Learning in the Natural Environment:

Taking Education Outdoors

Alisa Kahle

University of Washington, Tacoma

Abstract

This research explores the benefits, challenges, and barriers of outdoor education in elementary school students. Three themes were identified: barriers and challenges, effects of learning outdoors, and risks and consequences of outdoor education. The paper examines how research in this area can align with the practices at a Washington State elementary school in the West Puget Sound area. Furthermore, the paper explores implications for future research in this domain. This paper highlights many strategies for educators to increase learning opportunities in nature.

Keywords: outdoor education, natural environment, forest schools, green spaces, nature-based education

Learning in the Natural Environment: Taking Education Outdoors

This thesis aims to investigate the natural environment's impact on children's development and learning. I think the outdoor environment is a setting that is underutilized in schools, and I would like to discover ways to take advantage of nature. I want to explore the benefits, challenges, and reasoning behind using nature to foster learning and growth in young children.

Context

I have noticed a trend where the frequency at which students spend their time outdoors is decreasing. There have been many days, throughout the school year, when the students are inside the classroom all day. This could be due to weather or lack of time in the day. For the latter, we would often prioritize subjects such as reading and math, which are predominantly taught indoors. I am interested in finding more information about outdoor education programs, in which learning takes place in nature with organized activities. Although any learning that occurs outdoors may be considered outdoor education, I specifically would like to see how nature in non-man-made locations can be used as a space where learning takes place.

The geographical location of the Pacific Northwest comes with an abundance of natural benefits. Notably, the proximity to the forest as well as the water. Many programs have integrated fourth graders with their surrounding environment. They have focused on salmon release and exploring the Puget Sound region due to state standards (covering Washington State history). However, for other grade levels, environmental education or sustainability has rarely been taught. Environmental education and sustainability are approached differently in various regions of the country. Each location in the United States has had its priorities when it comes to

the environment, whether it is about agriculture, natural disasters, or lack of accessibility to nature due to being an urban development.

Importance

I have always felt connected to nature. I am from Honolulu, Hawaii, and spent a lot of my childhood playing outside, exploring nature, and spending time with animals. For my undergrad experience, I have a B.A in Elementary Education with a concentration in Environmental Studies. However, my environmental studies classes never overlapped with teaching. I want to learn more about using nature as a medium to foster imaginative play and the practicality of integrating the outdoors into the school day. The schools that I have taught at had little or no programs that included students being able to explore the outdoors. At my current school, we have an outdoor classroom and trail that has been used a little, and I would love to be able to take advantage of the space more. However, finding the time to take students to the outdoor classroom is an additional challenge. When I was recruited to teach for my district in the Kitsap Peninsula, a big selling point that the hiring committee made was about how Kitsap was the "nature side of the Pacific Northwest" and that there are plenty of outdoor activities in this area. Many people in the area are involved in these activities, yet they have not been integrated into the classroom. We are missing this vital community partnership that could be formed.

An educational theory that influenced my choice is constructivist learning theory, specifically, Friedrich Froebel's approach to outdoor learning and nature in early childhood. Froebel established kindergarten and believed that play and socialization were significant in childhood learning (GUTEK, 2002). Froebel spent a lot of time with nature and combined his love of the outdoors with early childhood learning. He used nature experiences, finger play, outdoor activities, music, art, and storytelling in the kindergartens he pioneered (Carlisle, 2009).

Focal Questions

This thesis will be about outdoor education in elementary school kids. I would like to explore the benefits and challenges of outdoor education with elementary-aged students in the literature. Specifically, I would like to answer the following questions:

- How does education in an outdoor setting benefit students' academics?
- What are the challenges or barriers that teachers face when trying to implement more time outdoors?
- How does the outdoor environment impact children's growth and development?

Literature Review

The outdoor environment is viewed as an important part of children's development, learning, exploration, and discovery. However, the amount of time that children spend indoors has increased over time (Cleland et al., 2009). During the school day, elementary students spend less time outdoors. Young children do not have the same opportunities to explore their natural environment and are showing less pro-environmental behaviors, physical activity, and cognitive functioning because of it (Amicone et al., 2018; Peacock et al., 2020; Wells & Evans, 2003). Schools feel additional pressure to perform well on standardized test scores. Due to testing, there is a larger focus on math and reading, which are predominantly taught indoors. Since children spend most of their waking hours in school, they lack learning opportunities that coincide with their natural surroundings (Cleland et al., 2009). I think this is an important topic for educators, as there are potential benefits from learning in the outdoors that cannot be replicated from being indoors.

In this literature review, I discuss the effects of teaching in the outdoors, and the benefits learning in nature has on students physically, emotionally, and academically. Second, I look at

the barriers and challenges that can arise with teaching outside, such as resources, region and climate, and types of vegetation used. Lastly, in this review, I discuss the risks and consequences of participating in outdoor education experiences and the potential dangers and negative impacts that may occur.

Effects of Learning Outdoors

The literature presents the benefits of students learning outdoors. These categories can be broken down into physical, emotional, academic, and pro-environmental benefits. Each of these subsections will discuss the four main benefits that contribute to being outdoors and learning in the natural environment.

Physical Impacts

Physical activity is shown to have a positive effect on children's physical health and have less risk of childhood obesity (Peacock et al., 2021). Currently, children are not meeting the recommended 60 minutes of physical activity per day in school with P.E. and recess alone (Peacock et al., 2021). In the same study, researchers compared the amount of physical activity students do in an outdoor setting vs. an indoor environment. Five elementary schools in Massachusetts with a total of 541 fourth-grade students participated in an outdoor education program owned by the YMCA. Students attended for 2-5 consecutive days, each day for five hours. The students participated in hands-on learning experiences in Environmental Education, Science, and Math. Students wore accelerometers to measure their activity. The results concluded that students had at least an additional hour of moderate to vigorous physical activity in the outdoor education program than in the indoor classroom. This particular study highlights physical activity primarily by boating, canoeing, and ropes courses. However, this is not realistic for most classroom curricula.

One way in which physical activity transpires is through the journey to and from the outdoor destination. Having educational experiences in green spaces requires students and teachers to walk to and from the classroom to their outdoor environment. In a study conducted by Kuo et al. (2018), two third-grade classes were observed in two different environments (indoors and natural outdoors) to compare engagement over 10 topics for 10 weeks. Post-treatment observations were always done indoors in the teachers' classrooms. Observations were observed during and after lessons. The lessons were both 40 minutes long and teachers teamed together in lesson planning. However, the lessons and nature were about 30 minutes long due to the walk to and from the green spaces. Students and teachers walked an additional 5 minutes each way to their outdoor site, for a total of 10 minutes, which increases the amount of physical activity that would otherwise not happen inside the classroom. To get to the outdoor classrooms, students and teachers need to physically travel, which increases the number of steps they get per day. Alternatively, educators may opt to keep students inside the classroom for a quick break to do jumping jacks or running in place because it can save time. However, the research suggests that this walk can benefit students more than just physical activity.

Emotional Impacts

One of these additional benefits focuses more on the emotional outcomes than the physical. In the same study, Kuo et al., (2018) noticed that there is an added benefit not only for students but for teachers as well. By walking to and from the classroom to the outdoor learning space, teachers and students are taking a break from classroom activities. Being outside rejuvenates teachers which helps them gain more energy (Kuo et al., 2018). Teachers also showed to have lower stress levels after stepping outside from the indoor class setting. When teachers' stress levels are lower, they can stay calm when problems arise and be more

understanding when students need social-emotional support. Students' stress levels are also impacted by being surrounded by nature.

In a study relating to nature's impact on stress, Wells and Evans (2003) examined how children's proximity to natural environments impacts their emotional wellbeing. In rural New York, children's life-stressor events and psychological distresses were scaled using maternal and self-reports to determine the impact of the stressors. In the study, 337 children from grades 3-5 who lived in rural New York participated in this study. The Naturalness scale was used to determine the amount of nature in the window views, house plants, and yards in the homes of the participants. The Lewis Stressful Life Event Scale was used to determine the frequency of stressful events that occur in the participants' lives (to determine how often they happen, not the severity of the events). This included family relocations, the subject of peer pressure, being picked on or punished at school, etc. The Rutter Child Behavior Questionnaire was used to measure the children's distress and psychological health determined by their parents. The Global Self-Worth Subscale (from Harter Competence Scale) was used by the children to determine their perception of psychological well-being. The results showed that children who were nearby natural elements (had natural views, several plants in the room, or a yard) had moderate impacts on stressful life events (Wells & Evans, 2003). The children's psychological distress and self-worth due to life stressors varied by the amount of nature the children were exposed to. The impact of stressful life events appeared to be lower when children had a high amount of nature in their setting. The study shows that the presence of vegetation and natural elements in a child's residential environment can provide them with resiliency from stressful events. When children are surrounded by vegetation and natural elements, it helps them be more resilient to stress. Some theories the author suggests are that social support may be greater when children are near

nature and allows them to develop friendships because outdoor spaces foster social interaction (Wells & Evans, 2003). When children have friends, that may help them be resilient to stressful events. Having opportunities for students to interact with one another is a crucial part of the learning skills needed to be successful in society.

Nature plays a role in helping increase the opportunities children need to have these interactions. In a systematic review conducted by Mann et al. (2022), 147 research studies analyzed the social-emotional and academic benefits of outdoor education with school-aged children (Kindergarten to 12th grade). The setting ranged from school gardens, field experiences, and lessons in the outdoor environment. The review showed that the outdoor environment led to more social-emotional opportunities. Some of the benefits that were shown include improve coping strategies, resiliency, self-efficacy, interpersonal skills, teamwork skills, and learning-readiness skills (Mann et al., 2022). The researchers also noted that student engagement in learning increases. This result shares similar observations with Largo-Wright et al. (2018) and Guardino et al. (2019).

When outside, students gain more excitement about the lessons and that excitement is apparent in their engagement with the class and activities (Largo-Wright et al., 2018). Children have a better academic experience and enjoy learning outdoors (Aflalo et al., 2020; Guardino et al., 2019). When children are enjoying their learning, fewer behavioral challenges occur. In the study by Guradino et al. (2019), observers recorded that students who have disabilities had more behavioral redirections, threw objects, and refused to work while indoors. However, in the outdoor classroom, the same students were focused and had fewer behaviors during lessons. The students, with and without disabilities, reported they enjoyed coloring, journaling, and reading books more in the outdoor classroom compared to the indoor classroom (Guradino et al., 2019).

Social-emotional learning can be a tricky subject to integrate into the school curriculum. By leaning on these lessons as a by-product of student experiences outdoors, teachers and students can capitalize on additional time and cohesion of the day-to-day schedule. In turn, this time saved can reduce the stress felt by all parties involved.

One study, in Australia, looked to pinpoint this impact on stress. The study focused on 133 students, ages 10-18, and it aimed to determine the influence of a green schoolyard on students' stress, well-being, and executive functioning (Kelz et al., 2013). The experimental school was set to have construction for a greener outdoor play space than the control, however, both schools were similar at the beginning with academic standards and structure**.** Physiological stress was measured by calculating students' blood pressure. Executive functioning was determined by using the Attention Network Test. Well-being was measured using the Basler Well-Being Questionnaire to determine how students were feeling. Perceived Restorativeness was measured using the Perceived Restorativeness Scale. The findings showed that students' overall blood pressure decreased after having a greener schoolyard compared to the control school. Students' well-being was significantly higher in the experimental group after having a greener schoolyard. Perceived restorativeness in compatibility and fascination increased after having a green schoolyard. However, there was no difference in planned comparison and a lower score in coherence.

Another key feature of social-emotional learning is being able to problem-solve and cooperate in group activities. In a study that was conducted in the Netherlands, students were observed in a small town and on two farms (van den Berg & van den Berg, 2010). Twelve students ages 9-17 with diagnosed ADHD participated in the study. The children were split into two groups, Farm 1 and Farm 2, and each group visited natural and built settings on consecutive

days. An open wooded area was used as the natural setting and children built a cabin. A quiet town was used as the built setting and the participants explored the neighborhood. After each activity, the children were interviewed about their moods and feelings and tested for their cognitive functioning. For both groups in the study, all the children were enthusiastic while in the wooded area (natural setting). There were no problems when it came to answering questions and cooperating. There was no aggressive or impulsive behavior. However, for the first group, while in town (built setting), the students complained for most of the day and did not follow instructions. Children were yelling and showed aggressive behavior. They exhibited hyperactive behavior and were unable to play the game. It took a long time for students to answer questions. In the other group, the children were enthusiastic to get to town, however, did not listen to instructions as they were eager to start. There was only one instance of verbal aggression, but the children were not social with one another. They were able to answer questions but were also inattentive. In the first group, they preferred the woods to the town. But for the second group, the children preferred the town. The second group also perceived both settings more positively in terms of restorative and mood than the first group. The first group had an increase in restorativeness and positive feelings in the woods than in town. This study suggests that nature may reduce some symptoms of ADHD. Being able to manage aggressive behavior can help students form positive relationships with their peers.

Being in nature can impact cognitive development in which students learn to play with one another and gain friendships. In a study conducted by Taylor et al. (1998), outdoor spaces in low-income urban environments were assessed. The researchers wanted to find if green spaces and the amount of adult supervision played a role in the types of activities children participate in. The number of children playing was doubled in high-vegetation areas than in low-vegetation

areas. There also showed to be a higher amount of creative play where vegetation was more present. There was also more adult supervision in the high-vegetation areas than in low-vegetation areas. Creative forms of play are vital and nature provides more opportunities for children to participate in play and exploration. (Taylor et al., 1998). In a later study conducted by Dowell et al. (2011), the researchers also found a connection between nature and play. The study was conducted in Australia, where two urban early childhood centers were evaluated on the type of natural spaces. Children ages 2-6 were observed with different types of play (social, cognitive, physical, motor skills, etc.). The study showed that the highest type of play was verbal interactions and then imaginative activity. In the natural setting, the most common types of play were imaginative activities and interaction with the environment. There was a higher amount of imaginative play in the natural setting than in the warehouse setting. Children at the natural childcare also experienced deeper play that lasted for a longer time, while at the warehouse, children changed their play frequently. nature helps foster children's imagination and exploration compared to non-natural settings. Children were also better able to stay focused on one activity in the outdoor setting than in the built environment. Dowell et al. (2011) showed the importance of a teacher to help enhance the children's experience of the natural environment by providing different opportunities for imaginative play and discovery.

Being out in nature allows children to gain self-awareness and confidence and overcome challenges through experiencing obstacles (Peacock et al., 2021). A review conducted by Chawla et al. (2014) involved elementary-aged students and the effects of the environment on their stress and resiliency. The observations through field notes, videos, photos, and interviews showed that when children were interacting with the surrounding nature, they felt a sense of peace and decreased their stress and anxiety. For young children, anxiety can be a strong emotional barrier.

The findings suggest that working in nature can remove this barrier and allow for more effective behavioral growth.

This study also included high school students who mentioned feeling fully relaxed and being able to have the time to reflect and care for their plants (Chawla et al., 2014). Students across different grades shared that the natural environment changed their mood and allowed for more opportunities for free choice and discovery.

There is value in children exploring nature and understanding their surroundings that is not able to be replicated in an indoor classroom. A qualitative study conducted by Adams and Beauchamp (2021) was done to see how children felt about mindfulness activities in nature reserves. The study included children ages 7-11 from South Wales. Teachers took children to two local remote nature reserves where they were surrounded by grassland, woodland, and wildlife. Students took part in multiple mindful approaches to nature, such as breathing meditations, listening exercises, watching nature, using their sense of smell and touch, and playing hide-and-seek Students and teachers were interviewed on the same day by the researchers who facilitated their mindfulness activities. The data was organized by common thematic responses. One key result was that all the students who participated in the mindful activities reported feeling calm and relaxed due to being in nature and the sounds they were surrounded by. Another theme was that the time being away from school and the structure of activities gave students more opportunities to reflect. The last theme was that children felt the sense of being in a different world or reality. The children reported feeling a connection to nature and the sounds and views around them made them feel like it was a different world.

Academic Impacts

For schools to see the value of teaching outdoors, they need to understand the academic benefits of learning with nature. Schools have a high focus on increasing math and literacy scores. Unless outdoor education helps students inch closer to their academic goals, there is no incentive to move their learning environment outside (Kuo et al., 2018). A common misconception that teachers and administrators have is that being outside will be distracting for students because various sounds in nature, paired with different visuals, will decrease on-task behavior. However, contrary to the misconceptions, several pieces of the literature showed that there is an academic benefit to learning outside (Aflalo et al., 2020; Kuo et al., 2021; Largo-Wright et al., 2018; Peacock et al., 2021). Recent studies not only find that test scores show an increase in performance, but multiple studies in the literature revealed that students have improved their attention, memory, and on-task behavior after learning outdoors (Amicone et al., 2018; Kuo et al., 2018; Largo-Wright et al., 2018).

Three studies showed that the number of redirections is higher in indoor lessons than when similar lessons occur outside. The study by Largo-Wright (2018) indicated that over the six-week study, students increase their on-task behavior more and there should be further studies to address the long-term effects of learning outdoors. In another study, students reported that they felt more comfortable learning science outdoors and they felt they had learned more outside than in the traditional indoor setting (Peacock et al., 2021). Lastly, a recent study conducted by Mason et al. (2021) investigated the impacts of indoor and outdoor environments on students' attention processing. The study showed that when third and fourth graders were exposed to negative stimuli in both the indoor and outdoor environments, students were able to stay focused more so when surrounded by greenery (including spaces with views of trees and plants). While

performing attentional tasks, students were more likely to self-regulate in outdoor spaces (Mason et al., 2022). This shows that nature can act as a buffer for negative distractions for students when working on academic tasks.

Nature has been shown to benefit children's ability to focus and stay on task. In a quasi-experimental study conducted by Norwood et al. (2021) was set to determine the effects of lessons in nature compared to a standard indoor classroom. More specifically, they set out to discover if student behavior and learning are influenced by indoor or outdoor spaces. This study was conducted with 13–14-year-olds in Queensland, Australia. The study involved three classes, with a total of 73 8th-grade students. All students were taught in an indoor classroom for the first 5 weeks of the study (the topic was "chemical changes"). Then, two classes were taught outside for the last 5 weeks (the topic was "rocks never die"). A portable whiteboard, crates with cushions, and trees for shade were used in the outdoor classroom. Individual lessons were 70 minutes long; however, the outdoor class started about five minutes later due to the walk. An adapted version of the Composite Index of Classroom Engagement was used to measure behavior. The results showed that the control group that stayed in the classroom exhibited more redirects per minute, especially during the last 5 weeks of the study compared to the outdoor classrooms. However, were no significant changes in grades between both groups. Teacher ratings were slightly lower in the outdoor classroom than indoor classroom during the last 5 weeks. In an earlier study conducted by Ulset et al. (2017), 562 preschoolers from 28 daycares and elementary schools were observed annually from 2006-2009. The daycares were assessed by the quantity of outdoor time and the quality of their outdoor space. The data showed a negative correlation with nature-based daycares with inattention and hyperactivity symptoms in children ages 4-6 compared to a control group. There also showed a significant positive correlation

between time spent outdoors and attention skills in children ages 5-6. The time spent outdoors positively impacted cognitive-behavioral development in children. The study discusses the long-term benefits of exposure to the outdoors in preschool. Children were able to gain self-regulatory skills with a high dose of natural contact in preschool. The cognitive and behavioral benefits of students' attentiveness were shown even after preschool.

In a similar study conducted by Wells et al. (2016), researchers explored the relationship between children's physical activity and location, as well as measured cognitive development, emotional well-being, and risk-taking. The observational study was conducted in three schools in Auckland, New Zealand. 118 students aged 11-14 years old participated in the study during the spring. Students wore a waist belt (Qstarz BT-Q1000XT GPS receiver) to collect location data every 15 seconds. Students wore the devices during waking hours besides bathing and water-based activities. The Actigraph GT3X+ accelerometer was used to measure physical activity. Emotional well-being was assessed using the Life Satisfaction Scale (LLS), the Ten Domain Index of Wellbeing (TDIW), and a scale to measure happiness in life. The Short Form Sensation Seeking Scale (Zuckerman, 1990) was used to assess the student's short-term physical and social risk-taking. The Balloon Analogue Risk Task (BART-Y) was used to measure risk-taking. The CNS Vital Signs computerized test was used to measure a variety of cognitive domains (visual and verbal memory, processing and psychomotor speed, reaction time, cognitive flexibility, and executive function). Students participated in more moderate to vigorous physical activity (MVPA) while in greenspaces than in non-greenspaces. There was a positive relationship between time spent in greenspaces and students' emotional well-being and life satisfaction. For risk-taking and sensation-seeking, there was no strong correlation with time spent outdoors. There was no relationship between greenspace exposure and the cognitive computerized test.

Students in the study only spent an average of 1.17% of their time in greenspaces, which shows the limited amount of time they spend outdoors. This study showed that there is a positive link between outdoor greenspaces and time spent doing physical activities children participate in. The amount of vigorous physical activity is directly tied to a person's health.

Pro-Environmental Benefits

When students are directly involved with nature, they show a sense of responsibility to their environment and surroundings. A study conducted by Aflalo et al. (2020) observed fourth-grade students learning with a computer versus learning on a farm and greenhouse to see the differences in their perception of the environment. Students who were hands-on with the animals and plants in the garden had a higher desire to improve their environment and had more awareness of their impact on the natural environment compared to the computer-based group (Aflalo et al., 2020). Students were physically involved in the care of plants and animals and, thus, they had personal responsibility for the wellbeing of flora and fauna. In one short-term study, students used scales that measured their attitudes and behavior toward outdoor play as well as their connection and affinity to nature (Mullenback et al., 2018). The students who participated in the outdoor school (four-day camp) showed to have a higher level of connection to nature and outdoor play behavior. Students were learning about various environmental education topics (i.e., ecology, geography, water, natural resources, species, comparing ecosystems, sustainability) from their camp counselors, and exploring nature during unstructured and structured times.

In an empirical study conducted by Harris (2021), students age 5-11 were observed in a forest school. The results showed that at first, students were afraid of the woods, but were able to overcome their fears to make it a more enjoyable experience. Students learned how to name and

identify plants and other life outside and by doing so, students gained an affinity for the woods and developed an ethos of care by wanting to preserve the environment (Harris, 2021). Children were able to develop a relationship with nature after first learning to overcome their fears. This is like the results of a different study involving Kindergarten students through an art-based environmental education program where students had negative initial reactions to nature (Hunter-Doniger, 2020). The children would complain about bugs and animals, carrying materials, and the temperatures. They were also concerned with the danger of being outdoors. The counselor's fear of nature impacted the students' opinions of nature (Hunter-Doniger, 2020). This idea is like Richard Louv's notion discussed in *The Last Child in the Woods*, which involved parental worries about the dangers of the outdoors as a reason for the decrease in time spent there. In turn, this evolves into what he describes as "nature-deficit disorder". However, in Hunter-Doniger's study, once the counselors became more comfortable with nature and allowed children to freely explore, children's fears of the outdoors lessened. The forest school allowed for more child-centered learning. Students were also able to use their senses to experience nature in a new and exciting way. The students had a large connection with nature through art by creating sculptures, sketching, making music, and identifying animal tracks (Hunter-Doniger, 2020).

A study conducted by Harvey et al. (2020) aimed to find a connection to nature with students ages 8-11 years old in the United Kingdom. Students who were in the study group participated in a biodiversity program led by Biological Science undergraduate students for one hour a week. Students would monitor species, build habitats and food sources, and view short presentations by undergraduate students. A Nature Connection Index was used to measure connectivity while the KIDSCREEN-27 was used to measure the children's well-being. The

students also answered questions on a mood survey at the beginning and end of the lessons. To measure short-term effects, an adapted version of the Positive and Negative Affect Schedule for Children Scale was used. The data revealed that there was a significant increase in students' well-being after the biodiversity program compared to the control group. As the study progressed, students in the program demonstrate a positive shift in mood. For both the control and study groups, all students reported a relatively high connection to nature at the beginning. Significant improvement in student connection to nature was only evident for students who reported lower connectivity with nature at the beginning of the program, as the rest reported consistently high connections throughout.

Barriers and Challenges

Through my research, I have seen challenges and difficulties with using nature in elementary classrooms. In some of the studies, schools had an optimal location to be close to nature, were able to go to farms, and had high access to the outdoors (Aflalo et al., 2020; Mullenback et al., 2018; Peacock et al., 2020). However, challenges can occur for schools in urban areas that are not near trees and landscapes optimal for outdoor teaching. In one study, Browning et al. (2018) have shown that not all greenery benefits students' academic and social success. There is also a financial burden for, already low funding, public schools to gain resources to teach outdoors. These resources are but are not limited to, materials for teaching, adequate seating, shade from harsh sun, and space to conduct lessons. Another theme is that there needs to be a time that is set aside to include nature but can raise challenges based on the requirements of the school day.

Resources

Having adequate space and resources is a large factor in the success of outdoor education. In a study by Dyment (2005), 451 elementary schools and 102 high schools were used to assess the barriers educators must face to have outdoor learning opportunities. Questionnaires and case study interviews were conducted and distributed to principals, teachers, and parents at school sites. The research showed that one of the main concerns in implementing lessons in nature involves a lack of resources from the schools. In particular, something that is out of teachers' and principals' hands is the poorly designed school grounds that do not have the space for learning to happen. In these cases, there are financial costs to have students take a bus to a different location, such as a conservation center or park.

In a later qualitative study conducted by Patchen et al. (2022), educators from three northeastern United States elementary schools were interviewed to identify the barriers to including outdoor time during the school day. The project's goal was to navigate the barriers and challenges to increase outdoor time through planning. The data showed 33 barriers that impacted students' opportunities to be outside. The barriers were then categorized into five main themes of why teachers limit outdoor time. In one theme, teachers stated that there was not a proper enclosed space that they could access. The spaces were not easy to get to and were not properly maintained. Teachers worried about cutting the grass, setting up seating, and interfering with other classes (Patchen et al., 2022)

Partnering with community-based organizations can help provide resources for schools in need of supplies for outdoor learning. In the study conducted by Peacock et al. (2021), Lawrence Public Schools in Massachusetts partnered with the local YMCA for access to their outdoor camp. Each school's resources and the YMCA funding determined the length of stay for the

students at the camp. The resources that were available to them included mentoring, location (highly dense forest and water), and outdoor recreational equipment. In another study, the authors were given grant money from the Environmental Center to build an outdoor classroom (Guardino et al., 2019). These resources are not readily available to all schools and thus need to be a strong consideration when creating outdoor spaces for students to learn.

The literature shows that the materials needed do not have to be expensive or new. For seating, students used carpet squares, tree stumps, logs, or grassy patches (Guardino et al., 2019; Largo-Wright et al., 2018). Tires and potted plants can be used for creating a barrier for the outdoor classroom (Guardino et al., 2019). Students also use clipboards and paper to write on (Guardino et al., 2019). Teachers in the studies used chalkboards or easels (Guardino et al., 2019; Largo-Wright et al., 2018). The supplies that are used in the outdoor classroom do not need to be different than what is already available in indoor classrooms. The studies showed the importance of being resourceful when it comes to storing and gathering teaching materials and finding an area near the school that can transform into a learning environment.

Another theme from the Patchen et al. (2022) article suggests that teachers chose to stay inside the classroom because of the lack of outdoor clothing students had access to. Appropriate shoes and clothing need to be addressed. Students who do not have proper attire may not feel comfortable going outside and did not want to get their clothes dirty due to limited resources at home. The limited clothing bank at the school singled students out and teachers wanted to have an equitable experience for all their students (Patchen et al. 2022).

Region, Season, and Climate

The literature had limitations when it came to the region and climate of the studies that were conducted. The literature displayed the success of outdoor learning in climates that are

convenient for being outdoors. Some studies that were conducted in the Southeast US experienced a lot of sunny weather or were conducted in the summer when the temperatures were consistently warm (Largo-Wright et al., 2018; Mullenback et al., 2018). In the Largo-Wright et al. study, teachers and administrators were concerned about shade from harsh sun rays. Multiple tents were used to shield students and teachers from the sun. Other studies did not take weather into account when presenting their findings. Further research will need to include "all-weather" schools and climates where the temperature is cold and wet to see the various challenges they bring, and to see if the results yield the same results as they do in sunny climates. In one study, the data collection had to be adjusted due to rain or bad weather (Guardino et al., 2019). The variability of weather could bring new challenges for regions that are typically rainy, such as the Pacific Northwest.

Type of Vegetation

A study conducted by Browning et al. (2018) replicated a study (Wu et al., 2014) to determine if the type of vegetation in Chicago Public Schools influences the result of math and reading performance. The findings suggest that there is a need for studies that distinguish the different types of vegetation (trees, shrubs, grass) concerning benefits. This will help determine which vegetation has the most impact. Browning et al. (2018) undermine the notion that all greenness positively affects students academically and there needs to be intentional thought while planning around schools (Browning et al., 2018). In a later study, Kuo et al. (2021) focused on types of plants near public schools in Washington state and measured 6th-grade academic performance based on proximity of greenness. The researchers were able to control each type of vegetation to determine which type has the strongest correlation with reading and math test scores. The presence of tree canopy contributes to higher scores than other vegetation

and without tree canopy, total greenness is not strongly correlated with academic performance (Kuo et al., 2021).

Risks and Consequences of Outdoor Education

In this section, I will look at the risks and consequences that are associated with outdoor education. Studies have shown how the hazards in the environment may cause physical harm to students. With the risk of physical harm to students, teachers are more protective when outdoors which eliminates some of the positive benefits of students being outside (i.e., risk-taking, and leadership).

Hazards and Safety

The main risk with implementing outdoor classrooms has to do with the safety issues involved. In one article, Torkos (2017) addresses the possible hazards that need to be addressed to create a safe learning environment outdoors. This includes identifying and removing possible hazards, such as poisonous plants, sharp objects, and unsafe terrain. Ensuring the outdoor spaces are safe requires regular assessment of the areas and determining any challenges that may occur. Staff and teachers who are supervising students should have training on student safety. An important consideration is developing safety policies to discuss with parents and guardians, so they understand and approve of any risks that may be involved. Students also need to have adequate footwear and clothing and need to have discussions about being aware of their surroundings (Torkos, 2017). However, eliminating all risks outdoors is not realistic, and there will always be a chance of students falling, scrapping themselves, and getting cuts or bruises. Students and parents must be able to cope with the risks involved in participating in outdoor experiences. Patchen et al. (2022) also mentioned students get hurt and nurses need time to help

students. Due to policy in some schools, teachers are unable to let students outside at the end of the day due to the time it takes for students to recover from being hurt.

Anxiety involved with Adult Supervision

In a school setting, adult supervision is a crucial aspect to consider. In an ethnographic study conducted by Stan and Humberstone (2011), students and teachers from 16 primary schools were observed to determine how teachers manage the risks of outdoor education. Adults were anxious about the children's safety and continuously reminded students about the different dangers within the outdoor space (Stan & Humberstone, 2011). In the study, teachers had anxiety about the idea of the students getting hurt and often gave them many warnings even when there were few risks involved in the task. This is in part because the visiting teachers did not have any special training in outdoor education. In an article, Torkos (2017) explains the importance of having training for staff and the involvement of parents when creating safety protocols. The adult's approach to risks came with negative effects because students relied more on teacher intervention and students were unable to be independent and problem-solve on their own (Stan & Humberstone, 2011). Originally, the outdoor experience aimed to teach children about teamwork, leadership, communication, and participation. Teachers were the ones doing the communicating and solving tasks, which took away from some of the positive impacts of the outdoor experience. The teachers' overbearing control was an unfortunate side-effect of how they protected the children from possible injuries. This was compounded by the concerns about liabilities and litigation if the students were harmed during the outdoor education experience Dyment (2005) also stated that possible health and safety can be a concern for educators when increasing the amount of outdoor learning during school hours. Some concerns were allergic reactions, injuries, unable to view students, and water safety. However, most of the teachers in

this study were not overly concerned about the risks. The priority of teachers is to ensure the safety of their students.

Summary

The environment in which we teach plays a role in how students learn. Educators, like myself, need to be aware of what types of settings support their student's learning and well-being. In this literature review, I looked at outdoor education with the effects of outdoor education, the barriers and challenges, and the risks and consequences of implementing outdoor education in a school setting. Next, I will be doing my action plan, which will involve the outdoor classroom that is located at the elementary school where I teach.

Action Plan

This action plan is based on the impacts of outdoor education on elementary-aged students. The following tables came from three main themes presented by the literature. The first theme is the effects of learning outdoors. The second theme is the barriers and challenges of outdoor education. The last theme is the risks and consequences of teaching in nature.

The school district that the action plan looks at is in the west Puget Sound area of Washington State, where I teach. The school site is in a K-5 school in a suburban area with access to an outdoor classroom through trails. The school is a Title 1 school, which is a federal program designed to give extra funding to schools with a high percentage of low-income families. The school district has four Title 1 elementary schools. The school had 349 students in the 2021-2022 school year. The following tables show the practices of the school site in terms of what the literature presents and my recommendations.

Figure 1

School Site Outdoor Classroom

Figure 2

Wooden Steps Leading to Outdoor Classroom

Effects of Learning Outdoors

The literature shows there are benefits to students spending time in nature. The benefits can be categorized into three categories: physical, emotional, and academic. The first category, physical benefits, include the improvement of physical activity when students are in an outdoor space. The emotional benefits category shows how nature can improve students' emotional well-being. The academic category shows the impacts of being in nature has on student's learning abilities. The literature shows that just being outdoors can have a strong impact on students' health.

Table 1

Effects of Learning Outdoors

Research	Practice	Recommendation
Learning in the natural environment provides more opportunities for children to have moderate to vigorous physical activity, which can improve fitness levels (Kuo et al., 2018; Peacock et al., 2021).	Students have one required outdoor time for recess for 25 minutes after lunch (but only when it is not raining). Teachers can go out for a second recess at their discretion, usually for 15 minutes.	I recommend that teachers double the amount of time spent outdoors in the natural environment. School administrators should set goals for teachers as weather permits. There needs to be natural spaces within a 5-minute walk from the school building.
Being outside in nature decreases students' depression and anxiety. Nature is shown to help children be more resilient to stress (Chawla et al., 2014; Hartig et al., 1996; Kelz et al., 2013; Peacock et al. 2021; Wells & Evans 2003).	To address student's depression and anxiety, teachers currently teach Social-Emotional Learning (SEL) lessons through the Second Step program. These lessons include ways for students to identify and solve problems. The school uses Panorama School Climate Surveys to determine students' perceptions of school. The school does not currently use nature to help with social emotional wellbeing.	Schools need to have more natural areas. Lessons should be conducted in nature to boost SEL for students. Lessons in nature do not necessarily be connected to SEL. School climate surveys should consider the learning environment in relation to student stress levels.

Student's memory, attention, and on-task behavior has shown to increase after learning outdoors and have had academic benefits for learning outcomes (Amicone et al., 2018; Kuo et al., 2018; Largo-Wright et al., 2018).	Our school has an outdoor classroom setup, as shown in figure 1, but is not used by many classroom teachers. Teachers use the technology provided by the school district to teach most lessons.	More outdoor time is needed in the natural environment. Assessments for memory, attention, and on-task behavior should be conducted to view the impact of lessons in nature. I recommend utilizing the outdoor classroom to teach lessons that do not require the use of technology.

Barriers and Challenges

The literature presents some challenges of outdoor education, such as the availability of resources, weather and climate, and type of vegetation needed to create positive impacts. My recommendations are not only for my school but for other schools around the district as well. As I taught at a different school site for three years in the same district and spent a year being a substitute teacher at various schools, I have noticed that some schools have individual accesses to nature, whereas some schools present to have more built areas (playgrounds, fields, blacktop) than others. Some have a more natural landscape that is conducive to teaching in the outdoors.

Table 2

Barriers and Challenges of Learning Outdoors

Research	Practice	Recommendation
A big contributor to schools not wanting to create outdoor learning environments is the funding. Resources and materials for an outdoor space do not need to be new or expensive to transform their learning environment. Carpet squares, tree stumps, logs, tires can be used to create seated spaces (Guardino et al., 2019; Largo-Wright et al., 2018).	An outdoor classroom was created by a staff member and volunteers (As shown in both figure 1 and 2). Trails are maintained by the staff member by creating steps and walking paths with recycled wood planks. However, this is all done voluntarily and is done on the weekends, by mainly one staff member.	The school district needs to create a budget for the creation and maintenance of green classrooms. Not schools have this feature, and more schools in the district should be able to create green spaces without needing to use staff money.

Region, climate, and weather can impact the success of outdoor education programs. Some programs had to be adjusted due to weather (Guardino et al., 2019; Largo-Wright et al., 2018; Mullenback et al., 2018).	From late fall to early spring, the outdoor classroom is rarely used due to the rain. The trails get slippery and muddy, and the path is not cleared so can be dangerous.	The school should have a covered outdoor area that can be used when the weather is rainy. The outdoor classroom should be used as much as possible when weather permits.
Not all greenness positively affects students academically. The presence of tree canopy contributes to a higher yield in test scores (Browning et al., 2018; Kuo et al., 2021).	Our school is surrounded by trees because it is connected to a forest (where the outdoor classroom is located). Not all schools in the district have as many trees in their outdoor space. They have fields and built areas instead.	Students need to spend more time surrounded by trees, not just built areas outdoors. Schools around the district need to create spaces with tree coverage. School district should have a budget for creating tree coverage in the area.

Risks and Consequences

The risks and consequences from the literature involved unknown hazards in the area that are not found indoors. These risks can increase both parental and teacher worry about taking their children outside. My recommendations are specifically about my school site, as it has a unique space that is ideal for outdoor education. There are practices in place to help eliminate some of the risks, however, improvements should be made.

Table 3

Risks and Consequences of Outdoor Education

Research	Practice	Recommendation
There will be risks of teaching outdoors with possible hazards and unknown terrain, allergic reactions, injuries. Parental worries contribute to deterring teachers from taking the risk of outdoor education (Dyment ,2005; Ray & Jakubec, 2018; Torkos, 2017).	One staff member spends some of their own time removing barriers to the trail. There are many thistles in the area that are sharp to the touch. Students and staff who use the trail sometimes need to avoid branches or fallen trees. Some wooden planks, as shown in figure 2, need to be replaced when they are rotted. When it	A budget for maintenance should be created to keep the trail safe. Since it is on school property, the district should make funding to have experts review the safety of the trail to help teachers feel at ease when bringing their students.

	has rained, the trail can get slippery.	
Adult supervision and anxiety of potential risks impact some of the positive impacts of the outdoors. Teachers worry about possible liabilities and litigation if students are harmed on their watch (Ray & Jakubec, 2018; Stan & Humberstone, 2011).	Parents are not communicated about going on the trail that leads to the outdoor classroom as it is still on school grounds. Students sometimes get hurt by falling, but it is treated the same as a student falling in the play structure area.	Families should have an opportunity to go on the trail with their child. Families should need to sign a release form and understand the potential risks involved in the outdoors. Students need to be aware of the risks, and safety protocols should be in placed.

Summary

In this section, we looked at how my school site reflects the practices of the literature's recommendations. Improvements can be made at both the district and school levels. Teaching in nature can improve the physical and emotional health of students as well as improve their cognitive function. However, the risks involved can deter teachers and families from wanting to take this step. To help ease potential worries, the district should put in more funding to create more outdoor spaces and keep them maintained. In the discussion section, I will examine the literature closely.

Discussion

In this project, I wanted to discover the benefits and challenges of outdoor education with elementary-aged students. I also wanted to find out how the natural environment impacts children's growth and development. The literature showed to have many benefits of outdoor education. However, some barriers can limit what teachers can do in their practice. I used the elementary school and district that I currently teach in the west Puget Sound area during the 2022-2023 school year as my focal comparison when looking at practices that are in place. In this section, I will explore the findings from the literature review and action plan, the implications for educators, and future research, as well as the limitations of the project.

Discussion of Findings

This project aimed to understand how the outdoor environment impacts children's growth and development and the possible challenges when implementing outdoor education. The literature showed a positive correlation between students' growth and time spent outdoors.

Benefits of Outdoor Education

The first question I proposed in my rationale was "What are the benefits of outdoor education?" The literature presents three key benefits for outdoor education: Physical, academic, and social-emotional.

One benefit of being outside in nature was that it increased students' physical activity in a day (Kuo et al., 2018, Peacock et al., 2021). To get to the outdoor classrooms or natural spaces, students are required to physically travel, which otherwise would not have happened. Students are more likely to walk and explore freely when outdoors than in an indoor classroom.

The second benefit was the academic benefit of being exposed to nature. An increase in student attention, memory, and on-task behavior was shown after students spent time outside or participated in activities while emersed in nature outdoors (Amicone et al., 2018; Kuo et al., 2018; Largo-Wright et al., 2018). Students were able to stay more focused with distractions and were able to regulate when working on academic tasks (Mason et al., 2022).

Another benefit was that students showed an increase in pro-environmental behavior after being involved with nature. Students who participated in outdoor camps or had hands-on learning with the natural environment gained an affinity for the woods and wanted to preserve the environment (Harris, 2021; Hunter-Doniger, 2020; Mullenback et al., 2018). Students learned to care for the living things they were surrounded by.

At my school site, there is already an outdoor classroom space created that is connected to the trails on campus that are surrounded by tree canopy. Students take a five-minute walk through a trail to get to a beautiful setting with seating and shade from the trees. However, going on the trail or spending time in the outdoor classroom is not a requirement. It can sometimes feel more like a burden to take students out because we need to notify our front office, administrators, and paraeducators who work with our students so that people are aware of our whereabouts. If a student needs to be picked up early, we must all go back to the classroom due to safety.

There are many days that students do not get the recommended 60 minutes of physical activity per day. This is due to multiple weeks of indoor recess and students only have 2-3 days of Physical Education per week. Furthermore, there are many days in which P.E. is canceled because of a lack of general education substitutes, and specialist teachers or guest teachers get pulled from their classes. On days when students do not have P.E. and have indoor recess, the only physical activity occurs when they walk in the hallway.

Students in the late fall are able to eat outside when the weather is warm at my school site. This has helped with students' emotional well-being, and I have noticed fewer lunchtime arguments on days when students eat outside as opposed to in the cafeteria.

Challenges of Outdoor Education

My second question from my rationale was "what challenges do teachers and educators face when implementing outdoor education?" Although many benefits are associated with outdoor education, some barriers, and challenges impact whether teachers can implement it in the classroom. First, school resources are limited, and teachers are unable to choose their outdoor space. Some classrooms needed to go out of their way to partner with local organizations to be able to have the optimal location for outdoor learning (Guardino et al., 2019; Lawrence, 2021).

Region, season, and climate also impact the success of outdoor learning environments. The Pacific Northwest is a wonderful spot to be emersed in nature, however, it is also very rainy most of the year. As stated in the Action Plan section, there are many days, particularly from the winter to spring, when students have indoor recess and do not go outside.

Not only are there complications with getting to nature, but there are also logistical risks that are associated with implementing outdoor classrooms. One is the hazards and safety issues that can arise. Although most of the research showed that the reality of the hazards is far less likely than the possible risks, there are still many safety protocols that need to occur if a student is hurt outside of the indoor classroom space(Ray & Jakubec, 2018; Torkos, 2017). The possible risks that may be involved can scare some parents and teachers from wanting to deal with the hassle of the outdoors. Adults being anxious about student supervision can remove many of the positive impacts of the outdoor experience.

Growth and Development

My last question from my rationale was "How does the natural environment impact children's development?" In the literature, the research showed that there are cognitive benefits for children when they are emersed in nature. The outdoor environment provides more opportunities for creative play. Children who played in nature have been shown to have more creative and imaginative play when forms of vegetation were present (Taylor et al., 1998; Dowell et al., 2011). This can help children learn friendship skills, foster imagination, and increase focus.

During the times that I took students to the trail, I notice that many students rarely go hiking or are exposed to nature. They were curious about the sounds, branches, and a creek that they saw. Many were concerned about the mosquitos and insects that were around.

At my school site, there is a lack of opportunities for creative play. With the stressors of completing math and reading curriculum, and scheduling conflicts with special education and reading services, it is a challenge, even at the kindergarten level to incorporate time for imaginative play throughout the day. Being in nature can foster important skills that should not be overlooked and forgotten.

Future Trends of Outdoor Education

The research showed a consensus that nature has benefits for students and the importance of students having opportunities to learn outside. I believe that future trends will align with what the research suggests in increasing the number of natural spaces for students to learn and opportunities for students to be outside. More research on outdoor education and nature-based learning has been created in recent years, especially after the COVID-19 pandemic. I noticed that most of the research I have found was created in the last 5 years (2018-2022). With more research conducted in recent years, districts will have to make a change to support student learning.

However, with wild spaces depleting due to the increase in developments, I think that will have a substantial impact on the amount of forest land made available for students to explore. It will be more difficult to visit natural spaces as our population increases. More people are moving towards the forest lands and away from the cities due to rising housing prices, and more homes are being built in rural towns. With the increase in work-from-home initiatives, more people are drawn to areas where wildlife is abundant.

Our state has already made plans to improve access to outdoor programs. On the Washington Office of Superintendent of Public Instruction (OSPI) website, there is a section about the benefits of outdoor education, and state standard alignments. There is also a new

statewide House Bill 2078 that allows schools to apply for grants for the purpose of increasing outdoor education in public schools across Washington State (OSPI, 2023). This shows the urgency that is needed to help schools with funding in creating programs outdoors.

Implications for Future Teachers, Students, and/or Schools

Educators need to understand that the natural environment is an important part of student development and cannot be replicated indoors. Some challenges and risks are involved, which is important to consider, however, the benefits of student learning and social-emotional growth are far greater. To have a successful outdoor experience, there needs to be tree canopy, areas that are not built structures (concrete and fields), staff training, as well as parental involvement.

The main concern of not wanting to be outdoors is the safety risks. Having parental involvement and staff training in outdoor spaces can eliminate the stress and anxiety that it can cause. Many teachers worry about the classroom time that is lost because going outside may mean taking a total of 10 minutes to walk to the setting and back. However, even with the loss of learning due to transitions, students can learn and understand the material when outdoors. Learning math, reading, and writing can continue outside and can also help students regulate their emotions.

I strongly consider educators advocating for outdoor spaces, gardens, and tree coverage at their school site to be able to have an area students can learn. In order to capitalize on the benefits that the outdoor provides, staff need to be properly trained on the outdoor activities and area that their school has to offer. There needs to be uniform policies and structure in place to enhance safety when students are not in their regular classroom. Districts need to include a

budget to create and maintain natural spaces available for students as there are strong initiatives to support the increase in outdoor education programs.

Implications for Future Research

There needs to be more research on different weather extremes that are based in the U.S. Many outdoor classrooms are in the area, however, the research on them is limited. I would like to see the success of outdoor classrooms and ways to make them successful in my current practice. I would also like to see research on government programs or resources that can support the implementation of natural spaces in outdoor classrooms. Further research is needed that measures types of outdoor spaces and the beneficial impact on students' growth and development. Outdoor learning environments need to be clarified and evaluated.

There also needs to be more research about the creation of an outdoor curriculum that integrates with other core subjects in elementary schools. There was research about implementing outdoor education with science classes, however, those studies were based on secondary schools. Future studies on using nature as a social-emotional intervention are needed, as the literature shows that by being in nature, students felt less stressed and became more resilient.

Limitations of the Project

Some limitation of this project was finding articles to use for my literature review. At first, I found articles about schools located in different countries, but I wanted to find locations that are similar to where I am. There was also more research for children in preschools, rather than elementary school ages. Many different search terms needed to be used interchangeably. I used natural spaces, outdoor education, outdoor environment, outdoor classroom, and forest schools to describe the setting I was looking for. Three studies were conducted from 1998-2005,

eight were conducted from 2009-2016. The majority of the studies occurred between 2017-2022. I found a mix of online and printed journal articles from the UW library database.

One of the major difficulties I had was finding the negative impacts that outdoor education can have. Many of the articles I found were centered on the positive impacts, and I had to ask teachers and myself, why we don't teach outdoors, and time and safety came to mind. The first time I had students go to the outdoor classroom this school year, The trail was very slippery and wet. I had two students who scraped their legs after falling off a wooden plank. Students had open wounds, and due to the school safety protocols and concerns from the students, we had to turn back to get them bandaged up. I also found that when I took students to the classroom, many were scared of falling and getting hit by branches that other students pushed out of the way. I would like to find research about negative impacts or potential problems for the outdoors. I could not find any studies regarding negative effects on health or emotion.

Ideally, I would have liked this project to have ended later in the spring so I could have more time in the outdoor space as the person responsible for clearing the trail waits until the weather is warmer with less rain. I plan to use it more toward the end of the school year.

A challenge with completing this project was that halfway through my graduate program, I decided to go back to teaching full time, but was placed in a school and grade level that I have not previously taught. Being new to the school and learning new curricula was an additional challenge in my personal life.

Conclusions

The lack of outdoor opportunities is detrimental to students learning and growth. In this paper, I explored what the research suggested with outdoor education and spending time in natural environments during the school day. I then compared what the research showed and what

my school site does, to create recommendations to improve to increase the amount of time students spend in nature. With the increased time indoors and technological advancements, young children are spending less time outside than ever before and this will have terrible consequences. Students are exhibiting a high amount of stress due to the COVID-19 pandemic and nature can be a great stress reliever for students to be able to learn best. Student learning is enhanced by nature.

References

Adams, D. & Beauchamp, G. (2021). A study of the experiences of children aged 7-11 taking part in mindful approaches in local nature reserves. *Journal of Adventure Education and Outdoor Learning*, *21*(2), 129–138. https://doi.org/10.1080/14729679.2020.1736110

Aflalo, E., Montin, R., & Raviv, A. (2020). Learning outdoors or with a computer: The contribution of the learning setting to learning and environmental perceptions. *Research in Science & Technological Education*, *38*(2), 208–226. https://doi.org/10.1080/02635143.2019.1603141

Amicone, G., Petruccelli, I., De Dominicis, S., Gherardini, A., Costantino, V., Perucchini, P., & Bonaiuto, M. (2018). Green breaks: The restorative effect of the school environment's green areas on children's cognitive performance. *Frontiers in Psychology*, *9*. https://doi.org/10.3389/fpsyg.2018.01579

Browning, M. H. E. M., Kuo, M., Sachdeva, S., Lee, K., & Westphal, L. (2018). Greenness and school-wide test scores are not always positively associated – a replication of "linking student performance in Massachusetts Elementary Schools with the 'greenness' of school surroundings using remote sensing." *Landscape and Urban Planning*, *178*, 69–72. https://doi.org/10.1016/j.landurbplan.2018.05.007

Chawla, L., Keena, K., Pevec, I., & Stanley, E. (2014). Green schoolyards as havens from stress and resources for resilience in childhood and adolescence. *Health & Place*, *28*, 1–13. https://doi.org/10.1016/j.healthplace.2014.03.001

Cleland, V., Timperio, A., Salmon, J., Hume, C., Baur, L. A., & Crawford, D. (2009). Predictors of time spent outdoors among children: 5-year longitudinal findings. *Journal of*

Epidemiology & Community Health, *64*(5), 400–406. https://doi.org/10.1136/jech.2009.087460

Dowdell, K., Gray, T., & Malone, K. (2011). Nature and its influence on children's outdoor play. *Journal of Outdoor and Environmental Education*, *15*(2), 24–35. https://doi.org/10.1007/bf03400925

Dyment, J. E. (2005). Green School grounds as sites for outdoor learning: Barriers and opportunities. *International Research in Geographical and Environmental Education*, *14*(1), 28–45. https://doi.org/10.1080/09500790508668328

Francis Norwood, M., Lakhani, A., & Kendall, E. (2021). Teaching traditional indoor school lessons in nature: The effects on student learning and behaviour. *Landscape and Urban Planning*, *206*, 103963. https://doi.org/10.1016/j.landurbplan.2020.103963

Froebel, Friedrich. (2009). In R. P. Carlisle (Ed.), *Encyclopedia of Play in Today's Society* (Vol. 1, pp. 246-247). SAGE Publications.

Guardino, Hall, K. W., Largo-Wight, E., & Hubbuch, C. (2019). Teacher and student perceptions of an outdoor classroom. *Australian Journal of Outdoor Education*, *22*(2), 113–126. https://doi.org/10.1007/s42322-019-00033-7

Gutek, G. L. (2002). Froebel, Friedrich (1782–1852). In J. W. Guthrie (Ed.), *Encyclopedia of Education* (2nd ed., Vol. 3, pp. 903-906). Macmillan Reference USA. https://link-gale-com.offcampus.lib.washington.edu/apps/doc/CX3403200249/GVRL?u=wash_main&sid=bookmark-GVRL&xid=92e7aa0a

Harris, F. (2021). Developing a relationship with nature and place: The potential role of Forest School. *Environmental Education Research*, *27*(8), 1214–1228. https://doi.org/10.1080/13504622.2021.1896679

Harvey, D. J., Montgomery, L. N., Harvey, H., Hall, F., Gange, A. C., & Watling, D. (2020). Psychological benefits of a biodiversity-focused outdoor learning program for Primary School Children. *Journal of Environmental Psychology*, *67*, 101381. https://doi.org/10.1016/j.jenvp.2019.101381

Hunter-Doniger, T. (2020). Seeing the forest through the trees: At the intersection of Forest Kindergartens and art-based environmental education. *Journal of Adventure Education and Outdoor Learning*, *21*(3), 217–229. https://doi.org/10.1080/14729679.2020.1771388

Kelz, C., Evans, G. W., & Röderer, K. (2013). The restorative effects of redesigning the schoolyard. *Environment and Behavior*, *47*(2), 119–139. https://doi.org/10.1177/0013916513510528

Kuo, M., Browning, M. H. E. M., & Penner, M. L. (2018). Do lessons in nature boost subsequent classroom engagement? refueling students in flight. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.02253

Kuo, M., Klein, S. E., HEM Browning, M., & Zaplatosch, J. (2021). Greening for Academic Achievement: Prioritizing what to plant and where. *Landscape and Urban Planning*, *206*, 103962. https://doi.org/10.1016/j.landurbplan.2020.103962

Largo-Wight, E., Guardino, C., Wludyka, P. S., Hall, K. W., Wight, J. T., & Merten, J. W. (2018). Nature contact at school: The impact of an outdoor classroom on children's well-being. *International Journal of Environmental Health Research*, *28*(6), 653–666. https://doi.org/10.1080/09603123.2018.1502415

Louv, R. (2008). *Last child in the Woods*. Algonquin Books.

Mann, J., Gray, T., Truong, S., Brymer, E., Passy, R., Ho, S., Sahlberg, P., Ward, K., Bentsen, P., Curry, C., & Cowper, R. (2022). Getting out of the classroom and into nature: A

systematic review of nature-specific outdoor learning on school children's learning and development. *Frontiers in Public Health*, *10*. https://doi.org/10.3389/fpubh.2022.877058

Mason, L., Zagni, B., Bacchin, F., Frison, C., & Scrimin, S. (2022). Children's attentional processes in outdoor and indoor environments: The role of physiological self-regulation. *International Journal of Environmental Research and Public Health*, *19*(20), 13141. https://doi.org/10.3390/ijerph192013141

Mullenbach, L. E., Andrejewski, R. G., & Mowen, A. J. (2018). Connecting children to nature through residential outdoor environmental education. *Environmental Education Research*, *25*(3), 365–374. https://doi.org/10.1080/13504622.2018.1458215

Patchen, A. K., Rakow, D. A., Wells, N. M., Hillson, S., & Meredith, G. R. (2022). Barriers to children's outdoor time: Teachers' and principals' experiences in elementary schools. *Environmental Education Research*, 1–21. https://doi.org/10.1080/13504622.2022.2099530

Peacock, Bowling, A., Finn, K., & McInnis, K. (2021). Use of Outdoor Education to Increase Physical Activity and Science Learning among Low-Income Children from Urban Schools. *American Journal of Health Education*, *52*(2), 92–100. https://doi.org/10.1080/19325037.2021.1877222

Ray, H. A. (2018). Nature's classroom: A review of motivators and deterrents for teacher engagement in outdoor education field experiences. *Journal of Outdoor Recreation, Education, and Leadership*, *10*(4), 323–333. https://doi.org/10.18666/jorel-2018-v10-i4-8770

Stan, I., & Humberstone, B. (2011). An ethnography of the outdoor classroom – how teachers manage risk in the outdoors. *Ethnography and Education*, *6*(2), 213–228. https://doi.org/10.1080/17457823.2011.587360

Taylor, A. F., Wiley, A., Kuo, F. E., & Sullivan, W. C. (1998). Growing up in the inner city. *Environment and Behavior*, *30*(1), 3–27. https://doi.org/10.1177/0013916598301001

The Washington Office of Superintendent of Public Instruction. (2023). *Outdoor Education for All Program*. OSPI. https://www.k12.wa.us/student-success/resources-subject-area/science/outdoor-education-all-program

Torkos, H. (2017). Risk management in outdoor learning experiences. *Journal Plus Education*, *19*(1/2018), 185–198. https://doi.org/10.24250/jpe/1/2018/ht

Ulset, V., Vitaro, F., Brendgen, M., Bekkhus, M., & Borge, A. I. H. (2017). Time spent outdoors during preschool: Links with Children's cognitive and behavioral development. *Journal of Environmental Psychology*, *52*, 69–80. https://doi.org/10.1016/j.jenvp.2017.05.007

van den Berg, A. E., & van den Berg, C. G. (2010). A comparison of children with ADHD in a natural and built setting. *Child: Care, Health and Development*, *37*(3), 430–439. https://doi.org/10.1111/j.1365-2214.2010.01172.x

Ward, J. S., Duncan, J. S., Jarden, A., & Stewart, T. (2016). The impact of children's exposure to greenspace on physical activity, cognitive development, emotional wellbeing, and ability to appraise risk. *Health & Place*, *40*, 44–50. https://doi.org/10.1016/j.healthplace.2016.04.015

Wells, & Evans, G. W. (2003). Nearby Nature. *Environment and Behavior*, *35*(3), 311–330. https://doi.org/10.1177/0013916503035003001