the rest of the staff to continually discover the potential of the kindergarten, and then ask for TLP to implement their ideas. This ongoing collaboration enables users' constantly updated understanding and adjustment of the site and a sustainable use of the natural environment, which are important for the successful operation of every forest kindergarten. In summary, the participatory design process has benefited both participants and the site and has created a long-lasting effect. It can be seen as evidence of the sustainable impact of participatory design on the pedagogical aspect, as Karen D. Könings et al. has argued that the participatory process can provide continuous benefits to schools by co-designing the curriculum after the construction was complete[59].

To establish a kindergarten that deeply integrates nature-based education, the preconditions of the kindergarten's natural environment largely determine what kind of educational programs it can develop and implement. In some highly urbanized areas, there is a major paradox in nature-based education for young children. On the one hand, children growing up in such environments need more access to nature, especially when children's time spending outdoors is declining dramatically. On the other hand, in highly urbanized areas, the size of kindergartens and the conditions of the outdoor environment often make it difficult to meet the spatial and physical requirements to carry out nature-based education. In this case, kindergartens must work with all stakeholders to use appropriate strategies to make efficient use of the natural resources available or other outdoor spaces that can be used. Moreover, related parties of the society should explore further on approaches to implementing nature-based education, and policy-makers should actively support the creation of flexible spaces in urban natural areas from the policy perspective.

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景观设计师在儿童早期自然教育中的引导作用

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图文摘要

文章亮点

- 介绍了在幼儿园改造项目中，景观设计师如何在改造的前期、中期及后期促进自然教育项目的开展
- 宫之丘森林幼儿园的改造采用了参与式设计作为基本策略
- 景观设计师和教育工作者在幼儿园项目中的长期合作能够带来的丰硕教育效益

关键词

参与式设计；
自然教育；
景观设计；
森林幼儿园；
教育效益

摘要

在森林幼儿园的环境中，结构性或非结构性的自然教育项目可以提高儿童的身体活动水平、运动技能、社交技能和环保行为等。大部分相关研究都将教师、家长和研究人员列为儿童户外学习项目的引导者，而景观设计师却很少被考虑在内。实际上，景观设计师除了参与环境的设计与建造外，还可以长期发挥更深远的作用。

本研究以日本宫之丘森林公园为例，旨在证明将景观设计师作为自然环境教育项目的引导者，可以使这些项目在多方面受益，产生持久的效果。宫之丘森林幼儿园与日本高野景观规划事务所团队开展了长达16年的学龄前儿童自然教育项目合作。在这个项目中，景观设计师采取了多种策略来改进既有教育项目并协助开发新项目。其中参与式设计是最为关键的策略，在改造（2006~2008年）及后续合作（2009年至今）阶段，通过设计师与教育工作者的共同参与合作，使户外自然环境和教学项目的可持续发展得到了保证。

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1 引言

在参与自然活动时，儿童可以接触不同尺度的自然环境，这大大促进了他们的健康和福祉——具体包括提升认知能力及养成受益终身的健康生活习惯和行为[1][2]，促进大运动和精细运动的发展[3][4]，以及提升自尊心和自我效能、改善情绪[5][6]等。以往的研究发现儿时的自然体验与成年人的环境信仰（即生态中心主义或人类中心主义）[7]、环境态度[8]、环境相关职业的选择[9]、环保行为[10]等因素正相关。由此看来，儿童早期与自然的互动培养了他们与环境之间的密切关系，我们可将此视为环境教育的基础。

尽管儿童参与自然活动的积极影响显著，他们的户外学习机会却仍然被各类电子产品所剥夺[11]。既有研究发现，阻碍有效户外学习的因素包括当地政策支持不足、户外学习场所的可达性限制、安全问题、文化层面的顾虑，以及教师的态度、经验和能力等[12]~[14]。其中与环境障碍（即可达性和安全问题）相关的研究通常侧重于探究如何通过培训来提升教师的经验与技能，以及如何获得政府和政策的支持[14]~[16]。而较少有研究通过设计方法来改善户外学习现状。少有的几个案例也存在研究对象规模相对较小、干预效果单一且难以持久等问题。例如，玛丽安娜·布鲁索尼等学者在两个日托中心的改造设计中增加了自然材质的使用，以此来鼓励基于自然的冒险游戏[17]。此外，在儿童自然教育项目引导者的人选方面，景观设计师也较少被考虑在内。妮可·M·阿杜安等学者的综述文章表明，大部分相关研究都将教师、家长和研究人员列为儿童户外学习项目的引导者[18]。但本研究认为，景观设计师拥有通过设计方法来助益户外学习项目的潜力，他们不仅可以帮助营造更加适宜的活动空间，还能在设计过程中与不同的利益相关者不断协作、优化教育项目，甚至使设计成为教育项目的一部分。由于既有研究对此方面关注不足，因此探究相关成功案例并从中汲取经验意义重大。

位于日本北海道札幌市的宫之丘森林幼儿园（以下简称“宫之丘”）正是这类案例中的一个代表，它见证了景观设计师和教育工作者在幼儿园项目中的长期合作所能带来的丰硕教育效益，同时证明了聘请景观设计师作为自然教育项目的引导者非常值得且效果显著。本文旨在以宫之丘为例，呈现景观设计师如何以不同的角色在幼儿园改造的前期、中期和后期持续推动自然教育项目的开展。

2 研究场地与研究方法

日本的学前教育机构大致分为两类，即公立托儿所（隶属于社会福利机构）和私立幼儿园（隶属于教育机构）。前者仅提供保育服务，较少承担教育责任，而后者则提供多样的教育服务。

目前，宫之丘是一座提供多样化自然教育项目的私立幼儿园，包括交通费、学费和管理费在内的总费用约为5 000美元/年。宫之丘坐落于札幌市手稻山脚下，占地15hm^2，场地高差37.4m，有一条小溪流经该地。幼儿园最初建成于1986年，旨在让儿童与自然建立紧密联系，同时对所居住的城市环境有所了解。这种学前教育类型当时在东亚并不常见，宫之丘因而成为了日本森林学校的先驱[19]。在创办初期，宫之丘为学龄前儿童（3~6岁）提供各种自然教育课程；自2009年以来，其入学年龄的限制扩大至2~12岁。除了学龄前儿童的常规课程外，还有为低龄儿童（2~3岁）开设的隔日课程和为小学生（6~12岁）开设的平日课后课程。大多数儿童乘校车上学，而在一些特殊的参观日则可以和父母一起上下学。校车覆盖半径约7km，到达幼儿园大约需45分钟。

早在2005年，随着出生率的下降，宫之丘就曾面临生源不足及维护资金不足等困境。因此，校园设施逐渐变得陈旧，且难以维持自然教育项目的开展。而在2009年幼儿园改造项目完成之前，由于对自然环境缺乏管理及对外部自然资源的不可持续利用，宫之丘也并不是一处开展户外教育项目的理想场所。

2005年，受高野景观规划事务所（TLP）创始人高野文彰关于儿童景观设计演讲的启发，宫之丘校长向TLP寻求景观解决方案，以期通过对自然空间的调整和管理，使其更具舒适性和吸引力。从2006年到2008年，TLP依据合约对宫之丘进行了改造设计。改造后的幼儿园包括三个自然游乐场——山上的森林、草坡和沿溪的自然池塘，此外还包含位于中央教学楼的屋顶花园和坐落于大门与其他建筑之间的马场（图1）。自改造实施以来长达16年的时间里，幼儿园和设计团队一直保持协作关

系，为儿童提供了良好的自然学习课程与丰富体验。

笔者（唐冬蕊）曾于2015年在TLP工作期间以设计师的身份参与了这项长期项目，随后于2019年作为幼儿园教师在宫之丘工作，得以从教育工作者的角度审视该项目。基于景观设计师和教育工作者的双重视角，笔者研究并调查了大量的历史文件，并对项目相关人员进行了采访，包括景观设计师、教师、校长及幼儿园毕业生等。

3 宫之丘森林幼儿园的自然教育项目

当前，宫之丘包含结构化和非结构化的两类自然教育项目，均基于其地理和文化特征开展。结构化项目包含季节性的特别活动，儿童日常的自由玩耍时间则属于非结构化项目。所有的项目都经历了多年的发展与改革。

3.1 户外冒险教育

户外冒险教育（OAE）通常指在野外或类野外环境中（如人造攀岩墙）[20][21]有意安排的具有一定风险和挑战性的户外活动。天气、地形、设备和其他因素能够给参与者带来不确定感和多样的挑战。通过户外冒险活动，儿童不仅可以获得户外生活技能，还可以增强社交技能和与他人的联系[22][23]，建立自尊[24][25]，培养对逆境的自我调节能力等[23][26]。儿童时期参与户外冒险活动也可能对日后的环境知识和环境伦理认识产生长期影响[8][23]。

宫之丘设有一些与自然环境交错布置的户外冒险教育设施，如攀岩墙和绳索。在每年7月的“露营日”（在幼儿园过夜），儿童可以探索日落后的森林、小溪和草地等自然环境（图2）。

3.2 基于自然的自由游戏

日常自由游戏作为一种非结构化和开放式的与自然互动的过程，是森林幼儿园最重要的组成部分。游戏体验伴随着活跃的、身体的和感官的体验，对0~5岁幼儿的学习和发展至关重要[27]。自然环境多种多样、充满变化，能够提供具有挑战性的开放式互动方式，因此基于自然的自由游戏体验有利于提高儿童的身体活动水平[28][29]和运动技能[3][30][31]。此外，由于儿童在森林幼儿园自由游戏时经常成组活动，此类强调合作的活动还有助于提高社交技能，同时发展创造性思维、提升执行力和自我调节能力[3][30][32][33]。游戏和开放式探索可以帮助儿童与自然建立感情和联系，为日后在成长过程中践行可持续行动打下基础[33]~[35]。

当前，宫之丘的孩子们每天都有一定的时间在户外自由游戏，期间整个场地（包括森林、草地和自然泳池）对所有人开放（图3）。玩耍时，教师会适时介绍一些自然科学知识，包括动植物和天气现象；或提供各类小工具供孩子们进行丰富的挖掘、建造和表演游戏等。随着季节变化，孩子们可以与大自然产生不同的互动，如在秋天收集树叶和采摘果实，在冬天玩雪。

3.3 园艺营养教育

根据联合国粮农组织的定义，营养教育的目的是帮助人们养成受益终身的健康饮食习惯，而儿童时期则是建立这些习惯的决定性阶段[36]。习惯、可获取性和接触程度是影响儿童果蔬摄入量的重要因素，因此园艺营养教育或是有助于儿童养成健康营养习惯的一种更有效、更具吸引力的方式[37]~[39]。具体来讲，与非园艺营养教育相比，园艺项目可以让儿童体验季节性的变化，了解植物生长及食物来源的相关知识[39]。在花园里劳作时，孩子们的合作和沟通技能也可得到提高[40]。

宫之丘的营养教育途径主要包括在教室外种植和收获新鲜食物等动手实践。每年五月底，孩子们都会前往中央教学楼的屋顶花园——用于观察植物生长的户外学习空间——播撒各种作物的种子（图4），而后定期前往屋顶进行除草和采摘等活动。大部分收获的蔬菜将成为孩子们的午餐食材。在一些特殊活动中（如七月的露营日），孩子们还将学习如何烹饪这些蔬菜。

3.4 动物辅助教育

近年来，马匹已被广泛应用于教育和干预治疗中，对象为包括残疾儿童在内的不同儿童群体。许多研究表明，骑马有益于患有孤独症、脑性瘫痪、唐氏综合症等的儿童，特别是在提高他们的运动技能和平衡性[41]~[43]、自我控制能力和自我形象[44][45]方面。

宫之丘是日本唯一为学龄前儿童提供常规骑马课程的幼儿园。该课程面向3~6岁的儿童，每年从五月开始，到十月结束。课程通常在马场内，或草地和山坡上（仅限5~6岁儿童）进行。除了骑马课，5~6岁的儿童在六月到十月间每天都需要轮流照顾成年马匹和小马驹。孩子们五六人为一组，负责梳理毛发、喂食饲料、领马、清理马厩等（图5）。

3.5 户外运动教育

户外运动不只需要在自然环境中开展，更强调与自然元素的紧密结合。典型的户外运动包括野外徒步、越野跑、游泳（在自然水体中）、滑雪、冲浪等。与自然环境的密切接触有益于儿童的身体健康[46][47]和心理健康[5][47][48]，对其日后环境意识、态度和行为的形成也至关重要[49]。与自由游戏和冒险活动不同，户外运动通常对体力要求更高、风险更低（按计划施行），对学龄前儿童而言难度较大。

宫之丘的户外运动包括冬季的高山滑雪和十月的山地越野跑。高山滑雪（图6）是一项传统项目，雪季时在巨大的草坡上进行，每个学龄前儿童都可以参加。山地越野跑（图7）是每年十月为5~6岁儿童举行的体育比赛。全线赛道长800m，涵盖各种地形，高差最大约40m。

3.6 基于艺术的环境教育

基于艺术的环境教育将艺术和环境教育相结合，在此过程中，儿童通过美学和艺术方法学习环境知识[50]。基于艺术的活动常常包含动手实践和相互协作，可以激发儿童的想象力及与空间的互动。基于艺术的环境教育主要关注环境概念和相关问题，如环境保护和可持续性等，因而有助于促进儿童的亲环境行为[51][52]。

基于艺术的环境教育是宫之丘的常见项目。在天气允许的情况下，5~6岁的儿童将前往中央大楼的屋顶花园，观察并绘制他们种植的蔬菜，同时孩子们会相互自由讨论这些植物。在日常自由游戏时间里，孩子们也可从森林中收集果实和树枝等自然材料。这些材料可以在冬季用作柴火，或在11月的艺术节期间用于艺术创作——用木头制作小雕塑、用落叶装饰扇子，以及用天然花卉染料作画（图8）。在这个过程中，孩子们会学习如何清理路面以更容易进入森林，以及如何以无害的方式从森林中获得材料。

3.7 文化意识教育

由于独特的历史和地理条件，北海道拥有许多特有的动植物。但是在北海道长大的儿童可能并不熟悉有关其他地区动植物的日本文化。因此，除了学习北海道的本土物种和饮食文化外，宫之丘还为孩子们提供了了解日本其他地区文化的机会。

绿竹（*Bambusa oldhamii*）是一种热带木本竹子，它作为建筑和生产材料、食物来源及艺术形象，在日本文化中具有显著的经济和文化意义。然而，由于冬季气候严寒，绿竹在北海道并不常见。为了让孩子们了解日本的竹文化，宫之丘会在每年夏天举办流水素面节（图9）。幼儿园教师和景观设计师一起用竹子制作竹槽，孩子们则会用竹碗和筷子品尝在其中流动的素面。红薯也是一种不易在北海道种植的重要食物和酿酒材料。每年11月，宫之丘会在森林中举办烤红薯节（图10），孩子们用砖块和铁丝网制作简单的炉灶，体验烤红薯的乐趣。

4 景观设计师在引导森林学校实现长期教育服务过程中的作用

景观设计师在宫之丘的项目中采用了多种设计策略改善户外环境，其中参与式设计为主要策略。在设计过程中，通过设计师与教育工作者的共同参与合作，使户外自然环境和教学项目的可持续发展得到了保证。

4.1 通过参与式设计创造用于开展教育项目的空间

和其他用地类型的设计相比，学校环境的设计相对更依赖不同利益相关者之间的合作，因为他们与学校环境的日常互动更多，对学校的了解更为深入[53][54]。通过参与式设计过程，景观设计师可以加深对学校及其运作方式的理解[54][55]。除了教师，宫之丘的实际用户是3~6岁的学前儿童（2006年的情况），因此考虑孩子们对户外活动场所的需求，并在设计中平衡趣味和单调、挑战和风险是至关重要的。

在2006年实施改造之前，宫之丘周边的森林经过建园以来长达20年的自由生长，已经形成了荒芜且不舒适的户外环境（图11）。其次，由于对户外学习持负面态度且缺乏相关经验，教师对带领孩子在户外学习玩耍充满顾虑。因此在TLP看来，改变教师对户外学习的态度与改造校园环境同样重要。

现有研究发现了一系列来自教师方面的对于户外学习的阻碍，例如不了解该学习模式[13][14]、对安全问题过度担忧和对风险管理缺乏信心[12][14]，以及自身缺乏户外学习的经历[14][56]等。另有研究表明，参与式设计可以帮助使用者改变相应的态度和行为，从而使实际环境与新开设的教育项目结合得更好[53][55][57]。因此，TLP建议为教师举办参与式工作坊，以帮助他们深入了解宫之丘的自然环境，并改变他们对自然环境和户外学习的负面认知。

2007年10月，TLP组织了一次面向宫之丘所有工作人员的工作坊。工作坊要求参与者进入山上围栏内的森林进行探索并清理杂枝乱草（图12–1），以供孩子们将来在此开展冒险活动。许多参与者都是首次踏入这片森林，他们兴奋地发现自己的工作场所竟有如此丰富的自然资源。在探索过程中，他们不仅加深了对森林中植物和小生物的了解，更收获了俯瞰幼儿园和眺望札幌市的不同视觉体验。秋天，许多树木的叶子呈现出迷人的色彩，但却因隐藏在密林中而被忽视。参与者们还发现栗子等已经成熟的果实掉落在地面，被落叶所覆盖（图12–2）。这次工作坊有效地展示了宫之丘美丽又奇妙的自然环境，改善了教师们对它的既有印象。在参与者适应了在森林中的行走和工作模式后，TLP鼓励和引导大家对场地未来的使用场景展开讨论，如标记可供儿童攀爬的树木或需要清除的树木。参与者针对儿童如何使用场地及教师如何引导户外学习等提出了丰富的构想（图13）。

在项目设计和施工过程中，TLP也开展了其他参与式工作坊。实施改造前，流经园中小溪很难为师生提供愉悦的体验。这条溪流由园所西侧山体中的水汇流而成，由于缺乏明显的边界，溪水混杂着泥土，岸边杂草丛生（甚至高过儿童），不仅易于蚊虫繁殖，也遮挡了泥泞湿滑的地面，非常不利于儿童探索。同时，对教师们而言，在孩子们玩耍后帮助他们换下弄脏的衣服也是一项繁重的工作。因而，这处水上游乐场逐渐被弃置。为了解决这些问题，TLP决定将泥泞的地面改造成一个自然池塘，为孩子们提供更安全、生动的水上游戏空间。考虑到切身参与建造可以帮助使用者更好地理解场地并与之建立联系，TLP为师生们安排了一次参与式工作坊——用天然形成的石块共同建造池塘（图14）。这些石块这可以帮助过滤水体中的杂质而不会干扰自然环境。在景观设计师的指导下，师生们首先标记出了池塘的大致区域，而后自行在其中嵌

入石块。通过这种参与式建造过程——尤其当观察到水体由浑浊变得清澈时——参与者们收获了极大的成就感。

在这座洁净的池塘建成后，TLP提出为孩子们建造可供穿行的石桥。2006年，幼儿园中幼儿的年龄为3至6岁，他们的运动技能差异较大，因此需要细致考量用于建造石桥的石块大小及间隙——石块的不同排布方式可以为孩子们带来多样的挑战和娱乐模式。TLP不仅观察了孩子们对池塘的使用情况，更收集了他们的建议并邀请他们参与建造石桥。经过精细准备及多次调整，景观设计师最终为孩子们搭建了三座大小不一的石桥（图15）。

2006~2008年间，TLP安排了多次参与式工作坊，鼓励幼儿园教职工、儿童及其家长共同参与幼儿园的设计和改造，并传达了“每个人都有能力让环境变得更好”的理念。自项目改造完成后，教职工会在每个月的例会上讨论新的改进意见，由于之前在设计建造过程中已经积累了相关经验，他们的建议更具可行性，同时宫之丘会在各项意见基本成熟时邀请已经与幼儿园相熟的TLP团队参与讨论（图16）。截至目前，宫之丘已经引入了多项新的自然教育项目（图17），包括夜间冒险（2009年引入）和林冠漫步（2020年引入）（图18）。虽然项目成效不一，但这种参与式设计模式在改造项目完成后得到了保留。

4.2 将教育活动转化为日常行为

由于宫之丘拥有的大部分土地属于受保护的自然资源，在实施改造项目前，幼儿园仅有的一小片可耕种的梯田难以为孩子们提供充足的种植蔬菜的机会。TLP提出的解决方案是在山前一层高的中央教学楼上建造一处屋顶花园。景观设计师经过地形调整，将屋顶与山体表面相接，使得屋顶与坐落在山中的森林活动区域相连通，覆盖了土壤和草甸的屋顶成为了山中森林的延续。屋顶花园的边缘还安装了栏杆以防儿童跌落。在屋顶花园中开展的种植活动保障了每位儿童都可以享用园内收获的蔬菜。同时，项目在中央教学楼背后的山坡加设护坡墙，护坡墙自然向西延伸以连接西侧地面。部分护坡墙被改造为攀岩墙，攀岩墙顶部种植的树莓可以模糊自然与建筑物的边界。由此，攀岩和树莓采摘活动相结合，形成了一项新的具有奖励性质的冒险活动（图19）。

宫之丘自20世纪80年代即开始养马。但在TLP实施景观干预之前，马匹均自由放养在户外，孩子们偶尔能在自由游戏时间和马玩耍。2008年，TLP在幼儿园的主入口和其余建筑之间用木板建造了一个马场作为“教室”（图5），孩子们可以通过木板中间的缝隙与马相接触。每天早晨，教师将马从马厩牵到马场中，当孩子们到达幼儿园时，会自然而然地与马打招呼。常规的骑马课程围绕马场进行，每个孩子都可以体验骑马的乐趣（图5）。此外，马场的设计也促进了一些辅助性项目的开展——自2016年起，孩子们可以轮流照顾马匹，并将马粪收集起来作为屋顶花园的肥料。

4.3 实现自然资源的多样化应用

尽管宫之丘为孩子们提供了丰富的自然环境和自由玩耍时间，但在2006年改造项目开始之前，他们与自然的互动却相当有限。场地中的森林虽因参与式工作坊的改造变得更易通行，但依旧较为荒凉，孩子们踏足其中仍会感到迷失。英贡·菲尔多福特曾在研究中指出，自然环境可以提供比其他游乐场地选择更广泛的活动[3]；但更值得注意的是，幼儿可能更青睐城市环境而非自然景观[58]。宫之丘的主要使用者是3~6岁的儿童，其中新入园的儿童（3~4岁）大多在札幌市生活。因此，他们所理解的游乐场所可能有别于已经习惯了在自然环境中玩耍的孩子。如果缺乏适当的引导，这些儿童可能难以将森林视作可以玩耍和探索的地方，从而兴致索然或远离。无序的森林中可能隐藏有许多单从外部观望难以发觉的玩耍之地（如可攀爬的树），如果能够自然地引导孩子们走近这些地方，他们享受森林并与之互动的机会也会随之增加。TLP认为，要拓展儿童在宫之丘自然环境中的活动类型，就需要帮助他们在自然中发现和认识更多的可能性。

TLP在幼儿园的场地上修建并连接了一些小径，以形成一个覆盖不同地形和区域的环路。道路的布局经过精心设计，能够引导儿童去探索可攀爬的树或果树等富有趣味的场所。小径呈自然形态，为孩子们的森林之旅指引了方向、增加了舒适感（图20）。此外，在小径的指引下，孩子们也可以快速地环行整个幼儿园，且不会遇到死路或回头路。小径也为孩子们的赛跑提供了场地——自2010年10月起，幼儿园每年都会举办越野比赛。

小径的引入也丰富了森林的季节性使用，可激发儿童与自然之间的更多互动。秋天，孩子们可以进入森林深处，收集更多种类的树叶。冬天，孩子们踏着积雪徒步探索冬日森林（图21）。过去，由于森林覆被情况复杂，积雪覆盖下的环境难以保障安全，孩子们只能在草坡上玩雪。

4.4 提供与自然元素和生物近距离接触的机会

除了促进自然环境中的体育活动，TLP还通过户外环境设计加强生态教育。顺山而下流经宫之丘的溪流在沿途为各种生物创造了丰富的栖息地，这些都是重要的教育资源。然而在实施景观干预之前，溪流的许多区段都未曾显露，也难以到达。尽管孩子们可以听到诸如青蛙、昆虫等水栖生物的鸣叫，但他们无法靠近声音来源并找到它们。由于孩子们无法直接通过眼睛观察这些生物，宫之丘的生态教育一直难以开展。针对这些问题，TLP提出应平衡场地的自然特性和环境的可达性。为了使儿童可以接近水生态环境，TLP清理了多余的矮生竹草（如*Sasa kurilensis*），同时为更多不同的本地物种提供了生长空间。而后，他们使用形状不规则的石块营造了显眼而自然的水岸。这些石块和本土植物沿水岸共同形成可为小动物提供庇护的微环境。同时由石块堆砌的水岸

稳定性强，可供孩子们观察自然场景（如蜻蜓、蝴蝶的蜕变）而不损害生物栖息地。

5 讨论

经营一所森林幼儿园通常需要承担大量的自然户外环境管理工作并建立有效的户外教育项目。尤其当自然教育尚未成为主流之时，仅依靠教育工作者的努力难以解决幼儿园所面临的众多阻碍。而通过与景观设计师合作，则可以实现对户外环境的更可持续利用，从而减少运营负担，并显著推动教学发展。这种合作不是单次、短暂的合作，而是通过两个阶段的参与式设计实现的长期、持久的合作。第一阶段是重点改造阶段，由设计师带领幼儿园的不同使用者在各个场地开展参与式设计工作坊。在此阶段，设计师不仅利用专业知识来改造户外环境，还为参与者提供了解改造过程的机会，传达了如何能够更好地利用户外自然环境及与之和谐相处的理念。此阶段的参与式设计能够促进用户与自然环境的密切互动，并在教育设施内形成互惠的工作和生活方式。接下来，合作进入了第二阶段（即后续合作），其间幼儿园的工作人员会提出新的合作建议，以实施进一步改造或开发新的教育项目。在宫之丘的案例中，首先，幼儿园的校长作为主要决策者发起并推动了后续的合作。在与高野文彰先生（宫之丘改造项目首席设计师）的沟通中，他意识到二人在儿童教育方面秉持相同的理念——例如儿童应当更多地接触自然、进行更多的冒险活动。但宫之丘缺乏相应的措施和方法以使其想法落地，而TLP恰恰因做过许多相关的实践而拥有充足的经验。其次，幼儿园在改造过程中并未闭园，因此项目需要循序渐进地开展以避免影响日常教学。在2008年改造项目完成时，宫之丘已经积累了一定的声誉和知名度，入学新生人数也随之增长。这巩固了校长对TLP的信任与信心，也坚定了他应用参与式设计理念的决心。因此，校长在后续幼儿园的管理中保留了参与式设计过程，以和工作人员共同发掘幼儿园的潜力，同时请TLP来实施他们的想法。这种持续的合作可以加强使用者对场地的实时理解，进而调整改造方案，同时强化对自然环境的可持续利用，这对森林幼儿园的成功运营意义重大。总而言之，参与式设计过程在助益参与者和场地的同时，也能带来持久的效果。参与式设计能够为教学带来可持续的影响，宫之丘正是其中一例实证——正如凯伦·D·康宁思[59]等人所认为的，在建造完成后，通过共同设计课程等参与式过程可为学校带来持续效益。

在建立一个深度融合自然教育的幼儿园时，幼儿园原有的自然环境条件极大程度决定了可以开发和实施的教育课程。在一些高度城市化的地区开展幼儿自然教育的主要矛盾在于：一方面，成长于城市环境中的孩子们需要更多地接触自然，尤其是当前孩子们的户外活动时间正在急剧减少；另一方面，在这类地区，受限于场地面积和室外环境，幼儿园难以满足自然教育所需的空间和外部条件。在这种情况下，幼儿园必须谋求与所有利益相关者展开合作，采用适当的策略以高效利用学校或其他可用的户外空间中的自然资源；同时，社会各方应进一步探索实施自然教育的方案，政策制定者也应从政策的角度积极支持在城市自然区域营造弹性空间。

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谨以此文纪念高野文彰先生（1943—2021），他是TLP创始人兼前任主席，也是宫之丘森林幼儿园项目的发起人兼首席设计师。感谢TLP设计团队，特别感谢赤嶺太紀子女士和上田悦路先生与我们分享该项目的详情。感谢宫之丘森林幼儿园的教职工，特别感谢校长三浦康暢先生，他也是宫之丘森林幼儿园项目的共同发起人，感谢他对项目的全力支持及与我们分享相关教育资料。

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