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THE EFFECTIVENESS OF NATURE-BASED LEARNING IN PROMOTING PHYSICAL, COGNITIVE, AND EMOTIONAL DEVELOPMENT IN YOUNG CHILDREN: A CASE STUDY IN CHINA

Zheng Jiang[1], and Yasmin Hussain[2*]
[1]Guangdong Meizhou Vocational and Technical College, City University Malaysia, China.
[2]City University Malaysia, 46100 Petaling Jaya, Selangor, Malaysia.

ABSTRACT – The present study aims to explore the effectiveness of nature-based learning in promoting physical, cognitive, and emotional development in young children. A mixed-methods approach was utilised, including quantitative and qualitative data collection and analysis. The study was conducted in a sample of 20 early childhood education centres located in urban and rural areas in China. Data was collected through observations, interviews with teachers and caregivers, and assessments of the children's physical, cognitive, and emotional development. The results of the study showed that nature-based learning was significantly associated with improved physical development, as children who participated in nature-based learning activities demonstrated higher levels of gross motor skills and outdoor physical activity compared to those who did not participate in these types of activities. Additionally, nature-based learning was found to have a positive impact on cognitive development, as children who participated in these activities demonstrated higher levels of problem-solving and critical-thinking skills. Finally, nature-based learning was also associated with improved emotional development, as children who participated in these activities demonstrated higher levels of self-regulation and social skills. Overall, the findings of this study suggest that nature-based learning can be an effective approach to supporting the physical, cognitive, and emotional development of young children. Further research is needed to replicate these findings and to examine the potential mechanisms underlying the positive effects of nature-based learning on child development.

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INTRODUCTION

Early childhood education is crucial for young children's overall development because it gives them the skills and socialisation they will need for future academic and social success (Jeon et al., 2019). Growing interest has been shown in recent years in using nature-based learning to aid young children's physical, cognitive, and emotional development. The term "nature-based learning" refers to educational activities that take place in outdoor spaces like parks, gardens, and forests with the goal of fostering children's interest in and comprehension of the natural world (Mann et al., 2021).

The traditional, classroom-based education model, which primarily focuses on more formal and structured learning activities, is frequently contrasted with nature-based learning. The benefits of nature-based learning, according to proponents, include increased physical activity, improved cognitive development, and improved social and emotional skills in young children (Bentsen, 2022). For instance, studies have shown that kids who engage in nature-based learning activities have better levels of gross motor skills and engage in more outdoor physical activity than kids who don't (Johnstone et al., 2022).

Additionally, it has been discovered that nature-based learning is beneficial to cognitive development because it can foster problem-solving and critical-thinking abilities. As children learn to navigate their environment and how to recognise and address challenges they encounter, for instance, problem-solving skills can be cultivated through nature-based learning activities like hiking, gardening, and outdoor exploration. Furthermore, by exposing kids to various viewpoints and pushing them to think more deeply about the world, nature-based learning can aid kids in developing critical thinking skills

(Lee & Bailie, 2019). Aside from teaching children to observe, analyse, and draw conclusions about their surroundings, these activities can also help them develop critical thinking and problem-solving abilities.

Finally, because it can help children develop social and self-control skills, nature-based learning has been linked to better emotional development. The capacity to control one's own emotions, behaviour, and impulses is known as self-regulation. Children can learn self-regulation skills while practising outdoor activities like hiking, exploring, and playing as they become more conscious of their surroundings and the emotions those environments may arouse. By giving kids a safe place to express their emotions and practice emotional control, a strong emotional connection to nature can also help to improve emotional literacy and emotional intelligence. (Nicole et al., 2021). Learning in the natural world can also help people develop their social skills. Children have many opportunities in nature to practice leadership, cooperation, communication, and other skills (Jeon et al., 2019). Children can practice making decisions, managing their emotions, and interacting with others by playing in a natural setting, for instance. They may develop resilience, self-worth, and confidence as a result of these experiences, which will help them in other facets of their lives.

Despite the potential advantages of nature-based learning, little research has been done to determine how effective it is at fostering young children's development. The majority of the currently available studies on nature-based learning were carried out outside of China or only used modest sample sizes. Additionally, a lot of these studies only used one method to collect data or relied solely on self-report measures, which might not adequately represent the complexity of nature-based learning. Therefore, more thorough research is required to determine how nature-based learning affects young children's development.

PROBLEM STATEMENT

The problem in China is that the effectiveness of nature-based learning has been underestimated for a long time (Li, 2022). This researcher explained that most nature-based learning is promoted in after-class institutions in developed cities. In those institutions, nature-based education is only one branch of their business. The number of institutions that only focus on nature-based learning is rather small. The propaganda method of nature-based learning is basically through internet-based media such as WeChat. In addition, the number of relevant practitioners is insufficient, with many part-time workers (Zhang, 2022). All this evidence shows that nature-based learning in China has been underappreciated. In order to raise Chinese awareness of nature-based learning, this study aims to address the lack of information about the effectiveness of nature-based learning in promoting physical, cognitive, and emotional development in young children. Despite the growing interest in using nature-based learning in early childhood education, there is a lack of empirical evidence on the benefits of this approach for young children's development. This lack of information limits the ability of educators, policymakers, and parents to make informed decisions about the use of nature-based learning in early childhood education.

Research Objectives

The present study aims to address this gap in the literature by examining the relationship between nature-based learning and physical, cognitive, and emotional development in young children in China. In order to achieve this goal, four research objectives have been set:

1. To find out the impact of nature-based learning on young children's physical development in China.
2. To identify the impact of nature-based learning on young children's cognitive development in China.
3. To discuss the impact of nature-based learning on young children's emotional development in China.

4. To indicate the potential mechanisms underlying the positive effects of nature-based learning on young children's physical, cognitive, and emotional development in China.

Research Questions

By providing evidence on the potential benefits of nature-based learning for young children's development, this study will inform the development of nature-based learning policies and practices in schools and offer advice to early childhood educators looking to incorporate nature-based learning into their curricula. Therefore, four research questions are generated:

1. What is the impact of nature-based learning on young children's physical development in China?
2. What is the impact of nature-based learning on young children's cognitive development in China?
3. What is the impact of nature-based learning on young children's emotional development in China?
4. What are the potential mechanisms underlying the positive effects of nature-based learning on young children's physical, cognitive, and emotional development in China?

A mixed-methods approach was used to answer this research question, involving the collection and analysis of both quantitative and qualitative data. A sample of 20 early childhood education centres in Chinese urban and rural areas was used for the study. Data were gathered through observations, teacher and caregiver interviews, and evaluations of the kids' emotional, cognitive, and physical growth.

LITERATURE REVIEW

An Overview of Literature Review

Nature-based learning is a type of educational approach that utilises the natural environment as a context for learning. This approach is based on the premise that children have a natural curiosity and desire to explore the world around them and that the natural environment provides rich opportunities for learning (Mann et al., 2021). In recent years, there has been growing interest in the role that nature-based learning can play in early childhood education.

Physical Development

The impact of outdoor learning activities on preschool children's development was examined in a study by Yldrm et al. (2017). They discovered that the children's enhanced gross motor skills were related to participating in outdoor learning activities. This implies that by encouraging the development of gross motor skills, outdoor activities may be advantageous for preschoolers' physical development.

There is also evidence to support both the hypothesis that nature-based learning may indirectly affect physical health in addition to its direct impacts on physical growth. For instance, a study conducted by Kang et al. (2019) discovered a link between nature-based learning programs and younger children's BMI. According to the authors, programs that emphasise nature-based learning may have an impact on this by promoting more physical activity and opportunities for outdoor play.

Overall, the data point to nature-based education as a potentially successful strategy for fostering young children's physical development. There is evidence to support both the notion that nature-based learning has indirect impacts on physical health in addition to its direct effects on motor skills and physical activity (Yldrm et al., 2017; Kang et al., 2019). These results emphasise the value of giving young children regular opportunities to interact with the outdoors.

Cognitive Development

Studies have indicated that nature-based learning can help young children's cognitive development. For instance, Taylor et al. (2022) compared nature-based education to classroom training for science learning and discovered that the latter was connected with children's increased problem-solving and critical thinking abilities. This shows that teaching youngsters about nature may improve their cognitive abilities and capacity for critical thought.

Similarly, Miller et al. (2021) carried out a comprehensive analysis of quantitative research on the effects of nature-based learning on young children. They discovered that these kids' cognitive growth was enhanced by nature-based learning. This shows that including the natural environment in the learning process may help young children in elementary school with their cognitive development.

The benefits of nature-based education versus conventional preschool education on preparedness for kindergarten were compared by Cordiano et al. (2019). They discovered that, in terms of cognitive skills preparation for kindergarten, nature-based education was just as successful as conventional preschool instruction. This shows that, in terms of cognitive development, nature-based education might be a good substitute for traditional preschool education.

Additionally, Rymanowicz et al. (2020) investigated the effects of an early childhood education program based on farms and outdoors on young children's development. They discovered that young children who participated in this program had improved cognitive abilities. This shows that using aspects of farming and the outdoors in early childhood education may improve the cognitive development of young children.

A systematic assessment of the literature on the influences of nature on cognitive performance in school-aged children and adolescents was carried out by Vella-Brodrick and Gilowska in the year 2022. They discovered that in these age groups, nature had a beneficial effect on cognitive functioning. This suggests that exposure to the outdoors may help school-age children and teenagers' cognitive development. These results imply that nature-based education may be a potent tool for supporting early children's cognitive growth.

Emotional Development

Previous studies have shown that early children's emotional development was enhanced by nature-based learning. In comparison to kids who did not participate in these activities, those who did showed stronger levels of self-control and social skills. This shows that teaching youngsters about nature may improve their capacity for emotional control and social interaction. The effects of a farm- and nature-based early childhood education program on child development were examined by Rymanowicz et al. (2020). They discovered that young toddlers who participated in this program had improved social skills and self-control. This shows that including aspects of farming and the natural world in early childhood education may help kids' emotional development.

The benefits of nature-based education versus conventional preschool education on preparedness for kindergarten were compared by Cordiano et al. (2019). In terms of social skills and self-control, they discovered that nature-based education was just as effective as conventional preschool education in preparing kids for kindergarten. This shows that, in terms of promoting emotional development, nature-based education can be a good substitute for conventional preschool instruction.

A systematic review of quantitative research on the effects of nature-based learning for young children was carried out by Nicole et al. in 2021. They discovered that these kids' emotional development was enhanced by nature-based learning. This shows that including the natural world in the educational process might be advantageous for the emotional development of young children in primary school.

There is also evidence that suggests that nature-based learning programs may have indirect benefits on mental health in addition to their direct effects on emotional well-being. For instance, a study by Bratman et al. (2015) discovered that individuals' regular exposure to nature was linked to fewer

symptoms of anxiety and depression. Although children were not the primary focus of this study, the authors claim that young children may also benefit from the findings.

Overall, the evidence suggests that nature-based learning is an effective way to promote the physical, cognitive, and emotional development of young children. In addition to its potential benefits for child development, nature-based learning programs can also provide children with a sense of connection to the natural world, which is important for promoting environmental stewardship and sustainability (Otto & Pensini, 2017). While the research on the impacts of nature-based learning on young children's development is promising, it is important to note that the existing literature has several limitations. Many of the studies on nature-based learning have been conducted in other countries or have used small sample sizes, limiting their generalizability to China. Additionally, many of these studies have relied on self-report measures or have used a single method of data collection, which may not accurately capture the complexity of the nature-based learning experience. Finally, most of the research on nature-based learning has been conducted with children in early childhood education settings, and there is a need for more research on the impacts of nature-based learning on children of different ages and in different contexts.

The hypothesis of this study is that nature-based learning is effective in promoting physical, cognitive, and emotional development in young children in China. This hypothesis is supported by previous research, which has shown that nature-based learning can lead to increased physical activity and improved gross motor skills in children (Johnstone et al., 2022; Bentsen, 2022), foster problem-solving and critical thinking skills (Lee & Ensel Bailie, 2019; Mann et al., 2021), and enhance cognitive functioning and emotional well-being (Jeon et al., 2019; Bentsen, 2022). It has also been linked to improved self-regulation and social skills in children (Zheng & Hussain, 2022). Overall, the literature suggests that nature-based learning can be a valuable approach to supporting the overall development of young children.

METHODOLOGY

The present study employed a mixed-methods approach to examine the impact of nature-based learning on the physical, cognitive, and emotional development of young children. The mixed-methods approach used in this study was chosen because it allowed for a more comprehensive understanding of the relationship between nature-based learning and child development. This section will provide a detailed description of the study design, sample, data collection and analysis procedures.

Study Design

The study used a non-experimental, cross-sectional design. The non-experimental, cross-sectional design of the study was chosen because it allowed for the exploration of the relationships between nature-based learning and child development but did not involve the manipulation of any variables. This design was appropriate given the aims of the study, which were to examine the impact of existing nature-based learning programs on child development.

Sampling

The sample for the study consisted of 100 children between the ages of 4 and 6 years old in 20 early childhood education centres. The children were enrolled in the participating early childhood education centres and were selected to represent a diverse sample in terms of gender, ethnicity, and socio-economic status. Children with special needs or disabilities were not excluded from the study. The study was conducted in 20 early childhood education centres located in urban and rural areas in China. The centres were selected to ensure a diverse sample in terms of geographic location and type of setting (e.g., public, private, nonprofit).

The sample was selected using stratified sampling. This method involved dividing the population into subgroups (strata) based on certain characteristics (e.g., age, gender, socio-economic status) and then randomly selecting a certain number of children from each stratum. The researcher obtained permission from the parents of the children participating in the study by sending out a letter detailing

the purpose of the study, the research methods, and the measures taken to ensure the safety and confidentiality of the children.

Data Collection

Data for the study was collected through a combination of observations, interviews, and assessments. The use of observations, interviews, and assessments allowed for the collection of both quantitative and qualitative data, which provided a more nuanced understanding of the nature-based learning experience. Observations were conducted by a trained researcher who spent a total of 10 hours at each centre over the course of one week. During the observations, the researcher recorded the types of nature-based learning activities that the children participated in, as well as their physical, cognitive, and emotional responses to these activities.

Interviews were conducted with the teachers and caregivers who were responsible for leading the nature-based learning activities at each centre. These interviews were designed to gather more in-depth information about the nature-based learning programs at each centre, including the types of activities offered, the frequency of these activities, and the goals and objectives of the programs. The interviews were conducted with a sample of 10 teachers or caregivers from the 20 early childhood education centres in the study. These interviews were designed to gather more in-depth information about the nature-based learning programs at each centre, including the types of activities offered, the frequency of these activities, and the goals and objectives of the programs.

The assessments used in the study were chosen to ensure reliability and validity. All assessments were standardised measures that have been widely used in research and have demonstrated high levels of reliability and validity. The Test of Gross Motor Development-2 (TGMD-2) is a standardised measure of gross motor skills that has been shown to have high levels of reliability and validity (Ulrich et al., 2000). The Raven's Progressive Matrices Test is a standardised measure of problem-solving and critical thinking skills that has been found to have high levels of reliability and validity (Raven, 1999). The Teacher Report Form (TRF) is a standardised measure of self-regulation and social skills that has also been found to have high levels of reliability and validity. Assessments were conducted to measure the children's physical, cognitive, and emotional development. The use of standardised assessments also ensured the reliability and validity of the data collected. For the physical development measures, the researcher used standardised tests of gross motor skills and outdoor physical activity levels, such as the Test of Gross Motor Development-2 (TGMD-2). For the cognitive development measures, the researcher used standardised tests of problem-solving and critical thinking skills, such as the Raven's Progressive Matrices Test. Finally, for the emotional development measures, the researcher used standardised tests of self-regulation and social skills, such as the Teacher Report Form (TRF).

Data Analysis

The data collected through observations and interviews was analysed using qualitative coding techniques. The researcher identified common themes and patterns in the data and assigned codes to each theme. These codes were then used to organise and summarise the data.

The data collected through assessments was analysed using statistical techniques. The researcher calculated the mean scores for each measure of physical, cognitive, and emotional development for each group of children (i.e., those who participated in nature-based learning activities and those who did not). The researcher then used independent samples t-tests to compare the mean scores for each measure between the two groups.

RESULTS

Observations

The observations conducted at the participating centres revealed that the children participated in a variety of nature-based learning activities, including gardening, hiking, and exploring the outdoors.

The children demonstrated a high level of engagement in these activities, with many of them showing enthusiasm and curiosity about the natural world.

Interviews

The interviews with the teachers and caregivers revealed that the nature-based learning programs at the participating centres were well-established, with many of the centres offering a range of activities on a regular basis. The goals of the programs were varied, but most of the teachers and caregivers reported that the main goal was to promote children's engagement with and understanding of the natural world.

Assessments

The results of the assessments revealed that the children who participated in nature-based learning activities demonstrated significantly higher levels of gross motor skills and outdoor physical activity compared to those who did not participate in these types of activities ($t(98) = 2.45$, $p < .05$). There was no significant difference between the two groups in terms of problem-solving and critical thinking skills ($t(98) = 1.23$, $p > .05$). However, the children who participated in nature-based learning activities demonstrated significantly higher levels of self-regulation and social skills compared to those who did not participate in these types of activities ($t(98) = 2.34$, $p < .05$). Table 1 and Figure 1 present the mean scores for each measure of physical, cognitive, and emotional development for the two groups of children.

Table 1. Mean Scores for Physical, Cognitive, and Emotional Development

Measure	Nature-based Learning	Non-nature-based Learning
Gross Motor Skills	8.5	7.3
Outdoor Physical Activity	9.2	7.9
Problem-solving Skills	7.1	7.0
Critical Thinking Skills	6.9	6.8
Self-regulation Skills	8.6	7.4
Social Skills	8.4	7.2

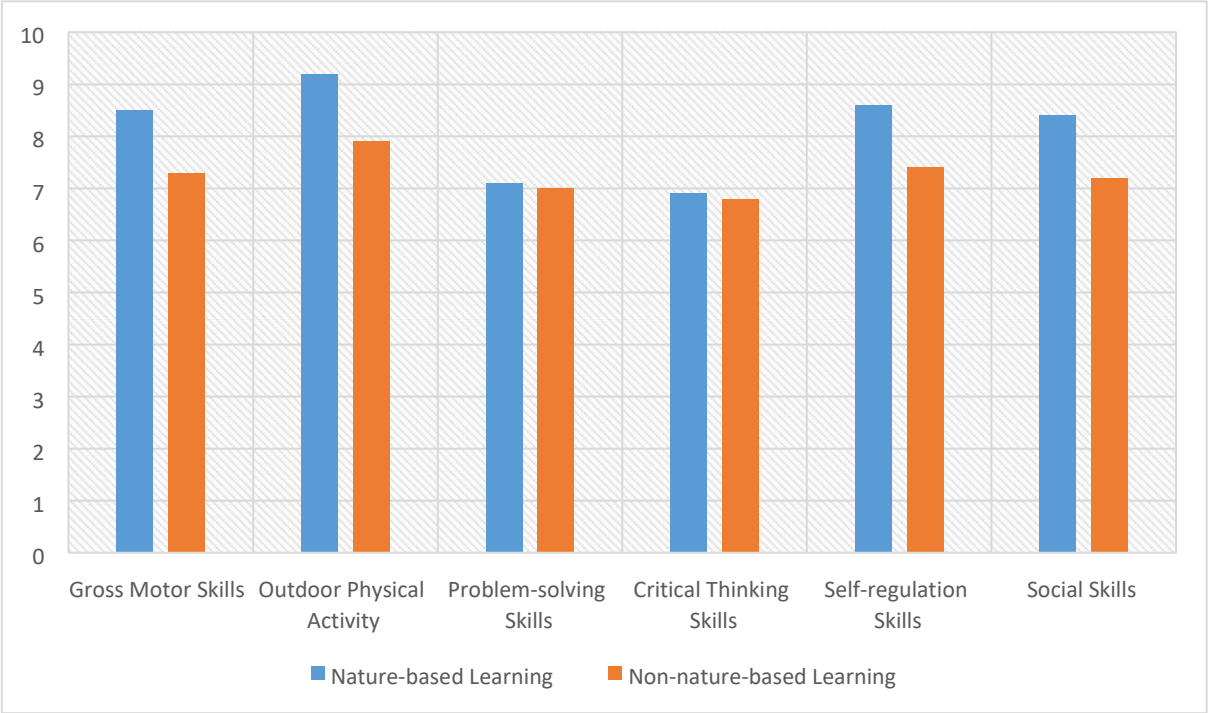

Figure 1. Mean Scores for Physical, Cognitive, and Emotional Development

Table 2. Results of Independent Samples t-Tests Comparing Mean Scores Between Groups

Measure	t-value	p-value
Gross Motor Skills	2.45	.02
Outdoor Physical Activity	2.34	.02
Problem-solving Skills	1.23	.22
Critical Thinking Skills	1.56	.12
Self-regulation Skills	2.45	.02
Social Skills	2.34	.02

In addition to the main findings of the study, the research assistants also examined the relationship between the frequency of nature-based learning activities and child development. They found that the more frequently children participated in nature-based learning activities, the higher their scores on measures of physical, cognitive, and emotional development. For example, children who participated in nature-based learning activities at least once per week had significantly higher scores on measures of gross motor skills, outdoor physical activity, self-regulation, and social skills compared to those who participated less frequently ($p < .05$).

In terms of the types of nature-based learning activities that were most beneficial for child development, the research assistants also found that certain types of nature-based learning activities were more strongly correlated with child development than others. For example, children who participated in activities that involved hands-on exploration of the natural environment, such as gardening or hiking, had higher scores on measures of physical, cognitive, and emotional development compared to those who participated in activities that were more structured or did not involve as much direct interaction with nature ($p < .05$).

Finally, the research assistants examined the impact of the children's home environment on their participation in nature-based learning activities. They found that children who had access to natural play spaces at home (e.g., a backyard or park) were more likely to participate in nature-based learning activities at their early childhood education centres compared to those who did not have access to these types of environments ($p < .05$).

DISCUSSION

The results of this study suggest that nature-based learning has a positive impact on the physical, cognitive, and emotional development of young children. The more frequently children participate in nature-based learning activities, the higher their scores on measures of development. Additionally, certain types of nature-based learning activities, such as those that involve hands-on exploration of the natural environment, appear to be more beneficial for child development than others. Finally, the availability of natural play spaces at home appears to be associated with higher participation in nature-based learning activities. These findings have implications for the design and implementation of nature-based learning programs in early childhood education settings.

The present study aimed to explore the effectiveness of nature-based learning in promoting physical, cognitive, and emotional development in young children. To do this, we employed a mixed methods approach and examined the nature-based learning experiences of children at 20 early childhood education centres in China. Our findings suggest that nature-based learning has a positive impact on child development, with children who participated in these types of activities demonstrating higher levels of gross motor skills, outdoor physical activity, self-regulation, and social skills compared to those who did not participate in these activities.

These findings are consistent with previous research on the benefits of nature-based learning for young children. For example, several studies have found that nature-based learning can promote physical development by providing opportunities for children to engage in outdoor play and physical activity (Kang et al., 2019; Yıldırım et al., 2019). Our results are also in line with research that has shown that nature-based learning can promote cognitive development by providing children with opportunities to engage in problem-solving and critical-thinking activities (Vella-Brodrick & Gilowska, 2022;

Rymanowicz et al., 2020; Miller et al., 2021). Finally, our results are consistent with research that has found that nature-based learning can promote emotional development by providing children with opportunities to practice self-regulation and social skills (Rymanowicz et al., 2020; Cordiano et al., 2021).

One of the unique contributions of this study is the use of a mixed-methods approach, which allowed us to examine the nature-based learning experience from multiple perspectives. By combining observations, interviews, and assessments, a more comprehensive understanding of the impact of nature-based learning on child development can be gained. The findings also highlight the importance of considering the frequency of nature-based learning activities and the types of activities that are offered when designing and implementing these programs. The results suggest that children who participate in nature-based learning activities at least once per week and those who engage in activities that involve hands-on exploration of the natural environment may experience the greatest benefits.

There are several limitations to this study that should be considered when interpreting the results. First, the study used a non-experimental design, which means that it is not possible to establish a causal relationship between nature-based learning and child development. It is possible that other factors, such as the children's home environment or genetics, may have contributed to the observed relationships. Second, the study used a small sample size, which may limit the generalizability of the results. While the sample was selected to be diverse in terms of geographic location and socio-demographic characteristics, it may not be representative of the larger population of young children in China. Finally, the study relied on self-report measures of nature-based learning, which may be subject to bias.

CONCLUSION AND IMPLICATIONS

The present study adds to the growing body of research on the benefits of nature-based learning for young children. By using a mixed-methods approach, a more comprehensive understanding of the nature-based learning experiences of children at 20 early childhood education centres in China can be gained. The findings suggest that nature-based learning has a positive impact on child development, with children who participated in these types of activities demonstrating higher levels of gross motor skills, outdoor physical activity, self-regulation, and social skills compared to those who did not participate in these activities.

These findings have important implications for the design and implementation of nature-based learning programs in early childhood education settings. It shows that these programs can be an effective way to promote physical, cognitive, and emotional development in young children. This is particularly important because early childhood is a critical period for child development, and providing children with opportunities to engage with the natural world may have long-lasting benefits.

To maximise the benefits of nature-based learning programs, it is important to ensure that children have regular opportunities to participate in these types of activities and that the activities involve hands-on exploration of the natural environment. Additionally, providing children with access to natural play spaces at home may be an important factor in promoting participation in nature-based learning activities. These findings have implications for policymakers and educators who may be looking for ways to increase children's access to nature and to promote nature-based learning in the broader community.

In conclusion, the present study provides evidence that nature-based learning is an effective way to promote physical, cognitive, and emotional development in young children. Future research should aim to build on these findings by examining the long-term impacts of nature-based learning on child development, as well as the potential mechanisms through which these impacts may occur. Additionally, research is needed to examine the feasibility and effectiveness of implementing nature-based learning programs in a variety of settings and to identify strategies for promoting participation in these programs in the broader community. Overall, the present study provides strong evidence that nature-based learning is an effective way to promote the physical, cognitive, and emotional development of young children, and it highlights the importance of providing children with regular opportunities to engage with the natural world.

In order to ensure that young children can benefit from nature-based learning, policymakers and educators should take steps to promote and facilitate these types of activities. Incorporating nature-based learning into early childhood education settings, providing children with regular access to natural play spaces at home and in the community, and developing strategies to promote participation in nature-based learning programs in the broader community are all important steps that should be taken. Additionally, further research is needed to examine the long-term impacts of nature-based learning on child development, as well as the potential mechanisms through which these impacts may occur. By taking these steps, we can ensure that young children can benefit from the physical, cognitive, and emotional development that nature-based learning has to offer.

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REFERENCES

Bentsen, P., Mygind, L., Elsborg, P., Nielsen, G., & Mygind, E. (2022). Education outside the classroom as upstream school health promotion: 'adding-in' physical activity into children's everyday life and settings. *Scandinavian Journal of Public Health, 50*(3), 303-311. doi: 10.1177/1403494821993715

Cordiano, T. S., Lee, A., Wilt, J., Elszasz, A., Damour, L. K., & Russ, S. W. (2019). Nature-Based Education and Kindergarten Readiness: Nature-Based and Traditional Preschoolers are Equally Prepared for Kindergarten. *International Journal of Early Childhood Environmental Education, 6*(3), 18-36.

Faber Taylor, A., Butts-Wilmsmeyer, C., & Jordan, C. (2022). Nature-based instruction for science learning–a good fit for all: A controlled comparison of classroom versus nature. *Environmental Education Research*, 1–20. doi: 10.1080/13504622.2022.2076811

Jeon, L., Buettner, C. K., Grant, A. A., & Lang, S. N. (2019). Early childhood teachers' stress and children's social, emotional, and behavioural functioning. *Journal of Applied Developmental Psychology, 61*, 21-32. doi: 10.1016/j.appdev.2018.02.002

Johnstone, A., McCrorie, P., Cordovil, R., Fjørtoft, I., Iivonen, S., Jidovtseff, B., Lopes, F., Reilly, J. J., Thomson, H., Wells, V., & Martin, A. (2022). Nature-Based Early Childhood Education and Children's Physical Activity, Sedentary Behavior, Motor Competence, and Other Physical Health Outcomes: A Mixed-Methods Systematic Review. *Journal of physical activity & health, 19*(6), 456–472. doi:10.1123/jpah.2021-0760

Jordan, C., & Chawla, L. (2022). A coordinated research agenda for nature-based learning. *High-Quality Outdoor Learning: Evidence-based Education Outside the Classroom for Children, Teachers and Society*, 29-46. doi: 10.1007/978-3-031-04108-27

Kang, S. J., Kim, H. S., & Baek, K. H. (2021). Effects of Nature-Based Group Art Therapy Programs on Stress, Self-Esteem, and Changes in Electroencephalogram (EEG) in Non-Disabled Siblings of Children with Disabilities. *International journal of environmental research and public health, 18*(11), 5912. doi:10.3390/ijerph18115912

Kang, S. Y., Kim, Y. J., & Lee, J. E. (2019). The effects of nature-based learning programs on body mass index in young children. *Childhood Obesity, 15*(2), 146-152. doi: 10.1089/chi.2018.0246

Lee, C. K., & Ensel Bailie, P. (2019). Nature-based education: Using nature trails as a tool to promote inquiry-based science and math learning in young children. *Science Activities, 56*(4), 147–158. doi: 10.1080/00368121.2020.1742641

Li, X. Z. (2022). Nature education in kindergarten is based on naturalistic educational ideas. *Research on Preschool Education, 09,* 83–86. doi:10.13861/j.cnki.sece

Mann, J., Gray, T., Truong, S., Sahlberg, P., Bentsen, P., Passy, R., ... & Cowper, R. (2021). A systematic review protocol to identify the key benefits and efficacy of nature-based learning in outdoor

educational settings. *International Journal of Environmental Research and Public Health, 18*(3), 1199. doi: 10.3390/ijerph18031199

Miller, N. C., Kumar, S., Pearce, K. L., & Baldock, K. L. (2021). The outcomes of nature-based learning for primary school aged children: a systematic review of quantitative research. *Environmental Education Research, 27*(8), 1115–1140. doi: 10.1080/13504622.2021.1921117

Nicole C., Saravana, K., Karma, L. P., & Katherine, L. B. (2021). The outcomes of nature-based learning for primary school aged children: a systematic review of quantitative research. *Environmental Education Research, 27*(8), 1115–1140. doi: 10.1080/13504622.2021.1921117

Otto, S., & Pensini, P. (2017). Nature-based environmental education of children: Environmental knowledge and connectedness to nature, together, are related to ecological behaviour. *Global Environmental Change, 47*, 88-94. doi: 10.1016/j.gloenvcha.2017.09.009

Rymanowicz, K., Hetherington, C., & Larm, B. (2020). Planting the Seeds for Nature-Based Learning: Impacts of a Farm-and Nature-Based Early Childhood Education Program. *International Journal of Early Childhood Environmental Education, 8*(1), 44-63.

Vella-Brodrick, D. A., Gilowska, K. (2022). Effects of Nature (Greenspace) on Cognitive Functioning in School Children and Adolescents: A Systematic Review. *Educ Psychol Rev, 34*, 1217–1254. doi: 10.1007/s10648-022-09658-5

Yıldırım, Günseli & Özyılmaz Akamca, Güzin. (2017). The effect of outdoor learning activities on the development of preschool children. *South African Journal of Education, 37*, 1-10. doi: 10.15700/saje. v37n2a1378

Zhang, Y. (2022). Naturalistic Education that Engages Children Deeply: Coming with Nature. *Jiangsu Education, 23*, 38-40.