Journal of
Zoological and Botanical Gardens

MDPI

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Translating Japanese Forest Education to Urban Green Spaces: Insights from Whole Earth Nature School for Park and Botanical Garden Programs

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Abstract

This study investigates the applicability of the Japanese forest education model, exemplified by the Whole Earth Nature School (WENS), to environmental education programs within urban parks and botanical gardens. Focusing on WENS's approach—characterized by immersive natural experiences, innovative facilitation techniques, and support from interdisciplinary educator teams to foster independent thinking through experiential learning—the research identifies three transferable insights: (1) Reorienting educational philosophy to prioritize nature-based learning for holistic development, particularly within urban green spaces; (2) Developing localized curricula that leverage the unique ecological resources of specific park and garden environments; (3) Establishing dedicated professional development systems for educators focused on site-based pedagogy. The findings demonstrate that adapting the forest education model can significantly enhance environmental education initiatives in urban parks and botanical gardens, which offers actionable strategies for integrating experiential nature learning into their educational planning.

Keywords: forest education; environmental education; urban parks; botanical gardens; experiential learning

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Academic Editor: Kevin Cianfaglione

Received: 9 July 2025
Revised: 6 October 2025
Accepted: 13 October 2025
Published: 17 October 2025

Citation: Zheng, K.; Fu, H. Translating Japanese Forest Education to Urban Green Spaces: Insights from Whole Earth Nature School for Park and Botanical Garden Programs. *J. Zool. Bot. Gard.* **2025**, *6*, 53. https://doi.org/10.3390/jzbg6040053

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1. Introduction

In the contemporary era, urbanization is advancing at an unprecedented pace, with cities expanding in scale and skyscrapers and transportation networks proliferating. However, this rapid development has also brought about a series of problems, among which the decreasing contact between children and nature is particularly prominent. Richard Louv, in his book Last Child in the Woods, coined the term "nature-deficit disorder" to vividly describe the phenomenon of modern children lacking interaction with nature, resulting in issues such as inattention, declining physical fitness, and a lack of understanding of nature [1].

China is no exception. Many students learning the poem "The green jade dresses up a tree so tall, ten thousand branches hang down green silk ribbons," have no concept of willow trees and can only memorize the dry text. Learning through multimedia images and videos alone cannot convey the aesthetic beauty of the "willow" imagery. This rote memorization approach is contrary to students' nature [2], and many students thus develop an aversion to classical poetry and even the entire subject [3].

Only by getting close to nature and truly seeing the willows by the river can one truly understand the essence of various classical imagery and comprehend the core of poetry.

Against this backdrop, forest education, as a mode that allows students to reconnect with nature and grow through learning and exploration in natural environments, has garnered widespread attention globally and been valued internationally [4].

Forest education is not merely an outdoor activity; it is a systematic course design and facilitation that enables children to not only acquire knowledge and facilitates stress recovery and attention restoration [5] but also develop comprehensively in physical, emotional, cognitive, and social skills within the embrace of nature [6].

Environmental education in China still faces numerous challenges, such as children's attitudes and behaviors towards the environment. It can be significantly improved through education and experience [7].

However, due to reasons such as population size and economic foundations in countries like China, it is more feasible to develop park education rather than forest education. Compared to forest education, park education in urban green spaces is more convenient for learners and easier to implement.

Therefore, we have noticed that some aspects of forest education are also applicable to park education projects. Although forest education and park education differ in terms of natural and semi-artificial teaching environments, there must be commonalities in teaching methods and philosophies.

Japan, a country with a mature forest education system, has a long history of practice in this field and has accumulated rich and valuable experience. Numerous forest education institutions in Japan have flourished, achieving significant results in enhancing children's comprehensive qualities, cultivating their love and reverence for nature, and strengthening environmental awareness.

A comprehensive study of Japan's forest education practices and an in-depth analysis of its successful experiences are of undeniable significance for the development of natural education in developing countries.

At present, natural education in developing countries is still in its developmental stage. Scholar Sun. R. L has pointed out that China's park environmental education lacks systematic research, fails to fully reflect the connotations of environmental education in knowledge and skill dissemination, environmental ethics, environmental experience, and perception, and lacks a complete environmental education system. There is a need for more research on developing environmental education strategies tailored to the characteristics of different target groups. The advantages of park environmental education in natural perception and experience have not been fully utilized, and the integration of the environmental education process with the natural environment is not close enough. The forms of park environmental education are monotonous, the content's professionalism needs improvement, and the personnel team is weak [8].

By studying Japan's forest education, we can draw beneficial experiences and transfer them to park education projects to answer some of the above questions and explore a natural education path suitable for the national conditions of developing countries, promoting the deep integration of education and nature, and ultimately facilitating the comprehensive development of children in various countries.

2. Methodology

This study employed a mixed-methods approach, combining qualitative and quantitative data collection and analysis. The research design included a literature review, case study analysis, and participant observation.

Section 3 primarily adopts a literature review approach to conduct a comprehensive overview of previously published studies on forest education in Japan.

Section 4 primarily focuses on analyzing various quantitative data of WENS, extracting the effectiveness of the practical model and the verifiability of educational outcomes that have contributed to WENS' success in forest education.

Section 5 systematically explores how forest education models can be transferred from forest environments to urban green space, primarily through constructing a nature education site spectrum, analyzing Contextual Alignment, discussing divergent challenges and collaborative potential, and conducting specific case analyses.

3. Overview of Japanese Forest Education Development

3.1. Historical Development

In Japan, forest-related education has a long history, with the establishment of the Tokyo Mountain Forest School in 1882 marking the beginning of professional education. Since the founding of the Japanese Forest Society in 1914, forest science in Japan has also focused on research topics related to professional education.

As early as 1925, Japanese scholars analyzed the popularization of forestry education in agricultural schools, pointing out that although forestry education had been introduced to Japan for several decades, its scale and rationalization were too large for agricultural schools mainly focused on agriculture and sericulture. During the 1930 Japanese Forest Society spring conference, numerous scholars engaged in in-depth discussions on the content, system, and issues of forestry education, such as the necessity of technical talent cultivation and the lack of understanding between educational and forestry administrations. These discussions reflected a high level of attention to the professionalization of forestry education at that time.

Subsequently, forest-related education in Japan entered a period of rapid development. Early research in Japanese forest education focused on the actual conditions of educational training, such as surveys of forestry club activities and analyses of training for employees of state-owned forests in Hokkaido. Subsequent research gradually expanded to innovations in educational training methods, for example, the development of computer-aided safety education systems and the proposal of forestry skill cultivator systems.

In 2014, Japanese scholars Oishi Yasuhiko and Inoue Satoko systematically reviewed the content of forest-related education in the field of Japanese forest science, revealing the thematic evolution and trends of forest education research in different historical stages, and they collectively referred to forest-related education as forest education [9].

In recent years, the Japanese Forest Society has continuously established educational theme discussion sessions at the World Forestry Congress, also demonstrating a high level of attention to forest education research.

3.2. Systemic Features and Achievements

From 1925 to 2011, there were a total of 448 research papers on forest education in the field of Japanese forest science, of which 284 were contributed by the Japanese Forest Society's journals and conference proceedings, 80 by the joint society's journals and conference proceedings, 29 by the associated society's journals, and 55 by the academic journals of the Forest Economics Research Institute. Analyzing the time series, there were only 77 papers in the 65 years from 1925 to 1989, 78 papers in the 10 years from 1990 to 1999, and a significant increase to 245 papers in the 10 years from 2000 to 2009. This trend indicates a marked increase in the number of forest education research papers in recent years [10].

Currently, Japan has more than 3000 natural schools with school forests, where many children participate in forest environmental education projects and satoyama forest revitalization activities. These natural schools have rich and complete course systems, with different

characteristic courses set according to the seasonal changes in nature, allowing students to learn a variety of subject knowledge in nature and improve their comprehensive abilities.

At the same time, Japan has also achieved many accomplishments in the cultivation of forest wellness talents and forest education teachers. For example, Shinano Town, as the birthplace of Japanese forest wellness, has a world-leading talent cultivation system. Many teachers engaged in forest education have undergone professional training and possess rich natural knowledge and educational teaching capabilities, enabling them to guide students in effective learning and exploration in the forest.

The social recognition of forest education in Japan is very high. The enrollment slots for hundreds of forest kindergartens are in high demand, and many parents recognize the importance of forest education for their children's growth and are willing to let their children participate in forest education activities. The media has also extensively covered forest education, which has allowed more people to understand forest education. The government, enterprises, and social organizations actively support forest education projects, providing them with funding, venues, and other resources for development.

4. Whole Earth Nature School: A Translational Model

4.1. Program Design Philosophy

In Japanese forest education, it is believed that understanding plants is not only important for science (biology) but also indispensable for life aspects such as clothing, food, and shelter, as well as cultural cultivation like literature, poetry, tanka, haiku, and music. However, Japanese students' knowledge and understanding of tree species are very limited. In 2010, a Japanese scholar conducted a survey study on 440 fourth-grade students from five municipal elementary schools in Fujisawa City, Kanagawa Prefecture. Through questionnaire surveys, the study analyzed the tree species that elementary school students could think of and the reasons for their knowledge. The data analysis revealed that reasons such as "bearing fruit," "changing with the seasons," and "existing in the living environment" accounted for a higher proportion of students' knowledge of tree species. A chi-square test confirmed a strong association between these reasons and students' tree species cognition. Consequently, the study concluded that planting tree species that bear fruit or change with the seasons can stimulate students' interest in trees. By improving the surrounding environment of schools and utilizing it for teaching, higher educational effects can be achieved, indicating the necessity of developing related educational programs [11].

Whole Earth Nature School in Japan adopts a similar approach and has a rational and efficient educational program development method in forest education that is worth learning from (Figure 1).

(1) Based on Regional Characteristics: The school integrates the natural ecological geography and human living environment of the region with various local conditions and features to design educational programs. For example, the main campus of Whole Earth Nature School conducts activities around Mount Fuji, the Fuji Five Lakes, hills and plains, and foothill forests.
(2) Focusing on Social Issues: Whole Earth Nature School is sensitive to various social problems in the region and uses these issues as key points and materials for designing activity courses. For example, they designed "hiking" activities targeting the aging population and developed courses on thinning and making bamboo and wooden products for unmanaged bamboo and forest areas.
(3) Engaging in Cross-sector Collaboration: Whole Earth Nature School gains support from local residents, businesses, and administrative agencies, with everyone participating in course design and engaging in cross-sector collaboration. This provides

opportunities for people who "care about local development" to discuss, think, and practice together.

Figure 1. These are some educational programs from Whole Earth Nature School, sourced from the school's official website. https://wens.gr.jp/educational-travel/.URL (accessed on 29 September 2025). The figure (Figure S1) can be found in the Supplementary Materials.

Guided by the aforementioned core principles in project design, WENS carries out more than ten different types of forest education programs every quarter, such as parent–child camping, ecotourism, and outdoor experiential learning.

We have attempted to build a general project design process model for WENS: first, clarify "for whom the project is designed and what problems it intends to solve," and then determine the project's "value anchor" driven by needs. Next, based on the specific resource conditions of the project, we develop a logically progressive hybrid content design—first designing a preliminary knowledge acquisition segment, then creating specific interactive practice sessions (including potential collaboration elements if applicable), and finally implementing an expansion and enhancement segment. This whole process achieves a linear improvement featuring knowledge internalization and skill externalization.

Research has found that the component of "aligning with the specific resource conditions for project enhancement" in this model does not rely on the unique resources of forest education, and there is potential for experience transfer. Details of this part will be elaborated on in Section 5.

4.2. Pedagogical Innovation

Whole Earth Nature School in Japan runs forest education with experiential teaching throughout the process, featuring many innovative highlights in teaching methods. The school employs the "DO→LOOK→THINK→GROW→DO" experiential learning cycle teaching method. Experiential Learning allowing participants to fully engage their senses and directly experience nature through observation, touch, listening, and tasting. This enhances their abilities to think, imagine, create, and take action [12].

For example, in the "treehouse building" course at the school, participants are not passively lectured to. Instead, under the guidance of instructors, they personally select suitable trees, learn logging skills, and build treehouses based on principles of mechanics. In this process, they directly experience the texture and grain of the wood by touching and manipulating it, thereby understanding the properties of trees. At the same time, they

develop problem-solving and innovative thinking skills by addressing practical issues such as structural instability during construction.

4.3. Educator Ecosystem

Forest education places relatively high demands on the teaching workforce. With the increased proportion of outdoor teaching, the frequency of encountering unexpected situations and serendipitous learning opportunities is higher compared to traditional indoor teaching. This requires teachers to have a deeper knowledge base and the ability to handle emergencies [13].

The teaching staff at Whole Earth Nature School's forest education program comprises three types of professionals. First, there are professional biologists who possess extensive biological knowledge and can explain the classification, habits, and ecological roles of flora and fauna in simple terms, allowing children to gain a deeper understanding of the mysteries of nature. Second, there are educational experts who, with their rich educational theory and practical experience, design course content and teaching methods to ensure that the courses are appropriate for the cognitive development levels of different age groups and achieve the best educational outcomes. Third, experienced outdoor instructors are an essential part of the team. They ensure student safety during outdoor activities and teach practical wilderness survival skills, such as setting up tents, navigating directions, and handling common outdoor injuries.

To continuously improve the professional competence and teaching standards of the faculty, Whole Earth Nature School regularly organizes teachers to participate in various training sessions and academic exchanges, encouraging them to constantly learn and explore new educational concepts and methods to meet the evolving needs of forest education.

4.4. Venue-Neutral Model Extraction

Forest education also has relatively high demands on facility environments. The lack of venues and facilities for forest education is one of the significant constraints on its development.

To meet the needs of teaching and activities, the natural schools conducting forest education at Whole Earth Nature School have carried out rational facility construction. Some branches have built several simple wooden cabins that blend with the natural environment in appearance while being equipped with basic living facilities such as tables and chairs, beds, and kitchen utensils inside, providing comfortable spaces for teaching and rest. Nearby the cabins, there are dedicated tool sheds storing various tools for outdoor activities and teaching, such as shovels, saws, magnifying glasses, and telescopes, which are readily accessible to teachers and students.

Additionally, some branches have constructed numerous observation towers. Children can climb these towers to overlook the entire forest landscape, observe the activities of distant flora and fauna, and broaden their horizons. The forest floor also features multiple nature trails with varying slopes and surfaces made of different materials, facilitating activities such as hiking and nature observation while allowing children to experience different terrain changes during their walks.

These facilities are designed to meet the practical needs of forest education activities while preserving the natural environment's original appearance as much as possible, enabling children to learn and explore in close proximity to nature.

While forest education historically contends with venue constraints, Whole Earth Nature School (WENS) demonstrates that facility design principles—not fixed infrastructures—constitute the transferable core. WENS adheres to three universally adaptable tenets: First, functional minimalism with ecological integration manifests in structures

like wooden cabins that preserve external natural aesthetics while embedding basic utilities internally, establishing a "blended infrastructure" paradigm where human facilities visually recede without fragmenting ecosystems. Second, mobile resource nodes operationalize through decentralized tool sheds positioned near activity zones, storing context-specific equipment to enable spontaneous exploration—a concept extensible as modular support stations requiring no permanent construction. Third, terrain-responsive observation systems utilize observation towers and multi-surface trails to amplify sensory engagement with topography, translating to urban settings through "perspective scaffolding" via temporary platforms or digital enhancements. Crucially, WENS' success hinges on achieving functional equivalence: Proximity to nature, tool accessibility, and immersive experiences can be maintained through context-appropriate solutions. For urban parks and botanical gardens where permanent structures are often infeasible, this implies translating forest cabins into pop-up learning pods using existing pavilions, replacing tool sheds with mobile nature kits deployed from visitor centers, and substituting built towers with augmented reality viewfinders on extant structures. Thus, the model's extractability lies in its capacity to decouple pedagogical functions from forest-specific implementations, validating that experiential learning can thrive in urban green spaces through strategic adaptation rather than replication.

5. Transferability Analysis: Forest to Urban Green Spaces

Through the differences in the naturalness of various natural education venues, we have compiled a spectrum of natural education venues for research purposes (Figure 2).

Figure 2. The Natural Education Venues Spectrum. The figure (Figure S2) can be found in the Supplementary Materials.

From the perspective of the natural education venue spectrum, forest education and park education are located at different positions on the spectrum. This characteristic profoundly influences their educational environments, content, and goals, and also provides the possibility for integrating the forest education system into park education.

5.1. Contextual Alignment

Forest Education: It is closer to the "pristine natural areas" and "semi-pristine natural areas" end of the natural education venue spectrum, with high ecosystem naturalness and complexity and minimal human intervention. For example, pristine forests and remote ecological reserves retain relatively complete ecological chains and a rich variety of wild flora and fauna.

Park Education: It leans towards the "urban parks and green spaces" and "managed artificial areas" end of the spectrum, with evident human planning and management. Urban parks are usually landscaped, equipped with recreational facilities, cultural venues, and emphasize serving the dual functions of public leisure and education.

5.1.1. Divergent Challenges

(1) Similarities

Common Spectrum Characteristics: Both are within the natural education venue spectrum, sharing the natural environment as the foundation for education. Therefore, they have consistency in their educational core, such as conveying natural knowledge and cultivating ecological awareness.

Educational Continuity: The continuity of the spectrum allows forest education and park education to complement each other. Park education can serve as the entry-level stage of natural education, helping the public, especially children, establish basic cognition. In contrast, forest education provides advanced experiences, deepening the understanding of pristine natural environments.

(2) Differences

Environmental Characteristic Differences: Forest education relies on areas with higher naturalness on the spectrum, offering complex and pristine ecological environments. Park education depends on areas with higher artificiality on the spectrum, characterized by safer, more controlled, and better-equipped environments.

Educational Activity Design: Based on their spectrum positions, forest education often features high-challenge, immersive activities that meet the exploration needs of pristine natural areas. Park education, on the other hand, focuses on low-threshold natural observation activities that align with the leisure and popularization functions of managed artificial areas.

Resource Utilization Focus: Forest education taps into the scarce resources of pristine areas on the spectrum (e.g., endangered species, pristine landforms) to support in-depth scientific research and ecological education. Park education integrates the cultural resources of managed artificial areas (e.g., historical buildings, cultural exhibitions) to emphasize education that combines nature and culture.

5.1.2. Synergistic Potential

Both forest education and park education are within the natural education venue spectrum, sharing the natural environment as the foundation for education. Therefore, their educational core is consistent, such as conveying natural knowledge and cultivating ecological awareness. The experience of building the forest education system should also be applicable to park education.

Moreover, since they are located at different positions on the natural education venue spectrum, they have a certain degree of complementarity, which can diversify natural education. Using the same educational system experience also facilitates the formation of a relatively complete educational chain, enabling systematic advancement of natural education from shallow to deep and from popularization to professionalism, fully leveraging the overall effectiveness of the natural education venue spectrum.

5.2. Implementation Framework for Urban Park/Botanical Garden Programs

5.2.1. Philosophical Repositioning

Japanese scholar Inoue Satoko proposed that the relationship between forests and human society is a feedback structure, and the main reason for the changes in this relationship is the impact of human society ("demand," "utilization," "behavior"). "Demand" has a hierarchical structure, and the emerging "demand" will change due to the "social system" of human society and the "function" of forests [13]. With the development of human society, the educational function of forests has also changed, enabling learners to acquire knowledge related to forests and forest ecosystems through direct forest experiences and become talents capable of sustaining development in society [14].

However, in urban areas, it is difficult to find areas with higher naturalness on the natural education venue spectrum that forest education relies on. Although not every city has forest resources with strong natural characteristics, almost every city has parks. Taking China as an example, by the end of 2024, more than 48,000 pocket parks and over 128,000 km of greenways had been built across the country. A total of 360 cities at the prefecture level and above had implemented the opening and sharing of park green spaces, with more than 18,000 hectares of lawns opened on a rotational basis and over 180,000 pieces of fitness equipment added [15].

Japanese scholar Sugisaki Komei suggested that when implementing forest environmental education topics under different conditions, the subjects, objectives, and content vary. To achieve the ultimate goal of "participation," it is necessary to set objectives and content based on the understanding and experience of participants according to their developmental stages [16].

Therefore, compared to forest education, park education in urban green spaces has a lower threshold but can still provide opportunities for students to engage with nature and promote holistic development. It allows students to reconnect with nature and grow through learning and exploration in natural environments.

5.2.2. Contextualized Curriculum Design

The educational project development approach of Whole Earth Nature School in Japan, which is "based on regional characteristics, focuses on social issues, and engages in cross-sector collaboration," is also applicable to park education. Park education takes place in areas closer to the "urban parks and green spaces" and "managed artificial areas" end of the natural education venue spectrum, where the environment and terrain are generally known and controllable.

Thus, when developing educational projects, it is easier to manage the park environment and modify it to meet teaching needs. Moreover, parks have more complete facilities, and their safety and artificiality are unique ecological characteristics of the park environment. Utilizing park facilities for teaching allows for safer engagement with nature.

For example, in forest education, it is necessary to avoid areas near wetlands and water bodies to prevent dangers, which results in the omission of related natural education content. However, in park environments, there may be dedicated viewing platforms over

wetlands and water bodies, allowing for safe and close observation and experience of these areas, which is an advantage of park education.

Scholar Fan Yanli, in her research on children's activity areas in forest parks under the concept of nature education, surveyed four forest park children's activity zones (Xi'an Zhuque National Forest Park Qinling Youth International Camp, Hefei Binhu Wetland National Forest Park Children's Ecological Paradise, Beijing Badaling Forest Park Forest Experience Center, Hunan Forest Botanical Garden Le Lin Youle Yuan and Yuhua Camp). These areas have favorable landscape conditions, rich flora and fauna, and diverse topography and geomorphology, providing abundant natural educational resources. Based on these resources, parks and various nature education institutions have conducted a wide range of nature education activities, offering good educational content and activity venues for children's nature education, serving as examples of developing localized course resources based on the unique ecological characteristics of park environments [17].

5.2.3. Professional Capacity Building

Both forest education and park education are within the natural education venue spectrum, sharing the natural environment as the foundation for education. Therefore, their educational core is consistent, and the concept of experiential teaching is equally applicable to park education, albeit in a semi-artificial environment.

Although it may not be possible to conduct large-scale activities like "building treehouses" that require significant space and environmental conditions, courses such as "artificial pollination" can still be implemented through experiential teaching in the limited space of parks and managed green areas.

Park education can also adopt the "DO→LOOK→THINK→GROW→DO" experiential learning cycle teaching method used by Whole Earth Nature School in forest education. This approach enhances students' abilities to think, imagine, create, and take action through practical experiences. For example, the nature school within Tokyo Metropolitan Hinohara Natural Park in Japan has achieved significant teaching results by allowing participants to fully engage their senses and directly experience nature through observation, touch, listening, and tasting in its nature observation courses.

For urban residents, the threshold for participating in park education is much lower than that for forest education. Moreover, compared to forest education in natural environments, park education in semi-artificial environments offers safer and more controllable conditions, reducing the likelihood of unexpected incidents and teaching accidents.

Governments should encourage the development of educational functions in urban green space systems, and park management departments should actively explore cooperation models with various educational institutions. Through educational space adaptability analysis, urban green spaces can be transformed from "static educational spaces" to "dynamic growth-oriented environments," supporting innovation and development in park education models.

Additionally, compared to forest education, park education venues have the advantage of higher safety. Therefore, the focus should be on cultivating teachers with outdoor teaching capabilities rather than coaches who ensure student safety during outdoor activities.

In park education classrooms, there are no traditional classroom buildings; teaching relies entirely on the park's landscapes and facilities. Generally, parks have well-developed trail systems, and how to use these trails for various observation and experiential activities while maintaining classroom rhythm is a core competency for teachers' outdoor teaching abilities.

At present, there is a scarcity of teachers with excellent outdoor teaching capabilities. Collaborations with park management departments can be established to provide specialized training in this area.

5.2.4. Facility Construction

Compared to forest education venues, which are closer to the "pristine natural areas" and "semi-pristine natural areas" end of the natural education venue spectrum and have high ecosystem naturalness and complexity, park education in semi-artificial environments has more complete facilities. Utilizing park facilities for teaching allows for safer engagement with nature. For example, in forest education, it is necessary to avoid areas near wetlands and water bodies to prevent dangers, which results in the omission of related natural education content. However, in park environments, there may be dedicated viewing platforms over wetlands and water bodies, allowing for safe and close observation and experience of these areas, which is an advantage of park education.

Parks and managed green areas can also learn from the experience of forest education in facility construction. For example, tool sheds can be set up within the park to store tools for teaching purposes, enhancing the park environment's educational functionality. The Kyoto Prefectural Botanical Garden in Japan periodically conducts ecological education projects, with dedicated facilities and equipment for ecological education within the park, providing a platform for learning about nature and actively contributing to the cultivation of environmental awareness and natural knowledge among local residents.

5.3. Case Study: Implementation of Forest Education in an Urban Park

To verify the applicability of the forest education model in urban environments, we conducted an exchange study on the "Xuanwo Team" project in Haikou City, Hainan Province, China. Since its launch, the project has designed multiple weekly nature course programs in parks, involving thousands of children aged 6 to 12. Activities include farming experiences, nature observation, and environmental art projects.

The program follows a design process model similar to the WENS project and has developed a series of nature education programs, such as "The Hidden Natural Beauty Secrets in Parks" and "No Need to Go Far: Urban Bird-Watching Program". These programs are implemented in parks where the organization has established cooperative partnerships.

In the pre-project and post-project questionnaires conducted among students participating in the "The Hidden Natural Beauty Secrets in Parks" program, there was a significant improvement in their mastery of plant-related knowledge. The average score of their self-evaluation on their mastery of natural knowledge increased from 67.82 points (out of 100) before the course to 86.06 points after the course completion.

We selected 50 children and conducted a paired t-test on their pre-test and post-test data from the "The Hidden Natural Beauty Secrets in Parks" program. The specific data used for the calculations (Table S1) can be found in the Supplementary Materials.

(1) Data Overview

This analysis is based on the pre-test ($X1$), post-test ($X2$) evaluation scores and the difference values ($d = X2 - X1$) of 50 students participating in the "The Hidden Natural Beauty Secrets in Parks" program. The core statistical information is as follows:

Average pre-test score ($\overline{X1}$): 67.82 points

Average post-test score ($\overline{X2}$): 86.06 points

Average difference value ($\bar{d}$): 18.24 points (meaning the average post-test score is 18.24 points higher than the average pre-test score)

(2) Paired t-test Calculation Process (Calculated Using Godel Tool)

a. Calculation of Key Statistics

First, the standard deviation (Sd) and standard error (SE) of the difference values are calculated from the data:

Standard deviation of the difference values (Sd):

$$Sd = \sqrt{\frac{\sum\left(d - \overline{d}\right)^2}{n-1}} \approx 17.73$$

Standard error (SE):

$$\frac{Sd}{\sqrt{n}} = \frac{17.73}{\sqrt{50}} \approx 2.51$$

Calculation of t-statistic

$$t = \frac{\overline{d} - 0}{SE} = \frac{18.24}{2.51} \approx 7.27$$

b. Determination of Degrees of Freedom and p-value

Degrees of freedom (df): $n - 1 = 50 - 1 = 49$

By checking the t-distribution table or calculating with statistical tools, it is found that: two-tailed test $p < 0.001$ (under the significance level of $\alpha = 0.05$)

(3) Test Conclusion

Under the significance level of $\alpha = 0.05$, the results of the paired t-test show that: $t = 7.27$, $df = 49$, $p < 0.001$, which is far less than0.05.

This indicates that the students' post-test evaluation scores after participating in the program are significantly higher than their pre-test scores, meaning this nature education program has a significant effect on improving students' mastery of natural knowledge [18].

These practical cases and data further demonstrate that the application of forest education model experience in urban environments can effectively enhance children's environmental awareness and relevant knowledge levels, as well as stimulate their interest in and desire to explore nature.

6. Discussion and Conclusions

This study validates the translational potential of Japanese forest education models—exemplified by Whole Earth Nature School (WENS)—for enhancing environmental education in urban parks and botanical gardens. Three actionable strategies emerge as critical pathways:

Philosophical reorientation toward nature-based learning proves fundamental. Urban green spaces, when leveraged as dynamic classrooms, can deliver holistic developmental outcomes comparable to forest settings, countering perceptions of their limited educational value.

Contextualized curriculum design must replace standardized approaches. By diagnosing unique ecological assets, educators can develop place-based experiences that transform local resources into transformative learning tools.

Professional capacity building requires systemic investment. Site-specific pedagogy training, interdisciplinary collaboration frameworks, and educator communities of practice form the cornerstone for sustainable program implementation—a finding underscored by WENS's success with decentralized teacher teams.

Critically, the venue-neutral model demonstrates that functional equivalence—not infrastructure replication—enables successful adaptation. Mobile resource kits, augmented

reality enhancements, and pop-up learning stations exemplify how forest-derived pedagogical functions (proximity immersion, tool accessibility, terrain engagement) can thrive within urban spatial constraints.

These strategies collectively address a theoretical gap: They establish a Natural Pedagogy Transferability Framework, demonstrating that experiential learning efficacy depends on core principle fidelity rather than environmental similarity. For practitioners, this enables park managers to: (1) Utilize existing hardscapes as sensory learning substrates; (2) Convert visitor centers into nature kit distribution hubs; (3) Train staff as "nature facilitators" rather than traditional instructors.

The findings of this study demonstrate the potential of adapting forest education models to urban green spaces. However, the successful implementation of such models requires careful consideration of cultural and contextual factors. For instance, while the WENS model is highly effective in Japan, its application in other countries may require modifications to address local environmental and social conditions.

Future research should quantify longitudinal impacts on participants' ecological literacy in urban settings to assess the long-term impact of forest education on children's ecological literacy. Additionally, further research is needed to explore the cultural adaptability of forest education models in diverse urban settings. Nevertheless, this study provides a validated blueprint for transforming parks and botanical gardens into catalysts for a nature-engaged generation—one capable of advancing human-nature symbiosis through firsthand ecological consciousness.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/jzbg6040053/s1, Figure S1: Some educational programs from Whole Earth Nature School; Figure S2: The Natural Education Venues Spectrum; Table S1: Random inspection date

Author Contributions: Conceptualization, K.Z.; methodology, H.F.; writing—original draft preparation, K.Z.; writing—review and editing, H.F.; supervision, H.F. All authors have read and agreed to the published version of the manuscript.

Funding: The research was funded by Hainan Institute of National Park, Hainan Provincial Philosophy and Social Science Planning Project (HNSK(ZX)24-252); National Research and Training Project of Humanities and Social Sciences of Hainan University (25GJJPY-7); Hainan Provincial Higher Education Teaching Reform Research Fund (Hnjg2024-10); Hainan University Teaching Reform Research Project (hdjy2420); Hainan University Humanities and Social Sciences Young Scholar Support Project (24QNFC-14).

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki. Non-interventional studies focusing on educational program effectiveness evaluation, which adopt anonymous data collection (e.g., pre-test and post-test scores of students) and do not involve personal sensitive information (such as name, ID number, and contact information), are exempt from ethical approval. This study mainly explored the transferability of the Japanese forest education model to urban green spaces, with data collected through two means: (1) online anonymous questionnaires tests for students participating in the "The Hidden Natural Beauty Secrets in Parks" program, to assess changes in their mastery of natural knowledge; (2) literature review and case analysis of the Whole Earth Nature School (WENS) and relevant nature education programs, which relied on publicly available information or official authorized materials. All collected data were only used for academic research on nature education model optimization and educational effect verification. Therefore, ethical approval was not required.

Informed Consent Statement: Informed consent was obtained from all participants involved in the questionnaire survey. Participation was voluntary, responses were collected anonymously, and the information was used exclusively for academic research purposes.

Data Availability Statement: Data are contained within the article and Supplementary Materials.

Conflicts of Interest: The authors declare no conflicts of interest.

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