

Literature Review: Nature-Based Play and Learning

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Prepared for
Four Winds Nature Institute

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Introduction

The mission of the Four Winds Nature Institute (Chittenden, VT) is advancing the understanding, appreciation and protection of the environment through community-based natural science education and research. Four Winds provides people of all ages with meaningful opportunities to explore the natural world. As part of their continuum of programming, Four Winds offers professional development for early childhood educators, childcare providers, and parents through Early Childhood Education Nature-Based Play Professional Learning Communities (PLCs). These PLCs support early childhood professionals as leaders who can leverage local resources and community connections, and make lasting changes in their teaching practice.

In order to stay abreast of the most recent research on nature play, Four Winds collaborated with PEER Associates to conduct a literature review related to the benefits of nature-based play and learning in early childhood.

What is Meant by Nature-Based Play and Learning?

For the purposes of this review, nature-based play and learning encompasses a spectrum of intentional outdoor activity ranging from child-led unstructured play to adult-led structured activities with intentional learning and/or developmental goals.

The literature that substantiates the benefits of nature-based play and learning draws from a broad range of related topics such as general exposure to nature, green spaces, and naturalized settings; active participation in outdoor activities; and garden-based learning. This review brings together relevant literature that is supportive of the diversity of activities that could be described as nature-based play and learning.

Why is Nature-Based Play and Learning Important?

Over the past decade, the decline of outdoor time and unstructured play in young children's lives has been well documented in both the scientific literature and the popular press. Children in the US now spend an average of less than 30 minutes per week in unstructured outdoor play. The outdoor time among children under the age of 13 generally decreased between 1981 and 2003 (Hofferth, 2009; Hofferth & Sandberg, 2001). This change in childhood play is seen in other countries as well. According to the UK Office for National Statistics (2018), the average amount of leisure time British children spend in parks, countryside, seaside, beach or coastal locations is only 16 minutes per day.

In response to this trend, many organizations have sought to increase access to nature play in childhood. For example, the number of nature preschools and kindergartens in the US reached an all-time high of 250 in 2017 (North American Association for Environmental Education, 2017), representing a 66% increase over the previous year.

At the same time there has been increased scholarship in the field, yielding a growing body of research about the many positive impacts of nature play. This literature review briefly summarizes findings on the benefits of nature-based play and learning in the following areas:

- Cognitive development;
- Academic performance;
- Social development;
- Mental and emotional health;
- Physical health; and
- Stewardship and sense of place.

The range of these benefits highlights the multifaceted value of nature play and learning. The sections that follow provide specific examples of these benefits from research studies around the world.

Benefits of Nature-Based Play and Learning

A goal of this review was to add to the existing body of work summarizing the benefits of children's engagement with nature. The selected citations, therefore, hail as much as possible from recent research. However, older, foundational research in the field is cited where newer studies were not available.

Nature play positively impacts children's cognitive development

A study of Norwegian preschoolers found that the amount of time children spent outdoors in daycare was positively related to attention skills and short-term memory (Ulset et al. 2017). Outdoor time in preschool may also protect children against inattention-hyperactivity symptoms, as interactions with nature have been found particularly effective in replenishing depleted executive attentional systems (Atchley and Strayer, 2012). Dadvand et al. (2015) found a similar beneficial association between exposure to green space and cognitive development among 2,593 7- to 10-year-old Spanish schoolchildren.

A comprehensive literature review on the benefits of nature for children concluded that nature provided extensive opportunities for children to acquire the abilities to discriminate, identify, and classify objects given the wide range of observable objects, features, and behaviors readily available (Gifford and Chen, 2016; Kellert, 2002).

As would be expected, the conditions under which outdoor learning takes place influence the outcomes. A case study conducted at two separate natural outdoor classrooms with preschool-aged children found that four factors in natural outdoor classrooms enhanced children's creativity and imagination: (a) predictable spaces, (b) ample and consistent time, (c) open-ended materials, and (d) caring, observant adults who support creative play and learning (Kiewra and Veselack, 2016).

Outdoor learning can improve academic performance

Learning outdoors has been shown to provide academic benefits both during and after lessons. Children with lower self-regulation skills in "normal" science classes showed a significantly higher self-regulated learning motivational behavior in the outdoor educational setting (Dettweiler et al. 2015). A study comparing lessons in nature and matched lessons in regular classroom settings found stronger classroom engagement after lessons in nature than after their matched indoor counterparts (Kuo, Browning, and Penner, 2018). The number of "redirects" (the number of times the teacher stopped instruction to direct student attention back to the task at hand) was significantly lower in and after the nature lessons.

The authentic, less stressful learning environment provided by nature may explain the higher academic performance in children learning in nature. A four year study of elementary school children from disadvantaged backgrounds participating in a nature-based learning program found that the students participating in the program consistently outperformed the control group in knowledge of science and overall academic performance (Camasso and Jagannathan, 2017).

Miller, Tichota, and White (2014) conducted a case study in Nebraska on how preschoolers learn math in an outdoor environment. They concluded that outdoor classroom environments (and the natural world) provided a powerful context for young children to explore, develop, and hone math skills. The researchers observed and recorded the preschoolers' authentic and meaningful math learning experiences and found that 77% of such experiences were child-initiated activities that emerged during their self-directed play.

Even simple exposure to greenness around the school has been shown to benefit academic performance (Chawla, 2015). For example, Wu et al. (2014) found that third-grade students in Massachusetts scored higher on standardized tests of English and math when they had more trees and other plants around their schools. Their analysis adjusted for demographic, socio-economic, and school level factors such as student-teacher ratio, administration, etc.

Nature play can improve children's social development and promote social harmony

Play and learning activities in nature and naturalized settings provide opportunities, in a number of ways, for improved social relations among children, students and teachers, and school communities as a whole.

A study conducted among English students who regularly attended forest school found that it improved children's social skills (O'Brien and Murray, 2006). Students showed an increased awareness of the consequences of their actions on other people (peers and adults) and acquired the ability to engage in activities with others, either sharing tools and tasks or taking part in cooperative play.

Compared to indoor school settings, nature provides opportunities for more dramatic social play (Drown & Christensen, 2014), which helps children to develop peer relationships as they learn social skills such as collaboration, altruistic behavior, and self-control (Gifford & Chen, 2016; Howes, 1988; Howes & Matheson, 1992). In addition, free and spontaneous play may be more effective than planned activities in promoting children's interactions with each other and

nature. Skar et al. (2016) explain that when adults move into the background and let children's play develop on its own terms, with fewer participants, and in one place for a longer period of time, children will come closer to both the natural environment and each other.

Practitioners of outdoor learning have described how it can create school unity by contributing to an increased quality of relationships across all members of a school community – student to student, teacher to teacher, and student to teacher. The effects include cross-grade collaboration and connections, as well as more constructive relationships in which students and teachers act in a family-like way, displaying responsibility and caring. (Bjorge et al 2017; Broda, 2011; Gibson, 2011). Research has shown that the teacher-student relationship in early childhood education influences academic performance and engagement through 8th grade, especially for students with marginalized performance and behavior problems (Hamre & Pianta, 2001; Roorda, Jak, Zee, Oort, & Koomen, 2017). Using outdoor learning strategies to promote social cohesion throughout the school community may pay longer term dividends across many dimensions of the educational experience.

Other researchers have found that certain elements of natural play and learning environments create a setting conducive to building social harmony within and beyond school. For instance, a study on preschool children from multiple U.S. states concluded that abundant natural materials and outdoor play space reduced competition and conflicts among children and encouraged generosity toward others (Dennis et al. 2014). Balseviciene et al. (2014) found that more residential greenness in the neighborhood was positively associated with preschool children's prosocial behavior such as being more "considerate of other people's feelings." In a 2016 study (O'Connor, McGunnigle, McCormack, & O'Rourke), parents reported their observations that children playing outside made the neighborhood nicer, helped families get to know each other, and improved community spirit.

Nature immersion, play, and activities benefit children's mental and emotional health

Much of the research on the benefits of nature for children's mental and emotional health has focused on exposure to nature in general. For example, multiple large-scale studies have indicated that children with proximity to green space have fewer emotional and mental health problems (hyperactivity, peer problems, and risk of mental health disorders) as well as higher emotional resilience (Aggio, Smith, Fisher, & Hamer, 2015; Balseviciene et al., 2014; Flouri, Midouhas, & Joshi, 2014). Exposure to green space in areas surrounding residences was also associated with reduced aggressive behaviors among adolescents (Younan et al., 2016).

A variety of research has shown that activities done in natural settings provide greater mental and emotional health benefits when compared to similar activities conducted in indoor settings. Children spending time in an outdoor education setting (forest school) versus a conventional indoor school setting reported reduced stress and greater energy and ability to feel pleasure (Roe and Aspinall, 2011). Compared to indoor classrooms, natural areas were shown to promote concentration and relief from stress in a study of students aged 9-13 (Chawla et al. 2013). Students frequently described the natural habitat and gardens as peaceful, calm, and relaxing.

Cumulative childhood stress can affect cognitive development and trigger later mental health issues (Hanson et al., 2016). Therefore, the psychologically restorative outcomes resulting

from increased time spent in nature could also have a long-term impact on children's mental health.

Nature-based play and learning contributes to children's enhanced physical health

An increasingly sedentary lifestyle, spending more time indoors using electronic media, and less time engaged in outdoor unstructured play, are major contributors to the decline in children's health (McCurdy, Winterbottom, Mehta, & Roberts, 2010). The need for greater activity is clear, and school environments present an opportunity to influence activity levels for all children.

Researchers have found that natural components in school environments can contribute to children's physical health. Soderstrom et al. (2013) compared the health of Swedish preschoolers who had high-quality schoolyards with trees, and hilly terrain with play structures, versus preschoolers with schoolyards with less nature integration. High-quality outdoor spaces were associated with better physical health outcomes such as longer sleep at night and higher health ratings by parents.

Compared to traditional playgrounds, natural playgrounds enable children to engage in moderate-to-vigorous physical activity (MVPA) (Boldemann et al., 2006; Dawn P. Coe et al., 2014) and improve their motor fitness (Fjørtoft, 2004). Engelen et al. (2013) found that introducing loose materials (play objects and materials that are open ended and manipulable) to traditional playgrounds significantly increased the amount of MVPA in 5- to 7-year-old children during break times, and the benefits were maintained over a longer time period. Natural playgrounds offer accessible and abundant loose materials from nature (e.g. sand, water, sticks, dirt) and ample space to introduce recyclable and manufactured loose materials for creative and constructive play.

As with any time spent outdoors, nature play also increases sun exposure and synthesis of Vitamin D (McCurdy et al., 2010), which is critical to the development of bones, muscles, and neurons, as well as lessening depressive symptoms and increasing feelings of vitality (Knippenberg et al., 2013). Multiple studies have shown that children who spend more time outdoors at school are less likely to be, or to become, nearsighted (French, Ashby, Morgan, & Rose, 2013; He et al., 2015; P.-C. Wu, Tsai, Wu, Yang, & Kuo, 2013).

Nature-based play instills a sense of place and stewardship

Nature play and learning have a profound influence on children's values toward nature and pro-environmental behaviors. For example, positive experiences in nature, specifically psychological restoration (being away from everyday worries and distractions), have acted as a motivational factor enhancing children's pro-environmental behavior (Collado and Corraliza, 2013). A study conducted on fifth- and sixth-grade students in Milwaukee, WI concluded that children who knew a neighborhood natural area where they could play had a significantly stronger sense of place (Kroencke et al. 2015).

The influence of nature on children could also last through their adult life. A review of more than thirty studies found that play in nature was one of the most important childhood experiences that later influence adult values and behaviors toward nature (Chawla and Derr, 2012). Asah, Bengston, and Westphal (2011) also found that higher childhood participation in

nature-based activities increased motivation to recreate outdoors as well as efforts to overcome barriers in doing so. Prévot et al. (2016) found that the environmental identity formed in childhood influenced students' choice of their college major.

In addition, multiple studies have found that "unstructured, frequent childhood play in wild settings" is the single most common influence on the development of lifelong conservation values (Finch & Loza, 2015).

Conclusion

The growing body of research describing the many potential benefits of nature-based play and learning suggests that these activities and approaches are worth considering for both formal and non-formal educational settings.

The potential outcomes for cognitive and social development and academic performance demonstrate that outdoor settings can positively contribute to the quality of learning in a variety of ways and that more time in nature or naturalized settings can have a beneficial impact on the entire school day as well as the larger school culture. Meanwhile, findings related to children's mental and physical health make a compelling case that nature immersion can be a vital part of the antidote to the increasingly sedentary yet stressful world in which many 21st century children dwell.

The literature points to the promises and potential of nature-based play and learning, but, as with any topic, there is much yet to learn. As summarized in Gifford and Chen (2016), more and better research is yet needed to understand questions such as:

- What are the mechanisms of causal relationships between exposure to nature and beneficial outcomes?
- How are the benefits of nature-based play and learning similar to or different from the same benefits from other approaches?
- How do the benefits of naturalized settings compare to truly natural settings?
- What approaches will address inequality of access to nature play and learning?

Practitioners and proponents of nature-based play and learning should use the literature as a guide to inform their practices and their stakeholders, while staying attentive and contributing to the ongoing deepening of knowledge about this field.

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