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Building Children's Connection to Nature in the Schools: A Piloted Nature-Based Intervention

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BUILDING CHILDREN'S CONNECTION TO NATURE IN THE SCHOOLS: A PILOTED NATURE-BASED INTERVENTION

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Education
at the University of Kentucky

By

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2024

ABSTRACT OF DISSERTATION

BUILDING CHILDREN'S CONNECTION TO NATURE IN THE SCHOOLS: A PILOTED NATURE-BASED INTERVENTION

Nature-based interventions (NBI) have demonstrated positive effects on a range of student outcomes, including enhanced prosocial behaviors, decreased levels of stress, and improved mood and concentration. Further, school-aged children's participation in NBIs supports students' reconnection with the natural world. Although schools represent an ideal setting to engage students from diverse backgrounds in NBI activities, existing research is limited in understanding the effects and feasibility of integrating NBIs within school settings. This study aimed to explore the effects of NBI activities administered within a school program on students' sense of connectedness with nature and their overall wellbeing. Additionally, participants were interviewed to evaluate their thoughts and perspectives on the intervention activities. Participants (n = 10) included children ages 8-12 years old who were enrolled in a summer school program in the Midwest region of the United States. Participants assigned to the intervention condition engaged in eight NBI activities over the course of a two-week summer school program. Pre- and post-measures of the Connection to Nature Index (CNI) and wellbeing check card were implemented across conditions to measure participants' connectedness to nature and wellbeing. Children in the intervention condition showed a significant increase in connectedness to nature following their participation in the NBI, whereas those in the control condition showed no changes in their nature connection. No significant differences were found in students' sense of wellbeing across time or condition. Interviews with participants in the intervention condition revealed evaluative insight regarding students' enjoyment of the NBI activities, perceived impact of the NBI, and barriers to intervention implementation. These findings support the potential benefits of integrating simple, NBI activities into the school day.

KEYWORDS: connectedness to nature, wellbeing, nature-based intervention, school

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June 17, 2024
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CHAPTER 1. INTRODUCTION

Despite the well-documented physical, psychological, and environmental benefits of a healthy relationship between children and nature, today's youth tend to spend little time outdoors, neglecting this human-nature connection. Between long school days and the constant pull of technology, children are spending increasingly more time indoors. This has led to what Lauv (2005) posits as "nature deficit disorder", a negative human cost as a result of being apart from the natural world. Childhood is a critical time to develop a connection with nature, as this is a period when children are still learning about and forming their beliefs about the world (Ernst & Theimer, 2011; Kahn & Kellert, 2002; Wells & Lekies, 2006). Individuals begin to form their environmental attitudes and beliefs in childhood, which informs their relationship with the natural world. To address this concern of nature deficit disorder, humans can foster their relationship with the natural world through human-nature interactions and developing a sense of connectedness to nature.

Connectedness to Nature

The term "connectedness to nature" describes an individual's perception of their relationship with the natural world (Martin et al., 2020). Specifically, Schultz (2002) defines connectedness to nature as "the extent to which an individual includes nature within his/her cognitive representation of self". Individuals perceive a more positive relationship with the natural world when it is included within their identity. A disconnect between humans and nature develops when individuals view themselves as separate or independent from the world around them (Kidner, 2000). Taken together, connectedness to nature can be summed up as the degree of closeness between oneself and nature

(Lengieza & Swim, 2021; Otto & Pensini, 2017). Simpson (2014) refers to this relationship to nature as a 'coming to know' experience, that unites both intellectual knowledge and emotional knowledge. Although cognitive pathways, such as increasing one's knowledge about the natural world, are commonly used as the primary route to enhance human-nature relationships, research supports that connectedness to nature is composed of both cognitive and affective components (Collado et al., 2013; Mayer & Frantz; 2004).

Cognitive Dimension

The cognitive dimension of connectedness to nature largely encompasses an individual's environmental knowledge, ecological worldview, and attitudes and beliefs about the natural world (Collado et al., 2013; Mayer & Frantz; 2004). Evans and colleagues (2007) specify that one's thoughts or beliefs about nature and environmental issues contribute to their connection to nature. These cognitive beliefs can also be informed by the attitudes and beliefs of one's parents or caregivers. Within this cognitive dimension, connectedness to nature can be summed up as the extent to which a person identifies themselves as part of the natural world (Tam, 2013). In the school setting, connectedness to nature promotes benefits related to children's educational success, including cognitive restoration. Children who are given opportunities to directly experience nature demonstrate a greater ability to concentrate in the classroom (Ohly et al., 2016). Exposure to green spaces or nature has also been observed to improve children's memory, stress management, self-discipline, and overall academic achievement (McCormick, 2017).

Affective Dimension

Connectedness to nature is not achieved through simply learning about nature, such as in an environmental education program (Lumber et al., 2017). Affective experiences with nature provide a space for children to build a sense of connection with nature. Nisbet and colleagues (2009), authors of the Nature Relatedness Scale, identified three elements that are critical in the development of connectedness to nature: (1) an understanding of how a relationship with nature presents in one's attitudes and behaviors, (2) regular contact or familiarity with nature, and (3) an emotional affiliation with nature. Affect plays an important role in the development of nature connection, as children who have built an affective relationship with nature may be more inclined to recognize the natural world as a part of their own identity (Korpela et al., 2018). Access to nature provides opportunities for children to explore their affective feelings toward nature. Specifically, increasing a child's experiences in nature enhances their interest in the natural world. Nature then becomes more meaningful to the child, especially when they learn through experience that the outdoors can be a fun and safe environment. Building familiarity with natural spaces allows children to relax in and enjoy the space, developing an ethos of care (Harris, 2021). Connectedness to nature in childhood stems largely from a child's affective responses to the natural world as well as how they think about nature (Collado, Staats, & Corraliza, 2013).

There are extensive benefits associated with children's relationship with nature as well as opportunities for children to make contact with nature. For example, children who are given opportunities to engage with nature for as little as 30 minutes per week have exhibited decreased negative psychological symptoms (e.g., stress, depression, and sleep

difficulties; Piccininni et al., 2018). When children lack opportunities to interact with nature, this inhibits their ability to build a relationship with the natural world, which may have a negative impact on children's overall health and wellbeing (Pretty et al., 2009; Snell et al., 2016). For example, Chalquist (2009) identified a relationship between human-nature disconnect and feelings of anxiety and depression.

Children and Nature

Childhood is a critical time to promote a relationship with nature, as children's experiences in nature have been found to impact their attitudes and behaviors toward the natural world (Chawla & Derr, 2012). In a study conducted by Streelasky (2017), elementary-aged students shared their perspectives on their favorite parts of learning at school. Overwhelmingly, the students highlighted the importance of the outdoors in their school experiences. For example, children who attended an outdoor school labeled outdoor learning as their most valued school experience. Further, children who attended an urban school, where learning primarily took place indoors, also shared that outdoor learning experiences were highly valued. These students specifically identified their favorite school experiences as interactions that occurred in outdoor settings (e.g., unstructured time, peer interactions).

Children's preference for nature experiences during the school day was also highlighted in qualitative research conducted by Yoon (2023). In this study, school-aged children were interviewed about what their ideal school looks like. The children described schools that were located in or near natural settings where they feel positive emotions, such as lakes, beaches, and parks. When asked why their ideal school would be located around these nature spaces, the child participants indicated that these spaces made

them feel calm and peaceful. Some students even identified feelings of connection with these natural spaces. Even children who attended school in dense urban areas identified the value of accessing nature in these spaces, including experiencing fresh air when walking to school and feeling enjoyment from viewing and interacting with nature (Freeman & van Heezik, 2015).

Nature-Based Interventions

One way to enhance children's connectedness to nature is to promote their engagement with nature through nature-based interventions (Otto & Pensini, 2017). Nature-based interventions (NBIs) are defined as programs with the objective to provide nature-based experiences to individuals as a means to promote positive outcomes (e.g., cognitive and psychological benefits; Taylor et al., 2022). There are many circumstances that may prevent individuals from engaging with the natural world, including living in spaces with limited access to natural settings (e.g., urban areas) and growing up in a low-income household (e.g., lack of time and access to green spaces). Consequently, these individuals have limited opportunities to build a connection with nature (Richardson et al., 2020). NBIs provide nature experiences to populations whose access to nature is limited, promoting more equitable opportunities for individuals to enhance their connectedness to nature and reap associated benefits.

Access to natural environments and engagement with nature are strong predictors of connectedness to nature in children (Barrable & Booth, 2020; Lengieza & Swim, 2021; Otto & Pensini, 2017; Schultz, 2002). This includes direct or first-hand nature experiences (e.g., nature walks, gardening, spending time outdoors), as well as indirect experiences with nature (e.g., painting a natural landscape, watching nature videos). NBIs

are typically implemented in outdoor settings with ample opportunities for individuals to directly experience elements of nature. Examples of common NBIs include forest schools, wilderness and adventure therapy, ecotherapy, garden care, nature walks, horse-riding, and horticulture therapy (Pretty & Barton, 2020; Taylor et al., 2022). Contact with nature, such as simply being in a natural setting, is an important component of NBIs in promoting nature connectedness (Pirchio et al., 2021). Physically handling or interacting with nature has been observed to aid in stress reduction, feelings of relaxation, and recovery of cognitive and mental capacities in adults (Palsdottir et al., 2021).

However, contact with nature alone is not sufficient to effectively enhance individuals' connectedness to nature, as psychological connectedness also plays a critical role in this relationship (Capaldi et al., 2014; Martin et al., 2020). An emotional connection with nature can be achieved through aesthetic and therapeutic pathways, including having positive experiences in nature, connecting with nature through the arts, and engaging in various nature therapies (Swank et al., 2015). For example, artistic activities, such as storytelling, dance, and art, have been identified as effective approaches for deepening children's emotional connection to their surrounding environment (Department of Conservation, 2011). Further, studies that host counseling groups with children in outdoor settings have found positive outcomes with participant enjoyment and positive affective experiences (e.g., improved social skills and enhanced self-esteem; Robinson & Zajecek, 2005; Swank & Shin, 2015; Swank & Cheung, 2017).

Research supports that implementing NBIs with school-aged children results in various benefits that enhance positive student outcomes. NBIs can be utilized as an effective tool to promote motivation and engagement in student learning (Merchant et al.,

2019). Students who are given opportunities to participate in outdoor learning have demonstrated greater engagement across multiple school subjects, including reading, science, mathematics, social studies, and physical education (Kuo et al., 2018). Similar effects have been found in classroom engagement following a nature-based experience or lesson. Findings from a school-based NBI conducted by Kuo and colleagues (2018) suggest that teacher redirection in the classroom decreased following nature-based learning experiences. Specifically, teachers redirected their students an average of every 6.5 minutes when their classroom lesson followed a nature-based experience compared to teacher redirection an average of every 3.5 minutes without the previous nature-based experience. Researchers in the field hypothesize that NBIs encourage children to participate in more hands-on experiences, which may promote student engagement in the classroom (Harvey et al., 2020). Additionally, NBIs offer a novelty factor that children find attractive. Novel learning experiences are often perceived as more meaningful to children, which may increase their interest in the topic and promote further discussion with their peers (James & Bixler, 2008). Integrating NBIs into the school day can be an effective method to promote student engagement and educational success.

Components of Nature-Based Interventions

Although research regarding children's participation in NBIs is relatively new, a review of literature in this area supports three main components that are commonly incorporated in NBIs developed for children: (1) outdoor learning, (2) nature activities, and (3) therapeutic techniques.

Outdoor Learning

Outdoor learning occurs when traditional, curricular teachings are simply relocated to outdoor settings to supplant indoor learning (e.g., forest schools, outdoor field trips, school gardens). Specific examples of NBIs for children that employ outdoor learning include nature summer camps (Collado et al., 2013), outdoor lessons (Marchant et al., 2019), nature-based field trips (Sprague et al., 2020), nature-based environmental education programs (Collado et al., 2013, 2020), and outdoor free play (Burgess & Ernst, 2020). In the school setting, opportunities for outdoor learning promote children's direct contact with nature. For example, compared to urban or indoor camp experiences with little to no direct experiences in nature, nature-based camps and programs were found to demonstrate greater effects on connectedness to nature, social skills, and overall wellbeing (Bolling et al., 2019; Collado et al., 2013). Furthermore, Burgess and Ernst (2020) found that preschool students enrolled in a nature-based preschool program with opportunities to engage in outdoor learning in natural environments exhibited greater motivation and enhanced learning compared to students who learned in a traditional, indoor school setting. This engagement of 'land as pedagogy' is simply moving one's body into nature as a means to learn both with and from the natural world (Simpson, 2014).

Even accessing views of natural environments from indoor settings demonstrates some positive effects on children. Browning and Rigolon (2019) found that students with a view of trees and green space through their classroom window showed improvements in their academic performance. Despite these findings, evidence supports the added benefits of directly engaging with nature. For example, children demonstrate greater

attention restoration outcomes from physically being in nature rather than simply looking at it through a window (Faber Taylor et al., 2002). Direct experiences in nature play a crucial role in enhancing students' connectedness with nature. Access to nature allows for more pathways to connect with nature, as opposed to experiencing nature through cognitive domains such as observing nature or simply learning about it (Collado et al., 2013, 2020). The implementation of outdoor learning in NBIs has a greater positive effect on enhancing children's sense of connectedness to nature than traditional, indoor practices.

Nature Activities

Although outdoor learning is a critical component of NBIs, nature activities that do not require an individual to physically be outdoors have also effectively enhanced children's connectedness to nature. Nature activities typically target the cognitive dimension of one's relationship with nature. These nature activities may include environmental education or learning about the natural world, such as learning about recycling, conservation, or the importance of flora and fauna (Collado et al., 2013, 2020). For example, Collado and colleagues (2020) integrated nature activities into a classroom's existing science curriculum by encouraging students to bring examples of plants, leaves, and branches into the classroom when they were learning about local flora and fauna. Further, elementary- and middle-school-aged children in an urban school setting demonstrated enhanced classroom engagement and academic scores in science when the curriculum integrated environmental education lessons (e.g., recycling, food production, water cycle; Sprague et al., 2020).

In addition to environmental education programs, NBIs may incorporate elements of adventure (e.g., nature investigations, hiking, forest field trips) and nature into existing school activities (e.g., planting and harvesting seeds, participating in recycling programs, making a food web, exploring fossils; Collado et al., 2013; Germinaro et al., 2019; Sprague et al., 2020). This approach allows for NBIs to be more practical for school-based implementation. Children who participate in nature activities (e.g., designing a green space with peers) demonstrate positive trends in emotional wellbeing and self-help behaviors, as well as prosocial behaviors (Chiumento et al., 2018). Many nature activities provide opportunities for children to develop social skills through interacting with other students and building peer relationships. Particularly, when children are tasked with creating solutions for environmental issues or tending to a school garden, there is a social element in which they must work together with their peers toward a common goal (Germinaro et al., 2019; Sprague et al., 2020). These types of activities encourage students to engage in group problem-solving and foster a team-building environment, which may contribute to their overall wellbeing.

Therapeutic Techniques

Therapeutic techniques, such as mindfulness and art therapy, were identified as a core element in fostering the affective piece of connectedness to nature. Essentially, these therapeutic pathways enhance children's positive experiences in nature, which may lead to the experience of positive feelings and emotions that enhance one's sense of wellbeing (Chiumento et al., 2018). Children experience a non-judgmental awareness of their environment when they engage in mindfulness. In natural environments, practicing mindfulness has been found to enhance children's feelings of connectedness to nature,

which in turn promotes greater mindfulness experiences (Schutte & Malouff, 2018). Moula and colleagues (2023) attribute this enhanced sense of connection to nature to the tranquility of mindfulness, which allows children to have calming, positive experiences in nature.

Art is a creative, therapeutic medium that can be integrated into NBIs to promote connectedness to nature and enhance feelings of wellbeing. Nature-based art activities further promote experiential learning, creative expression, and exploration of nature through the senses (Kang et al., 2021). Examples of these activities include creating art using materials found in nature, drawing or painting natural scenes, and taking photos of nature. Kang and colleagues (2021) observed improvements in children's ability to relieve stress, maintain attention, and improve peer relationships through drawing and journaling about nature with their peers and experiencing nature through their senses. Rich sensory experiences in nature encourage more meaningful perceptions of the natural world. In turn, this promotes a positive relationship between children and the natural world. James and Bixler (2008) go as far as describing the experience of nature through touch as an "intimate interaction." Art and sensory orientation are important pathways in promoting affective experiences with nature and enhancing children's sense of connectedness with the natural world.

Outcomes of Nature-Based Interventions

Extensive benefits have been observed across children and adults who participate in NBIs. Although a common goal of NBIs is to enhance connectedness to nature in individuals, NBIs can also serve as complementary interventions to promote individuals' sense of overall wellbeing (Keenan et al., 2021; Swank et al., 2015). For example, in a

study conducted by Swank and colleagues (2015) adults with stress-related disorders (e.g., anxiety, depression) who noticed three good things in a nature walk over six weeks experienced a greater connection with nature, enhanced positive affect, and improved wellbeing. Additionally, research indicates that individuals who participate in NBIs are more motivated to seek out similar, nature-related activities in the future (Asah et al., 2012). A review of NBI literature identified connection with nature and wellbeing as two primary themes of existing NBIs.

Nature Connection

NBIs demonstrate effectiveness in enhancing one's attitude toward the environment and their sense of connectedness to nature (Collado et al., 2013). Interventions that incorporate nature have a greater positive effect on this human-nature connection than traditional environmental education alone (Collado et al., 2020). Specific factors identified as impacting children's sense of connection with the natural world include direct exposure to nature over time, unstructured nature play, and creating affective experiences in nature. Research conducted by Dopko and colleagues (2019) supports the importance of providing children with opportunities to experience nature and build a positive connection with the natural world. Specifically, fifth-grade students who participated in a four-day, residential nature program (e.g., hiking, observing wildlife, identifying plants) reported a significantly greater connection with nature as well as enhanced enjoyment of nature. NBIs that emphasize art and aesthetics within nature also contribute to children's connectedness with nature. For example, school-aged children who worked together to build a sculpture in a local park reported experiencing enjoyment outdoors and developing an emotional connection with nature. (Hallam et al., 2022).

Wellbeing

A review of literature indicates that children who participate in NBIs demonstrate positive trends in their emotional wellbeing, including enhanced self-efficacy, positive perceptions of oneself, and engagement in prosocial behaviors (Bolling et al., 2019; Chiumento et al., 2018). Bolling and colleagues (2019) found that outdoor learning promotes peer play and collaboration through enhancing peer proximity, familiarity, and shared interests. Creating these spaces for children to build positive peer relationships encourages students to practice and build prosocial attitudes and behaviors that foster feelings of wellbeing (Bolling et al., 2019; Burgess & Ernst, 2020). Specifically, findings from research conducted by Germinaro and colleagues (2021) support a positive relationship between peer collaboration and increased self-efficacy and positive attitudes toward oneself.

Even brief interactions with nature or short-term NBIs have been observed to produce positive impacts on children's wellbeing (Roberts et al., 2020). For example, in a study conducted by Bolling and colleagues (2019), as little as two hours of outdoor nature experiences each week was identified as significantly improving children's overall wellbeing. Specifically, simple activities in nature, such as nature walks, cleaning up litter, and observing sights and sounds in nature, have been found to enhance children's overall psychosocial health and wellbeing (Richardson et al., 2018). Despite extensive evidence supporting positive student outcomes as a result of interacting with the natural world, outdoor learning and nature-based activities are underutilized tools in primary education experiences.

Access to Nature in School

Although existing research with NBIs typically take place in outdoor, natural environments, NBIs may also have a place in school settings where some children have limited opportunities to engage with nature. Children who grow up in urban and densely populated areas often have limited access to green space, inhibiting their opportunities to reap the benefits of experiencing and building a relationship with nature. Access to nature is greatly dependent on factors such as physical proximity, safety of one's neighborhood, parental concerns, and time before and after school (Holloway & Pimlott-Wilson, 2014). For children who are unable to access nature in their home environment, a strong sense of connectedness to nature may be difficult to achieve. Further, many existing NBIs that promote connectedness to nature take place in specialized programs or summer camps. Children enrolled in these types of programs commonly come from families or backgrounds that value nature or can easily access nature (Collado et al., 2013). The school setting provides a unique environment in which nature activities can be introduced to children who may not otherwise have opportunities to connect with the natural world.

Research indicates that NBIs in school settings benefit both cognitive and emotional functioning in children (Collado et al., 2013; Sando, 2019). NBIs provide opportunities for students to recover from the stress of tackling everyday school demands, such as storing and retrieving information, regulating one's attention, and maintaining appropriate classroom behavior (Hartig, 2003; Marselle et al., 2021). Creating opportunities for students to restore their cognitive and psychological capacities through engagement with nature enhances students' ability to handle daily life challenges. Further, children who participate in NBIs demonstrate enhanced self-

awareness and social skills, increasing their engagement in prosocial behaviors toward their peers (Robinson & Zajicek, 2005). Research conducted by Harvey and colleagues (2020) found that children who spent only one hour each week outdoors during the school day demonstrated improvements in their mood and wellbeing. Taken together, experiences with nature through NBIs in schools promote children's psychological and mental health, encourage social relationships, and enhance children's self-concept (Genter et al., 2015; Richardson et al., 2020; Wood et al., 2016).

Significance of NBIs in School

A common goal of NBIs in the literature is to foster a child-nature connection and to promote their overall wellbeing (Carter, 2016). In the school setting, students can develop a sense of respect and appreciation for the natural world through directly interacting with nature, experiencing nature through their senses, experiencing positive emotions in green spaces, and building a sense of community with nature (Reese et al., 2019). Although schools have been identified as important and unique environments to encourage nature experiences for all types of students, there has been little research that explores the acceptability and practicality of NBIs in school settings. Educators present valid concerns regarding the implementation of NBIs during the school day, including weather conditions, student behavior, class size, time constraints, and a lack of experience with facilitating NBIs (Moffett, 2011). Existing research in this field is limited in the development of NBI programs or activities that are effective and can be easily incorporated into the school day.

Practicality is a critical element in the development of successful and useful school-based NBIs. In particular, NBIs must be efficient and simple for teachers to

incorporate into their lesson plans (Durlak et al., 2011). Teachers have an incredible number of responsibilities in the school setting, so teacher acceptability is a critical aspect to consider in intervention planning and implementation. In a study conducted by Marchant and colleagues (2019), researchers facilitated focus groups to collect qualitative information regarding teachers' perspectives and experiences with implementing NBIs in their classrooms. Teachers identified several barriers to NBI implementation at school, including concerns regarding student safety in outdoor settings, feeling a lack of control, curricular pressure, a greater potential for distractions, and a lack of confidence in teaching in outdoor settings. Additionally, some teachers indicated feeling overburdened by integrating yet another responsibility into their already busy schedule (Collado et al., 2020; Marchant et al., 2019). Despite these areas of concern, the same teachers also highlighted several positive effects of NBIs, including allowing their students more freedom to learn through exploration and observing enhanced student engagement with learning. Further, teachers observed that their students appeared to have more fun engaging with NBIs (Marchant et al., 2019). Many of the teacher participants expressed an understanding that school may be the only opportunity for some of their students to experience or engage with nature.

NBIs in the school setting can provide students with nature experiences both outdoors and within the classroom, including nature-guided imagery, mindfulness meditation using sounds and sights in nature, and engaging students in outdoor learning (Coughlan et al., 2022). The option of indoor nature activities is important for educators as outdoor learning may present barriers to various schools or classrooms such as urban areas that lack access to green space, poor weather conditions, and curricular demands.

Mindfulness, art therapy, and other therapeutic techniques provide several opportunities to promote connectedness to nature without being outdoors, including drawing or journaling about nature, creating stories about nature, and experiencing nature through listening to nature sounds or watching nature videos (Chiumento et al., 2018; Kang et al., 2021). These indirect nature experiences play an important role in enhancing the accessibility and practicality of NBIs across various types of classrooms and school settings.

Purpose of the Current Study

The purpose of this study is to explore the impact of simple, nature-based activities on children's connectedness to nature and wellbeing in a school setting. There is a gap in the current literature regarding the capacity to integrate nature-based activities into the classroom setting. A majority of existing NBIs that target school-aged children are implemented in outdoor learning environments, such as field trips, one-day interventions, forest schools, or simply transitioning the traditional classroom lesson to an outdoor setting. Although these NBIs are effective at improving positive student outcomes (e.g., connectedness to nature, wellbeing), they can be challenging for educators to implement during the school day due to concerns such as time constraints and increased student distractions. The current study aims to address this gap in the literature by developing practical nature-based activities that can be incorporated into the school day without compromising time in the school day to teach and learn academic standards.

The researcher developed and implemented an NBI for school-aged children that was designed to be short and practical for school-based application. Specifically, the

objectives of this study were (1) to determine if participation in the summer school-based NBI enhanced students' connectedness to nature and (2) to determine if participation in the summer school-based NBI impacted students' sense of wellbeing. Additionally, this study sought to (3) gather qualitative data regarding students' perspectives of the NBI activities, as well as the perceived impact of the intervention on their connectedness to nature. It was hypothesized that students who participated in the NBI activities would demonstrate an increase in their connection with nature and overall wellbeing, whereas students in the control condition would show consistent connectedness to nature and wellbeing across the intervention period.

CHAPTER 2. METHODOLOGY

Setting

The study was conducted in a rural school in the Midwest region of the United States. School enrollment data indicates that approximately 250 students are enrolled in the school district with 94% of those students being White, 1% Black or African American, 1% Latinx, 1% Asian, and 3% two or more races (Public School Review, 2023). Approximately 40% of students in this school district are eligible to receive Free or Reduced Lunch (U.S. News, 2021). The NBI took place during the school district's summer school program, which lasted two weeks in the summer months. Throughout the summer school program, students spent the morning at school Monday through Friday, where they participated in a variety of activities of their choice (e.g., art, baseball, fishing). The researcher coordinated with summer school staff to find a 15-minute period each day for children assigned to the intervention group to participate in the NBI activities. These activities were facilitated in outdoor settings around the campus, including at a park and in a grassy area near the school building.

Participants

Participants for this study were recruited from students who enrolled in one of the two-week sessions of the district's summer school program. This included children ranging from the age of 8-12 years old. Research indicates that NBIs are especially effective in enhancing connectedness to nature in second through fifth graders, as they are still forming their attitudes and beliefs about the world (Barthel et al., 2018; Kellert & Westervelt, 1983), which supports the chosen population for this study. A review of summer school enrollment data found 26 children to be eligible for participation in this

study, and parental consent was solicited from these students. A total of 14 students received parental consent and provided verbal assent to participate in the study. Of these participants, four were not included in the results of this study, as they did not complete all components of the NBI due to their absence from summer school. Attrition rates were consistent across the control condition (29%) and intervention condition (29%). One student was excluded from participating in the NBI due to limited verbal language that prevented him from participating in all study procedures, including providing verbal assent to participate in the intervention. Of the 10 students who completed all components of the NBI and were included in data analyses, 60% identified as female and 100% were White. In terms of participant ages, two students were 12 years old, one was 11 years old, one was 10 years old, five were 9 years old, and one was 8 years old (see Table 1).

Table 1

Demographic Data for School-Aged Participants (n = 10)

	Control		Intervention	
	n	*%*	*n*	*%*
Gender				
Female	4	80	2	40
Male	1	20	3	60
Race/Ethnicity				
White	5	100	5	100
Age				
9 years	2	40	3	60
10 years	0	0	2	40
11 years	2	40	0	0
12 years	1	20	0	0

Note. n = number of participants; % = percentage of participants

Intervention Development

The NBI consists of eight individual sessions of nature-based activities. Each session was developed from one of the four factors of connectedness to nature identified by Cheng and Monroe (2012): enjoyment of nature, empathy for creatures, sense of oneness, and sense of responsibility. It was intended that participants be exposed to two sessions of each connectedness to nature factor. A learning outcome was developed for each session based on the corresponding factor, highlighting the purpose of each session and what the child was expected to learn from the activity (see Appendix F). For each of the eight learning outcomes developed, a lesson plan was created using a consistent

format that included the lesson objective, materials needed, factor of connectedness to nature, the structure and specific activity for the session, and reflection questions (See Appendix G). Specific activities were developed from and inspired by various nature-based activities shared on internet platforms. The development of individual lesson plans is described in greater detail below:

Lesson 1

The purpose of this lesson is to build a sense of oneness with nature by recognizing how nature impacts one's senses. For this activity, the interventionist leads students in a mindfulness activity titled, "Be Like Nature" (Rogers, 2017) that encourages children to imagine they are various elements of nature (e.g., a tree, the sun) and experience the environment around them through their senses. This activity is intended to take place outside; however, it could be adapted for indoor settings using media to present students with sights and sounds of nature. Following the activity, students are asked reflection questions about the elements of nature that they felt through their senses and how they felt after completing the activity.

Lesson 2

In the second lesson, students are encouraged to build empathy for creatures and elements of nature (e.g., plants and animals) by taking the perspective of nature. In an outdoor setting, the interventionist provides writing materials for children to journal with. Students are prompted to pretend they are a plant or animal in nature and write a story or draw a picture that describes their day. Throughout this activity, students are encouraged to imagine what their plant or animal is thinking and feeling. After the activity, students

are encouraged to share their story or picture and describe the thoughts and feelings of the plant or animal.

Lesson 3

Lesson 3 targets students' enjoyment of nature through the identification of positive emotions they experience when engaging with the natural world. For this activity, students are provided a paper cutout that serves as a picture frame They are encouraged to color or decorate their paper if they choose. Preferably in an outdoor setting, students are instructed to hold up the picture frame to "frame" a scene in nature that makes them feel happy. Following the activity, students are asked to describe their nature scene to their peers, including the parts of their "picture" that made them feel happy.

Lesson 4

Lesson 4 was designed to encourage students to enhance their sense of oneness with nature by recognizing that humans are part of the natural world. Students are provided a notebook and writing utensils for this lesson. They are prompted to mark an "X" on their paper, which represents themselves on a sensory map that they will create. Then students are encouraged to take notice of the elements of nature surrounding them through their senses, such as the feeling of wind on their skin, the warmth of the sun, and the smell of the grass. After taking in the environment through their senses, students are then prompted to draw pictures, words, or symbols on their sensory map to represent the nature around them (Rocha, n.d.). Following the activity, students are asked to share their sensory map with their peers and describe the senses they used to locate various parts of nature.

Lesson 5

The purpose of Lesson 5 is to enhance children's sense of responsibility by encouraging them to develop an understanding of how their behaviors affect the natural world. For this activity, students are divided into groups of three or four. Each group is given an environmental problem, and they must work together to develop a solution to address the problem. For example, the interventionist may present the following scenario to students: "You are building a fort in the woods and come across a nest of baby rabbits in the spot you need to build a supporting wall. What do you do?" After developing a solution, the group must role-play or act out the scenario of the environmental problem and their solution. Students are then asked to reflect on how human actions affected nature in their scenario.

Lesson 6

Lesson 6 targets students' enjoyment of nature by challenging them to use critical thinking skills through physical contact with nature. For this activity, students are instructed to sit in a circle in an indoor or outdoor setting. The interventionist instructs the students to close their eyes and hold their hands behind their backs. Students are then given an object found in nature (e.g., rock, pinecone) and prompted to take a few minutes to feel their object and its different textures. The interventionist then collects the nature objects from the students and passes them back out randomly to the students. Students are instructed to feel the nature objects and trade them with each other until each child finds their original nature object (Arocha, n.d.). As a reflection, students are encouraged to share what was difficult about the activity and what they found to be most helpful in identifying their object.

Lesson 7

For Lesson 7, students develop a sense of responsibility for nature by making decisions that promote the wellbeing of nature. In an outdoor setting, students are tasked with using materials found in nature (e.g., grass, rocks, sticks) to build a habitat for a specific animal that lives in that area. Students can work individually or as a group for this activity. After building the animal habitat, students are encouraged to tell the group about their habitat as well as their reasoning for the structure they chose and why it would be a good fit for the animal they chose.

Lesson 8

The goal of this lesson is to enhance children's empathy for creatures by encouraging students to demonstrate feelings of empathy and compassion for nature. Students are given journaling materials and prompted to pretend to be a plant or animal of their choice. They must write or draw about what it is like to be that plant or animal. Specifically, students are encouraged to consider what their plant or animal might be thinking or feeling in their environment (e.g., a flower in the sunlight may feel happy). Following the activity, students are asked to share their journal entries or pictures with the group. They are encouraged to share what they were thinking and feeling as that plant or animal, as well as reasoning why they believe that plant or animal had those particular thoughts and feelings.

Procedures

NBI activities were facilitated by the primary researcher. The researcher obtained permission from the school district to recruit student participants and implement the NBI during the summer months. Two weeks prior to the start of the summer school session,

the school's administrator sent an email to all parents and guardians of students ages 8-12 years old who enrolled in summer school. Electronic and paper copies of the parental consent form were shared with these parents and guardians. On the first day of the summer school session, the researcher collected consent forms from students. Students with parental consent were then assigned to either the *control condition* or the *intervention condition,* depending on the summer school activity they were enrolled in. Specifically, all students who attended baseball for their first activity were exposed to the NBI (intervention condition), and all students whose first activity was art simply engaged in the typical summer school activities (control condition). Random assignment was not used for this study as it was more practical for the researcher to schedule times to facilitate NBI activities within the summer school schedule. Prior to implementing the NBI, students who received parental consent to participate in the study were asked to provide verbal assent before further engagement with study procedures. Students who did not assent or whose parents did not consent to their participation in the study continued to participate in the summer school activities as organized by the district.

The NBI consists of eight intervention activities that last between 10-15 minutes. Intervention activities were implemented four times per week during the summer school program, lasting a total of two weeks. As part of the intervention, students were exposed to nature and engaged in various nature-based activities. Specifically, NBI activities included mindfulness activities, journaling about nature, experiencing nature through one's senses, building habitats out of materials found in nature, etc. Although students in the intervention condition were directly exposed to nature and nature-based activities, outside of the NBI activities students in either condition were not prevented from

naturally engaging with nature throughout the summer school schedule. A session outline was created to detail the specific NBI activities and connectedness to nature factors associated with each session across the intervention. A treatment fidelity checklist was also developed to measure the efficacy with which the interventionist implemented the NBI activities (see Appendix K). The checklist includes objective, observable items that represent the activity components necessary to ensure that individual activities were facilitated according to directives written in the lesson plan (Khoury et al., 2019).

Before introducing NBI activities, participants across conditions completed a pretest of the Connection to Nature Index (CNI) and wellbeing check card on the first day of the summer school session. These pretest measures assessed participants' level of connectedness to nature and overall wellbeing prior to the implementation of the NBI activities. For the following eight days of summer school, participants assigned to the intervention condition participated in one 10- to 15-minute NBI activity each day; whereas students assigned to the control condition simply participated in the regularly scheduled summer school activities.

On the last day of the summer school session, participants across conditions completed posttest measures of the CNI and wellbeing check card to assess student outcomes following the implementation of the NBI. In addition to these measures, participants assigned to the intervention condition who engaged in at least six NBI activities were invited to participate in a structured, student group interview. Student interviews elicited anecdotal evidence of children's experiences and perspectives as active participants in the NBI activities. Data from the pretest and posttest measures, as well as student interview information, were organized and interpreted to draw evaluative

conclusions about the effectiveness of the NBI in enhancing children's connectedness to nature and feelings of overall wellbeing.

Measures

Connection to Nature Index

The CNI is a tool developed to assess children's connectedness to nature by measuring their feelings in natural spaces, their perception of the human-nature relationship, and their concern for nature (e.g., plants, animals) (Cheng & Monroe, 2012). The CNI was adapted from the Connectedness to Nature Scale (Mayer & Frantz, 2004) to measure nature connectedness specifically in children. The index was developed by conducting interviews with fourth-grade students about their perceptions of connectedness to nature. The CNI is determined to be most appropriate in assessing connectedness to nature in children 8-10 years old (Cheng & Monroe, 2012). The CNI consists of 16 statements rated on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*) (see Appendix H). High average scores indicate a strong connection with nature. Cheng and Monroe (2012) identify four factors of connectedness to nature to inform the development of the CNI: enjoyment of nature (e.g., "When I feel sad, I like to go outside and enjoy nature"), empathy for creatures (e.g., "Taking care of animals is important to me"), sense of oneness (e.g., "Humans are part of the natural world"), and sense of responsibility (e.g., "My actions will make the natural world different"). Previous research evidences the correlation between CNI scores and other variables associated with affective attitudes toward nature, including knowledge of one's environment, perception of family values, and previous experiences in nature ($r = .13$, $p < .01$; Cheng & Monroe, 2012). The CNI also demonstrates good internal consistency (α

= .87), supporting the use of the CNI as a valid measurement of children's connectedness to nature.

Wellbeing Check Cards

To measure student wellbeing across participation in the NBI, the current study employed wellbeing check cards, as utilized in research conducted by Chiumento and colleagues (2018) (see Appendix I). The wellbeing check card is a short, anonymous measure of children's mental health and wellbeing. The measure consists of seven items, including statements such as "I have things to look forward to", "I feel relaxed", and "I feel like I have friends". This self-report tool utilizes a 5-point Likert scale, in which children rate items from 1 (*none of the time*) to 5 (*all of the time*). Wellbeing check cards were adapted from the Warwick Edinburgh Mental Wellbeing Scale (Clarke et al., 2011), which has been validated for children 13 years of age and older ($\alpha = .87$). Although the wellbeing check cards were developed for children older than those enrolled in the present study, Chiumento and colleagues (2018) implemented the measure with children ages 9-15 years old to measure their wellbeing following their participation in an NBI. These findings support the effective use of wellbeing check cards for the purpose of measuring school-aged students' sense of wellbeing over time.

Structured Student Interview

In addition to quantitative measures, qualitative reports were collected through structured group interviews with students who participated in the NBI activities. The purpose of these student interviews was to provide evaluative information regarding student acceptability of the intervention activities, as well as brief accounts of participants' experiences connecting with the natural world. Existing research supports

the use of mixed methodology in behavioral intervention research to aid researchers in further understanding the effects of an intervention, including potential facilitators and challenges to intervention implementation (Fabregues et al., 2022). The researcher elected to use the structured interview format with child participants to gather a broad understanding of student experiences while also remaining time-sensitive within the summer school schedule. Five structured interview questions were developed from the study objectives to broadly evaluate what participants enjoyed and did not enjoy about the NBI activities, their perceived connection to nature as a result of their participation in the NBI, how their engagement in the NBI activities made them feel, and their thoughts regarding the implementation of NBI activities during the school year. In particular, the researcher was interested in understanding students' broad acceptability of the NBI activities. The specific interview questions can be found in Appendix J. Participant responses to interview questions were transcribed by the researcher and later analyzed for common themes and areas of agreement and controversy (Kidd & Parshall, 2000). Common themes identified from the interviews serve as supplementary conclusions to findings from quantitative data analyses.

Fidelity of Implementation

Treatment integrity is an important indicator of program efficacy. Interventions that are implemented with fidelity are more likely to yield positive intervention effects (Berkel et al., 2011). Specifically, for the duration of the NBI activity, the interventionist was evaluated using a treatment fidelity checklist on whether or not they addressed each of the following objectives: (1) the interventionist had all the materials needed for the activity, (2) the interventionist introduced the activity according to the lesson plan, (3) the

interventionist led students through the activity, making an effort to maintain student engagement, and (4) the interventionist asked students reflection questions listed on the lesson plan and facilitated a group discussion. Although adaptation plays a key role in intervention implementation to make activities and instruction more relevant to a specific population (Berkel et al., 2011), fidelity checks were performed throughout the two-week intervention period to observe any lesson deviations and ensure that the fidelity of implementation was not undermined. For 50% of the NBI activities (i.e., four lessons), a school administrator was provided a copy of the lesson plan and treatment fidelity checklist, and they observed and rated the interventionist's facilitation of NBI activities. Across all four NBI activities evaluated, the interventionist was observed to facilitate the lesson plan with 100% fidelity (see Table 2). These findings demonstrate that participants engaged in NBI activities as outlined in the lesson plans developed for this study.

Table 2

Treatment Fidelity Checklist Data for NBI Implementation

	Materials	Activity introduction	Facilitated activity and engagement	Reflection question(s) and discussion
Lesson 2	Yes	Yes	Yes	Yes
Lesson 5	Yes	Yes	Yes	Yes
Lesson 6	Yes	Yes	Yes	Yes
Lesson 8	Yes	Yes	Yes	Yes

Study Design and Analysis

The present study employed a mixed method, repeated measures comparison group design, in which student outcomes (i.e., connectedness to nature, overall wellbeing) were compared across time and condition. Qualitative data regarding participants' perceptions of NBI activities were also collected. The research design was primarily quantitative; however, qualitative data was collected to provide greater insight into NBI acceptability, including identifying potential implementation barriers (Fabregues et al., 2022). To assess the effects of the NBI on students' connectedness to nature and wellbeing, paired samples t-tests were used to determine statistically significant differences in pre-post measures of the CNI and wellbeing check card. Paired samples t-tests are used to compare three or fewer means with a dependent relationship, such as pre-post scores (Lomax & Hahs-Vaughn, 2012). Additionally, independent samples t-tests were conducted to compare CNI and wellbeing check card scores across conditions. Independent samples t-tests are used to compare means of samples that do not have a relationship, such as control group and intervention group scores (Lomax & Hahs-Vaughn, 2012). Since the summer school schedule did not allow for the random assignment of participants, this analysis was important to determine if there were statistically significant differences in students' connectedness to nature or wellbeing across assigned conditions prior to implementing the NBI. In sum, quantitative data analyses will establish whether or not significant differences occur across time and condition, as a result of implementing the proposed NBI.

Additionally, structured interviews were conducted with participants in the intervention condition to collect supplemental, qualitative data about student perceptions

of NBI activities. Student responses from the structured interviews were analyzed using a structured thematic analysis. Specifically, written notes from the two interview sessions were coded by the researcher to identify recurring patterns that represent themes or overarching statements articulated by students (Lochmiller, 2021).

The thematic analysis framework developed by Braun and Clarke (2006) guided the qualitative coding process. Particularly, the researcher conducted an initial review of the interview data to become familiar with student responses. Initial codes were then developed from specific words or interesting features of responses. The researcher searched for themes in these highlighted features, which Braun and Clarke (2006) define as important aspects of the data that related to questions asked and represent a "patterned response or meaning" in the collected data set. Qualitative data was coded into these identified themes, which were then given specific names or descriptions. Findings from the qualitative analysis provide further insight into the acceptability, practicality, and perceived effectiveness of the NBI.

CHAPTER 3. RESULTS

At the start of the intervention period, 14 children were enrolled in the study. Participant data was screened prior to data analyses, and data from four participants was removed due to missing data. Only participants who completed all intervention components (n = 10), including pretest and posttest measures of the CNI and wellbeing check card and six or more NBI activities, were included in statistical analyses. A review of completed study materials supports that all participants completed every component of the surveys, and missing data was calculated to be 0%. Additionally, students in the intervention group answered all five structured interview questions.

Table 3 provides the descriptive statistics of pretest and posttest data for the CNI and wellbeing check card across both groups. On the CNI, mean scores range from one to five, with higher scores representing a greater sense of connection to nature. At the beginning of the intervention period, participants in the intervention group endorsed an average score of 3.95, and participants in the control group averaged a score of 4.44. At the end of the intervention, the intervention group averaged a CNI score of 4.16, and the control group averaged 4.24. Similarly, mean scores on the wellbeing check card range from one to five, with higher scores indicating enhanced feelings of overall wellbeing. Prior to the intervention period, students in the intervention group averaged a wellbeing score of 3.86, compared to the control group's average of 3.71. Following the intervention period, the intervention group average increased to 3.88, and the control group average increased to 3.74.

Table 3

Descriptive Statistics for Rating Scale Data

	Intervention				Control			
	n	*M*	*SD*	*SEM*	*n*	*M*	*SD*	*SEM*
Pre-CNI	5	3.95	.62	.28	5	4.44	.33	.15
Post-CNI	5	4.16	.65	.29	5	4.24	.27	.12
Pre-Wellbeing	5	3.86	.50	.23	5	3.71	.64	.29
Post-Wellbeing	5	3.88	.44	.20	5	3.74	.72	.32

Note. Post-CNI = Pre Connection to Nature Index administration; Post-CNI = Post Connection to Nature Index administration; Pre-Wellbeing = Pre wellbeing check card administration; Post-Wellbeing = Post wellbeing check card administration

Prior to analyzing the effects of the intervention, the researcher conducted an independent samples t-test across group conditions to investigate whether between-group differences existed in students' connectedness to nature or wellbeing (see Table 4). Results of these analyses suggest that there were no significant differences between the intervention and control group for pretest ratings of connectedness to nature ($t(8) = -1.546$, $p = .080$) or wellbeing ($t(8) = .402$, $p = .349$) prior to the NBI implementation. Although the structure of the summer school session did not allow for the random assignment of participants due to activities they were enrolled in, results of the independent samples t-test indicated equal variances across conditions. The Shapiro-Wilk test of normality was also conducted to ensure the normal distribution of pretest data. Results suggested normally distributed pretest CNI scores ($W = .929$, $p = .440$) and pretest wellbeing check card scores ($W = .936$, $p = .509$). Additionally, pretest data were further analyzed using the Fisher's exact test to determine if participant condition affected children's wellbeing or connection with nature prior to the intervention. Results

indicated no significant associations between participants' assigned condition and their pretest CNI scores (p = 1.000) or pretest wellbeing check card scores (p = 1.000).

Further comparisons indicate that following the two-week intervention period, there were no significant differences observed between the intervention and control group for connectedness to nature ($t(8)$ = -.246, p = .406) or wellbeing ($t(8)$ = .384, p = .356). In other words, children in the intervention group did not endorse a greater connection with nature or feelings of wellbeing than children in the control condition, despite their participation in the NBI.

Table 4

Independent Samples T-Test for Between Subjects Comparison

	t	*df*	*p*
Pre-CNI	-1.546	8	.080
Post-CNI	-.246	8	.406
Pre-Wellbeing	.402	8	.349
Post-Wellbeing	.384	8	.356

Note. Post-CNI = Pre Connection to Nature Index administration; Post-CNI = Post Connection to Nature Index administration; Pre-Wellbeing = Pre wellbeing check card administration; Post-Wellbeing = Post wellbeing check card administration

Research Question 1

The first research question compared participants' connectedness to nature before and after the intervention period. Specifically, the researcher was interested in investigating whether participation in the NBI increased students' sense of connectedness to nature. A paired samples t-test was administered to determine if participants demonstrated an increase in CNI scores from pretest to posttest measures (see Table 5). Effect sizes were also calculated to further assess the practical significance of mean

differences within subjects. Cohen (1988) suggested interpreting effect sizes as small (d = 0.2), medium (d = 0.5), and large (d = 0.8).

Paired samples correlation data represent the relationship between individuals' pretest and posttest CNI scores. Results suggest that students' CNI scores in the intervention condition were correlated at a statistically significant level (r = .956, p = .006). In other words, small pretest scores were more likely to be associated with small posttest scores, and large pretest scores were more likely to be observed with large posttest scores. Conversely, student CNI scores in the control condition did not indicate a statistically significant correlation across time (r = .263, p = .335). Findings from the paired samples t-test suggest that children in the intervention group demonstrated a significant increase in their sense of connectedness to nature from pretest (M = 3.95, SD = .62) to posttest (M = 4.16, SD = .65) following their participation in the NBI activities, $t(4) = -2.49$, p = .034, d = .19. Conversely, students assigned to the control condition did not show a significant increase in their CNI scores from pretest (M = 4.44, SD = .33) to posttest (M = 4.24, SD = .27) following the two-week summer school session, $t(4)$ = 1.186, p = .151, d = .37. Results of the paired samples t-test indicated a small effect size across conditions.

Table 5

Paired Samples T-Test for Pre-Post CNI Data

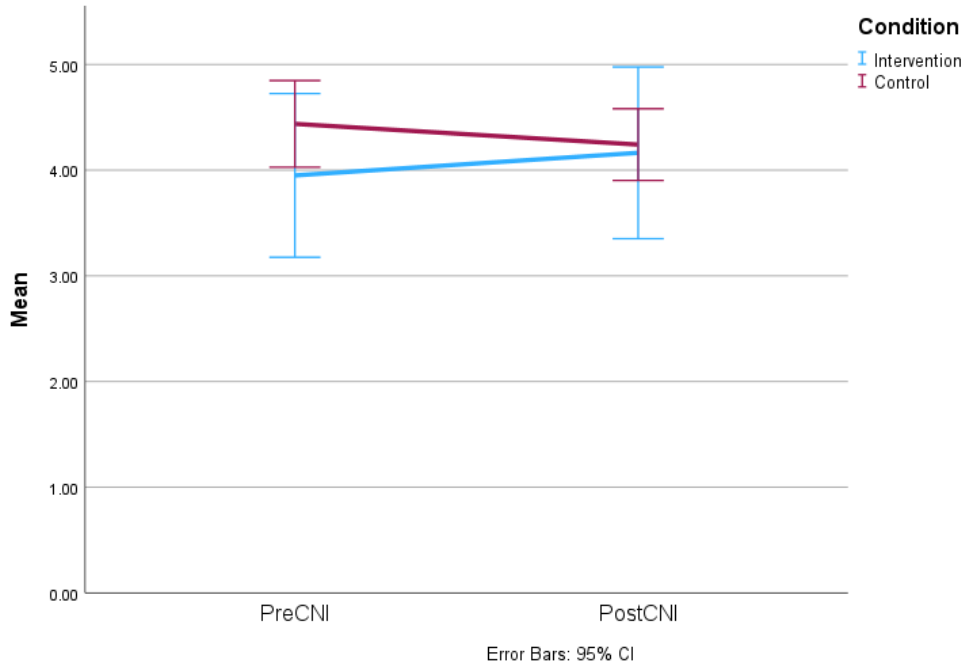
	Correlations		T-Test			
	r	*p*	*t*	*df*	*p*	*Cohen's d*
Intervention Group						
Pre-Post CNI	.956	.006**	-2.492	4	.034*	.19
Control Group						
Pre-Post CNI	.263	.335	1.186	4	.151	.37

Note. CNI = Connection to Nature Index; *$p < .05$; **$p < .01$; ***$p < .001$

Results from these analyses indicate that students who participated in the NBI activities may have perceived a greater sense of connectedness to nature as a result of their participation in the NBI whereas students in the control condition did not change their feelings of connection with nature. Although results of the independent samples t-test indicated no significant difference between participants' posttest CNI scores across conditions, students who participated in the NBI showed a statistically significant increase in their connectedness to nature from pretest to posttest, which was not observed in the control condition (see Figure 1).

Figure 1

Pre-Post CNI Data Across Condition



To expand on the key components of connectedness to nature from which the NBI activities were developed, further analyses were conducted on the four factors of connection to nature coined by Cheng and Monroe (2013): enjoyment of nature, empathy for creatures, sense of oneness, and sense of responsibility. Specifically, the researcher was interested in examining the specific factors of connectedness to nature that were responsible for the increased CNI scores endorsed by students in the intervention group. Paired samples t-tests were administered for each CNI factor to investigate the effects of individual factors of connectedness to nature on children's CNI scores over the course of the intervention (see Table 6).

Enjoyment of Nature

The CNI endorsed seven items that load onto the factor of enjoyment of nature. Participant ratings on this factor of connectedness to nature significantly increased across

both the intervention group ($t(4) = -2.258$, $p = .043$, $d = .14$) and the control group ($t(4) = 3.071$, $p = .019$, $d = .42$). Results indicated a small effect size for the intervention group and a medium effect size for the control group.

Empathy for Creatures

Four items on the CNI loaded onto the factor of empathy for creatures. Results indicate that participant ratings on this factor increased significantly across both the intervention group ($t(4) = -3.207$, $p = .016$, $d = .21$) and the control group ($t(4) = 2.449$, $p = .035$, $d = .14$). Results indicated a small effect size across conditions.

Sense of Oneness

Three items on the CNI make up the factor of sense of oneness. There were no significant differences in participants scores over time for both the intervention group ($t(4) = .306$, $p = .388$, $d = .50$) and the control group ($t(4) = 1.423$, $p = .114$, $d = .52$). Results indicated a medium effect size across conditions.

Sense of Responsibility

Three items loaded onto the sense of responsibility factor on the CNI. Participants endorsed no significant differences in their sense of responsibility for nature over time for both the intervention group ($t(4) = -1.176$, $p = .152$, $d = .76$) and the control group ($t(4) = -.911$, $p = .207$, $d = .82$). Results indicated a medium effect size for the intervention group and a large effect size for the control group.

Table 6

Paired Samples T-Test for Pre-Post Factors of CNI Data

	t	*df*	*p*	*Cohen's d*
Enjoyment of Nature				
Pre-Post Intervention	-2.258	4	.043*	.14
Pre-Post Control	3.071	4	.019*	.42
Empathy for Creatures				
Pre-Post Intervention	-3.207	4	.016*	.21
Pre-Post Control	2.449	4	.035*	.14
Sense of Oneness				
Pre-Post Intervention	.306	4	.388	.50
Pre-Post Control	1.423	4	.114	.52
Sense of Responsibility				
Pre-Post Intervention	-1.176	4	.152	.76
Pre-Post Control	-.911	4	.207	.82

Note. CNI = Connection to Nature Index; *$p < .05$; **$p < .01$; ***$p < .001$

Research Question 2

The second research question targeted whether child participation in the NBI enhanced their overall wellbeing at the end of the summer school session. Specifically, the researcher was interested in analyzing whether participants demonstrated an increase in their overall wellbeing on the wellbeing check cards from pretest to posttest. Table 7 shows the results of the paired samples t-test analysis. Paired samples correlation data represent the relationship between individuals' pretest and posttest wellbeing check card scores. Results suggest that students' ratings of wellbeing in both the intervention

condition (r = .932, p = .011) and the control condition (r = 860, p = .031) were correlated at a statistically significant level. For example, students with high ratings of wellbeing prior to the intervention were more likely to continue to demonstrate high or higher ratings of wellbeing following the intervention period, regardless of condition.

A paired samples t-test was administered to determine if children's sense of wellbeing increased following their participation in the NBI. Findings suggest that no significant differences were observed in wellbeing check card ratings from pretest (M = 3.86, SD = .50) to posttest (M = 3.89, SD = .45) for students in the intervention group, $t(4)$ = -.314, p = .384, d = .18, as well as across pretest (M = 3.71, SD = .64) and posttest ratings (M = 3.74, SD = .72) for students in the control group, $t(4)$ = -.157, p = .441, d = .37. Effect sizes indicated a small effect across both conditions. Taken together, child participation in the NBI activities had no statistically significant effect on their perceived sense of wellbeing.

Table 7

Paired Samples T-Test for Pre-Post Wellbeing Data

	Correlations		T-Test			
	r	*p*	*t*	*df*	*p*	*Cohen's d*
Intervention Group						
Pre-Post Wellbeing	.932	.011*	-.314	4	.384	.18
Control Group						
Pre-Post Wellbeing	.860	.031*	-.157	4	.441	.37

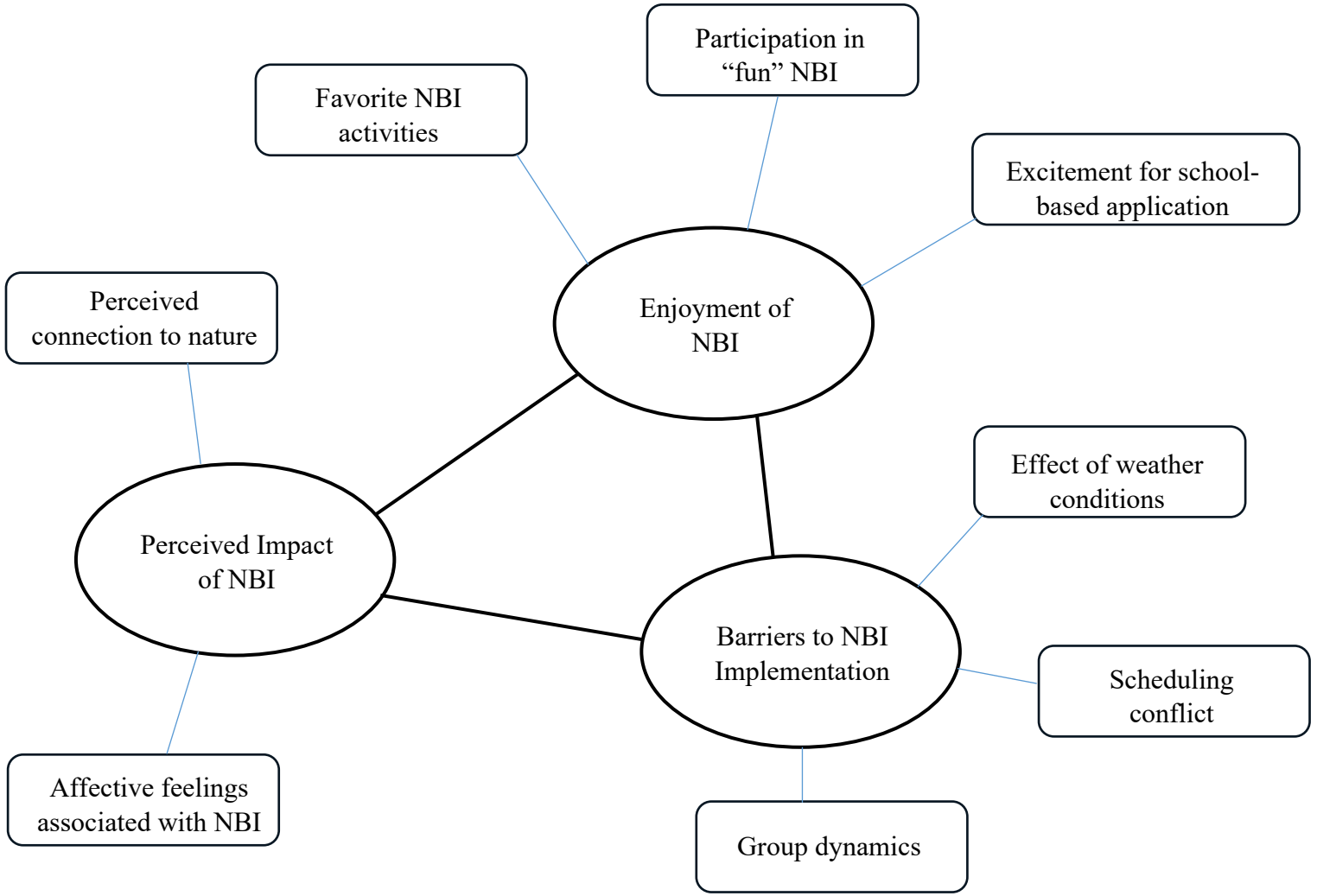
Note. Wellbeing = Wellbeing Check Card; *$p < .05$; **$p < .01$; ***$p < .001$

Research Question 3

The final research question was intended to gather students' perceptions and opinions of the NBI. Only children assigned to the intervention group ($n = 5$) who participated in at least six of the eight NBI activities completed a short, structured interview to assess their individual experiences and perceptions of various components of the NBI. The researcher asked participants five questions regarding their perception of the NBI activities, if their participation impacted their connection with nature, and their thoughts regarding the implementation of similar activities during the school year (see Appendix J). The interview was conducted in two sessions due to participants' summer school schedules on the last day of summer school, with two participants in one interview and three participants in the other. The researcher hand-recorded participant responses to the interview questions using short-hand and verbatim responses. Three evaluative themes emerged from the responses of students through the structured interviews: (1) enjoyment of the NBI, (2) perceived impact of the NBI, and (3) barriers to NBI implementation.

Figure 2

Thematic Map of Qualitative Data



Enjoyment of the NBI

One evaluative theme that emerged from the analysis of student interview responses was participants' expression of enjoyment for the NBI activities. The students were able to articulate their thoughts on specific activities that they enjoyed throughout the intervention period, including using descriptive words to label the intervention activities as enjoyable (e.g., "I like doing fun activities in nature.") Further, when asked about their thoughts on incorporating similar NBI activities into the school year, most participants indicated feelings of excitement for the possibility of engaging in these activities as part of their school day (e.g., "I'd like that. I like nature and everything about it.")

Favorite NBI Activities. Participants were asked which of the NBI activities were their favorite to participate in. Of the eight NBI activities introduced throughout the intervention period, three students in the intervention group shared that building an animal habitat out of elements of nature was their favorite NBI activity (Lesson 7). One of these students specifically indicated they "liked when [they] were making an ant kingdom," in reference to gathering leaves and long pieces of grass to create shade for an ant hill found in the middle of the playground. Additionally, two students found drawing to be the most enjoyable aspect of the intervention activities. Specifically, one student mentioned "drawing the map with grass," referring to the sensory map activity (Lesson 4) in which students drew a map of the sounds, smells, and feelings of nature around them. During this particular activity, several participants discovered the use of grass as a writing utensil to incorporate color and smell into their sensory maps.

Participation in 'Fun' NBI Activities. Throughout the student interviews, multiple participants described the NBI activities as 'fun' or explicitly expressed enjoyment about participating in the NBI or simply interacting with the natural world. For example, when asked how they knew that they felt closer to nature, one student expressed that they felt more connected with nature because they "learned more fun activities to do outside." Similarly, another student shared that they know they feel connected with nature because they "like doing fun activities in nature." These comments suggest participants largely found the NBI activities to be fun and enjoyable.

Excitement for School-Based Application. The last subtheme related to children's enjoyment of the NBI is participants' expressed excitement for integrating similar NBI activities into the school day. Four of the five children demonstrated excitement when asked how they would feel if they had the opportunity to take part in short, NBI activities during the regular school year. Specifically, one child cheered and exclaimed "Yes!" while another child shared that they "never get to do that," referring to engaging with nature during the school day. One student responded to this question with the following: "I'd like that. I like nature and everything about it." The last student to express positive thoughts about engaging in NBI activities during the school year made a point that it "depends on the weather." This child went on to offer an alternative to participating in NBI activities during inclement weather and suggested that they "could bring nature inside on cold days."

Perceived Impact of the NBI

A second theme identified from the thematic analysis regarded participants' perceived impact of the NBI activities. Specifically, the students shared how they felt

after interacting with nature, as well as if they recognized an effect of their participation on their perceived connectedness to nature. Within this theme, participants reported feeling closer to nature and expressed affective feelings associated with their interactions with nature through the NBI activities.

Perceived Connection to Nature. Students elaborated on their perceived connection to nature in response to an interview question that specifically targeted this connection: *Do you feel closer to nature after doing all of the nature activities?* Four of the five participants in the intervention condition indicated that they felt closer to nature as a result of their NBI participation. When asked to explain how they knew they felt closer to nature, one student indicated that they learned more about nature as a result of their participation: "I know more about nature." Three of the participants spoke about their enjoyment of the NBI activities, including referencing specific NBI activities that they enjoyed, as well as enjoyment in participating in the NBI as a whole. One of the participants expressed that they "learned more fun activities to do outside," which suggests they may continue to engage in the NBI activities in the future. Conversely, when one student was asked if they felt closer to nature, they responded, "Not really." They went on to share that they "don't really go outside unless [they] have to," suggesting a general dislike for nature. This student's perception of the NBI speaks to the reality that some children are more inclined to participate in and enjoy nature activities than others.

Affective Feelings Associated with Nature Engagement. Participants also spoke about their affective feelings and experiences as a result of interacting with nature. Affective feelings and experiences shared by participants included both positive and

negative feelings associated with the natural world and NBI activities. Responses related to this subtheme arose specifically in response to the following interview question: *How do you feel after spending time outside or in nature?* Three of the students expressed experiencing generally positive feelings when they interact with nature, indicating that they felt "good" after spending time outdoors. Further, three participants mentioned feelings of relaxation and decreased stress when they were in nature. As one student shared, "I feel sweaty and I feel good and relaxed after" spending time in nature. Another student simply stated that they "feel less stressed" when they get to engage with nature. Although largely positive, one participant expressed negative affective feelings associated with being with nature. Specifically, this student shared that they feel "bored because [they] can't do what [they] want" when they are outside. This student's perspective evidences that, although children generally find nature to be a preferred place and enjoyable experience, a child's relationship with nature is unique to that individual.

Barriers to NBI Implementation

Throughout the student interviews, participants shared some concerns regarding potential barriers to the implementation of the NBI, specifically within the context of a school setting. Although there was no specific interview question that targeted this area of implementation barriers, students were able to point out challenges that arose throughout the NBI period. The specific barriers that students identified include the effect of weather conditions, conflicts with integrating NBI activities into their schedule, and challenges related to social factors.

Effect of Weather Conditions. One student expressed some hesitation regarding the implementation of NBI activities during the school year because of inclement weather

conditions that could occur. Specifically, in response to the question regarding participants' thoughts on engaging in nature activities during the school day, this student indicated that it "depends on the weather." Although this student offered a suggestion for continuing NBI activities in an indoor location, it is worth noting that it would be challenging to facilitate the NBI activities in outdoor settings with extreme temperatures, rain, etc. It is also notable that on the day that structured interviews were conducted, participants were gathered outside during a cold and windy afternoon, and many of the students expressed feeling cold at this time.

Scheduling Conflicts. In response to the interview question about which nature activities the students did not enjoy or would like to change, two students shared that they did not enjoy "when [they] were doing mindfulness at the ballpark" (Lesson 1). Specifically, one student reported that they did not enjoy this activity because they "were missing baseball." Due to the short, four-hour day of the summer school sessions, participants were pulled from their summer school activities to participate in the NBI activities. On the first day of the intervention, some of the participants were pulled from their baseball activity to engage in the NBI activity. The interventionist altered the schedule for future sessions as a result of student input; however, participant input lends itself to the possibility that implementation of similar NBI activities during the school day may cause conflict with various scheduling factors such as finding time to implement the activity without interfering with core curricula and students' preferred activities (e.g., specials, recess).

Social Dynamics. The last barrier that emerged from the student interviews summarizes challenges related to working within a group. The NBI was developed for

school-based implementation, and the NBI lessons were intentionally designed to be facilitated in a group setting to model future classroom integration. Regarding difficulties with social dynamics, two students shared that the role-play activity (Lesson 5) was their least favorite due to challenges with social interaction and group dynamics. Specifically, one student said they "have social anxiety," which made it difficult to act out a role in front of their peers. Another student shared that they did not particularly enjoy the role-play activity because their "group didn't listen." The nature of these NBI activities in the school setting makes group participation inevitable; however, identifying such potential barriers is important in recognizing actions or suggestions that can be put in place to prevent or resolve group challenges as they arise such as establishing group norms before NBI implementation.

CHAPTER 4. DISCUSSION

Children's relationship with the natural world has been found to have extensive benefits regarding children's physical, mental, and emotional health. Specifically, existing research has established that promoting children's connectedness with nature is related to enhanced mental health, physical health advantages, restorative benefits, enhancements in prosocial behaviors, and positive self-regulation strategies (Chawla, 2015; Dopko et al., 2019; Tillmann et al., 2018). Within school settings, connectedness to nature has been shown to improve children's capacity to attend to instruction, engage with school activities, support memory abilities, and have positive peer relations (Hartig, 2003; Marselle et al., 2021; Robinson & Zajicek, 2005). Further, NBIs that are embedded within the school day schedule are observed to be more inclusive and relevant to students' nature connection than a one-day nature intervention that is implemented once or twice across the school year (Collado et al., 2020).

The present research intends to encourage the use of NBIs in classrooms and school settings to promote students' relationship with the natural world and positive feelings of wellbeing. Nature can be used as a tool to enhance various aspects of learning, even though outdoor learning has a reputation of being viewed as "extra work" or a distraction to students (Marchant et al., 2019; Moffett, 2011). Educators have increasingly high expectations regarding student academic achievement, which often leads to the prioritization of academic success over the mental and emotional health of students (Brown & Dixon, 2020). Further, existing research on the effectiveness and practicality of NBIs in the school setting is limited. To address these gaps in the literature, the current study explored the impact of short, school-based NBI activities on

children's sense of connectedness to nature and overall wellbeing. Findings from this research may support the importance of strengthening children's relationship with nature as a means to promote their emotional wellbeing.

The researcher developed eight nature-based activities to be implemented within the school setting. The NBI took place during a summer school session that lasted two weeks. The NBI activities were designed to target each of the four factors of connection to nature (i.e., enjoyment of nature, empathy for creatures, sense of responsibility, sense of oneness) coined by Cheng and Monroe (2013). Each NBI activity lasted about 10-15 minutes and included activities such as mindfulness, journaling, and role-play. The NBI activities were designed to take place outdoors, although many could be adapted for indoor settings. The researcher collected participants' ratings of connectedness to nature and wellbeing both prior to and following the implementation of the NBI. Additionally, the researcher conducted structured interviews with children in the intervention group, following the NBI implementation. The purpose of this interview was to obtain student perceptions of the NBI activities, such as what they did and did not enjoy about the activities and whether they perceived a greater sense of connection to nature as a result of their participation in the NBI.

Effect of the NBI on Connectedness to Nature

The first research question examined whether children's participation in the NBI activities enhanced their connectedness to nature. The researcher hypothesized that students in the intervention condition would show an increase in their CNI scores following the intervention period, whereas the CNI scores of the students in the control condition would stay consistent over time. Results of this study supported the

researcher's hypothesis. Specifically, children who participated in the NBI activities reported a statistically significant increase in their connectedness to nature at the end of the intervention period. Conversely, children who simply attended summer school and did not engage in the NBI activities did not report a statistically significant increase in their posttest CNI scores. Essentially, students' participation in the NBI may contribute to their enhanced feelings of connectedness to nature.

These findings align with existing literature, which supports that children's interactions with nature and participation in NBIs enhance their attitudes toward and connection with the natural world (Barrable & Booth, 2020; Collado et al., 2013; Lengieza & Swim, 2021; Otto & Pensini, 2017). When given opportunities to access nature both directly and indirectly, children are able to build a relationship with nature. Even short-term interactions with nature can have a notable impact on the child-nature relationship (Piccininni et al., 2018). Although much of the research on NBIs with children looks at more complex or involved nature activities (e.g., field trips, overnight camps, nature programs), results from the present study support the effectiveness of short and simple nature activities that can be integrated into a child's school day. Educators may be more inclined to implement NBI activities in their classrooms that are practical for the school day. This may create opportunities for more students to build a connection with nature, regardless of their access to nature at home or existing environmental beliefs.

Further analyses were conducted to gain deeper insight into the specific factors of connectedness to nature that may have contributed to the enhanced posttest CNI scores. Specifically, two factors of connectedness to nature increased significantly from pretest to posttest: enjoyment of nature and empathy for creatures. A significant increase was

noted for both the intervention condition and control condition, which may be partly due to participants spending a majority of their morning outdoors during the summer school program. These findings suggest that, regardless of condition, participants reported that they experienced greater positive feelings in nature and a stronger affinity to care for nature at the end of the intervention period, which contributed to their overall sense of connectedness to nature. Children typically experience positive emotions when they access nature both directly and indirectly (Yoon, 2023). These positive experiences contribute to a child's emotional connection with nature, which is a critical component of connectedness to nature (Capaldi et al., 2014; Martin et al., 2020).

Effect of the NBI on Wellbeing

The second research question examined the effect of the NBI on children's overall sense of wellbeing. In light of existing research demonstrating a relationship between NBIs and child wellbeing, the researcher hypothesized that children in the intervention condition would show an increase in their wellbeing from pretest to posttest, whereas children in the control condition would show consistent ratings on the wellbeing check cards over time. This hypothesis was not supported by results from this study, as participants' sense of wellbeing did not increase at a statistically significant level.

Counter to the results of the current study, existing literature documents a clear relationship between NBIs and child wellbeing, including self-efficacy and engagement in prosocial behaviors (Bolling et al., 2019; Chiumento et al., 2018). Even spending short amounts of time outdoors has been found to positively impact an individual's mood (Harvey et al., 2020). It is important to note that, across condition, participants averaged high ratings of wellbeing prior to the intervention period. In particular, students in the

intervention condition averaged a score of 3.86 and students in the control condition averaged a score of 3.74, with 5 being the highest score on the wellbeing check card. Due to the elevated ratings of wellbeing at pretest, it may be difficult for participants' posttest ratings to demonstrate an increase in wellbeing that is statistically significant. Additionally, the present NBI took place in the summer months during which students do not experience the added stress of academics and school responsibilities. This may also account for high levels of participant wellbeing. Although these findings do not support a statistically significant increase in wellbeing, posttest ratings of student wellbeing remained consistent over the course of the intervention period, which suggests that children's participation in the NBI and the summer school program supported their wellbeing.

Student Evaluations of the NBI

The third objective of the present study was to further understand students' perceptions and evaluations of the NBI activities as well as their thoughts on incorporating NBI activities into the school day. Children in the intervention condition were asked five structured interview questions regarding their thoughts and experiences in participating in the NBI activities. Three themes emerged from the evaluation of student responses, including student enjoyment of the NBI, students' perceived impact of the NBI, and potential barriers to NBI implementation. These themes are comparable to themes identified in research conducted by Marchant and colleagues (2019) in which students and teachers identified cognitive restoration (e.g., decreased stress, improved concentration), positive feelings and experiences in nature, emotional health benefits, and

curricular pressure (e.g., time constraints) as critical themes in the development of successful, outdoor NBIs for children.

Participants in the intervention group overwhelmingly expressed enjoyment of the NBI activities. They particularly enjoyed using elements of nature to build habitats for animals and connecting with nature through art. Throughout the interviews, participants used the word 'fun' to describe their interactions with nature, which supported their enjoyment of the NBI activities. These 'fun' experiences during the NBI likely contributed to students' increased factor of enjoyment of nature on the CNI (e.g., "Being outdoors makes me happy") in turn, enhancing their connectedness to nature. Existing research suggests that positive experiences in nature during childhood allow children to enjoy green spaces and develop an ethos of care for the environment (Harris, 2021). Further, school-aged children identify the outdoors and nature interactions as their favorite parts of learning (Streelasky, 2017), which evidences the importance of engaging students in fun, NBI activities during the school day to enhance their enjoyment of learning. Four of the five participants expressed excitement about the possibility of incorporating similar NBI activities into the academic school year, as their past school experiences did not include nature activities. Children today spend less time outdoors than previous generations, which limits their opportunities to build a connection with nature (Luis et al., 2020). Although participants in this study live in a rural community with ample access to open green space, they were still excited to have more opportunities to be with nature.

A majority of the students who participated in the NBI activities shared that they experienced positive feelings and a greater connection to nature following the NBI. Both

positive and negative affective experiences were reported by participants in the interviews. Specifically, students expressed feelings of relaxation and decreased stress as well as broad experiences of simply feeling "good" when they spent time in nature. These calming experiences align with the CNI item that says, "Being in the natural environment makes me feel peaceful." Findings from existing literature support the participants' experiences as children have been found to experience calmness, decreased stress, and restorative effects as a result of their participation in NBIs or interactions with nature (Hartig, 2003; Kang et al., 2021; Moula et al., 2023). Participants in the current study indicated that they felt more connected with nature after engaging in the NBI activities. They shared that they learned more about nature and new ways to interact with nature. Others attributed this increased nature connection to simply enjoying the NBI activities.

One participant shared that they did not feel a greater connection with nature following the intervention. This participant indicated that they do not particularly like nature and that they prefer to be inside. It is important to note that the same student who did not feel a greater connection to nature also did not express enjoyment of the NBI activities and shared feelings of boredom in participating in NBI activities. Their experience further supports the notion that positive feelings and experiences in nature are critical in enhancing children's connectedness to nature. This student's insight also emphasizes the importance of implementing NBI activities across indoor and outdoor settings, as both environments may contribute to a strong child-nature relationship (Coughlan et al., 2022). Adapting these NBI activities for indoor locations (e.g., mindfulness with videos of sights and sounds in nature, making crafts with nature

materials) may increase student's positive experiences with nature and perceptions of the NBI activities across a wider range of students.

Lastly, participants were able to identify multiple potential barriers to the implementation of NBI activities in school settings. One student indicated that weather could affect the location of the NBI activities. Inclement weather limits NBI activities to indoor settings which further supports the importance of adapting the present NBI activities for indoor implementation. Additionally, participants indicated concern regarding missing scheduled activities to engage in the NBI activities. These barriers identified by the participants align with findings from research conducted with educators, in which elementary school teachers identified inclement weather and time constraints as barriers to NBI implementation (Moffett, 2011). Although all of the NBI activities were implemented in an outdoor setting for the present study, each of the lessons could be easily adapted for indoor implementation. This could allow educators to introduce NBI activities in the classroom to address concerns with inclement weather conditions, limitations with school day schedules, and limited access to green space on campuses. For example, elements of nature (e.g., twigs, leaves, rocks) could be brought into the classroom for the habitat building activity (Lesson 7) or a guided mindfulness meditation using images and sounds of nature could be played for students in their classroom (Lesson 1).

Social dynamics are identified as a third potential barrier to NBI implementation. Particularly, students shared that they experienced anxious feelings when engaging in the role-play activity (Lesson 5) as well as some group conflict during this activity. Although these social factors and dynamics may impact students' engagement or experience with

this particular activity, the role-play scenarios may create opportunities for students to build relational skills such as conflict resolution and effective communication. Existing research supports that nature activities encourage students to practice social skills and connect with their peers (Germinaro et al., 2019; Sprague et al., 2020). Further, similar social difficulties occur naturally in the classroom setting during academic activities, free play during recess, and physical education class. Perhaps practicing these skills within nature interactions will further promote the generalizability of prosocial skills across settings.

Limitations

Findings from the current study suggest positive effects of the NBI on children's connectedness to nature as well as a favorable perspective of the NBI activities from participants in the intervention group. However, this study has limitations that impact the internal validity, external validity, and generalizability of the study's findings.

A limitation of the methodology used in the present study is the abstract nature of the dependent variables. Psychological constructs such as connectedness to nature and wellbeing are difficult to measure, as these variables are subjective and cannot be observed directly. Further, abstract constructs are especially difficult for children to understand well enough to provide self-report data (Brugger et al., 2011). To address this concern, the current study employed measures that have established psychometric properties in measuring these complex constructs in school-aged children. For example, Sobko and colleagues (2018) note that children may have difficulty distinguishing between cognitive interests in nature and emotional connection with nature. The use of

the CNI was intentionally selected to address such concerns as this measure specifically highlights affective components in children's connectedness to nature.

Another limitation of the methodology was the decision to use a structured interview format with school-aged children rather than a semi-structured interview. The researcher opted for the structured interview format as there was limited time during the summer school schedule for students to complete components of the current NBI, and the researcher was interested in gathering a broad understanding of students' perceptions of the NBI activities. The structured interview questions prompted short responses from the participants. As a result, the themes identified from the children's qualitative input lacked depth regarding their positive experiences in nature, how they knew they felt more connected to nature, and how the NBI could be improved for future application. In a semi-structured interview with participants, the researcher could have prompted participants to further elaborate on their thoughts and experiences throughout the NBI period, drawing more in-depth insight from the participants to enhance student acceptability of NBIs in schools. Additionally, the thematic analysis of qualitative data for this study was coded only by the primary researcher. Analyses did not include a secondary coder, which would have provided stronger evidence for the identified themes extracted from the qualitative data.

This study was comprised of a small sample size that lacked cultural diversity, which limits the generalizability of the findings. A post hoc power analysis was conducted to determine the sample size required to detect a meaningful effect of the NBI on children's connectedness to nature and wellbeing. Findings indicated the adequate sample size to achieve 80% power at a 0.05 significance level and a medium effect was

68 total participants or 34 pairs. The sample size of the present study was underpowered, which influenced the choice of statistical analyses used, as well as the confidence with which conclusions could be drawn from the results. This limitation is a common occurrence in the literature. School administrators may be hesitant to allow the implementation of NBIs during the school day as connectedness to nature may not be perceived as a valuable addition to the classroom due to curricular pressure, tight schedules, and a lack of resources (Marchant et al., 2019; Moffett, 2017). As a result, nature research in school settings is often limited in the number of participants researchers are able to recruit. For this particular study, participants were recruited from a small sample of school-aged children whose parents enrolled them in the district's summer school program. Despite the underpowered sample size, results from this study suggested positive student outcomes regarding students' connectedness to nature.

In addition to the small sample size, the 10 participants who completed the study represent a limited range of cultural identities. All students enrolled in the study were White and identified as cisgender. Further, these students live in rural community that is surrounded by rivers, trees, and open green space. Results from this study do not represent the experience of students of color or students who live in urban settings that may have limited access to nature spaces. The NBI was also implemented in outdoor settings within a summer school program, which does not reflect an academic school schedule with full class sizes and curricular pressures. Although the present study aims to promote the implementation of similar NBI activities during the school day, these findings do not fully represent the effects of the NBI activities on children's connectedness to nature or wellbeing in the classroom setting.

Lastly, the results of this study evidenced statistically significant findings regarding the impact of the NBI on children's connectedness to nature; however, these findings may not be interpreted as practically meaningful, due to small effect sizes. Despite these small effect sizes, children in the intervention group largely expressed experiencing a greater connection to nature following their participation in the NBI, as indicated in their interview responses. Moreover, all children enrolled in the study demonstrated a strong sense of connectedness to nature at the start of the intervention. Perhaps this strong baseline connection with nature is due to participants having ample opportunities to access and interact with nature within their rural community. These students may also come from families who have already developed a strong affinity for the natural world. Regardless, children in the intervention group demonstrated a significant increase in their connectedness to nature despite reporting high CNI scores before participating in the NBI.

Recommendations for Future Research

Findings from the current study demonstrate promising evidence regarding positive student outcomes associated with participation in the NBI; however, these findings lend suggestions for future research on strengthening children's connectedness to nature in school settings. One recommendation involves assessing the effectiveness of NBI activities that are adapted for indoor implementation. All NBI activities were implemented outdoors (e.g., playground, grassy patches) during the summer school session; however, this may not be practical for educators during the academic school year. Future research may explore NBI adaptations for indoor settings such as using media in the classroom to access sights and sounds in nature. For example, facilitators

may adapt Lesson 1 by showing children a guided meditation video in the classroom that includes nature sounds (e.g., bird chirping, wind blowing) and views of nature scenes. Another example is to bring elements of nature into the classroom for the NBI activities. For Lesson 6, the facilitator can bring a collection of rocks or pinecones indoors for students to feel and experience. Taken together, future research should investigate the effects of indoor nature activities on children's connectedness to nature, as these adaptations may be critical for the implementation of such activities in school settings that have limited green space or strict time constraints throughout the school year.

Future research may also consider adapting specific lesson activities to address students' unique differences across cultures and backgrounds. Although the NBI activities broadly promote children's enjoyment in and with nature, cultural adaptations can enhance the applicability of the NBI to a more diverse target audience. For example, students who live in urban areas may have a difficult time finding a physical scene in nature to "frame" in Lesson 3; however, these lessons can be adapted for children to draw scenes in nature from memory or find a photo online. Further, lesson activities that involve writing utensils may not be accessible to students with physical limitations. Students may be encouraged to explore and connect with nature through different art mediums, such as finger painting or sculpting with clay. Another example of incorporating cultural adaptations in future research can be to develop environmental scenarios (Lesson 5) that draw on social justice initiatives such as having students role-play advocating for clean air quality in low-income neighborhoods.

In addition to exploring the effects of NBI adaptations, another recommendation for future research is to integrate the NBI lessons and activities into the academic school

schedule. Although findings from the summer school implementation suggest positive student outcomes in school settings, replicating study procedures during the academic school year will paint a more accurate picture of the effectiveness of the NBI in classroom settings. In this scenario, educators may facilitate the NBI activities with students as this would be a more accurate representation of a school-based NBI than having an outside facilitator come into the school. Additionally, future research should solicit teacher input regarding the acceptability of the NBI as educators can provide critical insight into the feasibility of the NBI in schools (e.g., simplicity of lessons, frequency of lessons throughout the week) and how to effectively integrate the activities within their classroom.

Although the present study only assessed participants' level of connectedness to nature and overall wellbeing, existing research in the field supports the impact of NBIs on social skills development, positive peer interactions, and student learning behaviors (e.g., motivation to learn, attitude toward learning; Burgess & Ernst, 2020). Future research may explore the impact of the current NBI on additional student outcomes (e.g., motivation, concentration, prosocial behaviors). School administrators and educators may be more inclined to integrate NBI activities into the academic school day should the activities positively impact student outcomes that directly relate to academic success. Connectedness to nature in children is associated with several positive academic outcomes, including enhanced attention, memory, and academic achievement (McCormick, 2017; Ohly et al., 2016); however, it may be beneficial to directly measure these outcomes in children following their engagement in the NBI activities.

Lastly, future research may explore the maintenance of the NBI effects on children's connectedness to nature. Research in the field of nature and children is limited in regard to understanding the effect of children's participation in NBIs on their relationship with nature over time. Similar to findings in existing literature (Harvey et al., 2020; Piccininni et al., 2018), the present research supports the positive impact of short nature activities on children's connectedness to nature. Future research may prioritize addressing this gap in the literature by measuring children's connectedness to nature and wellbeing several weeks after their participation in the NBI. These findings may better inform our understanding of effective dosages and duration of similar NBI activities in school settings, especially in terms of understanding meaningful effects on student outcomes.

Implications for Educators

Overall, findings from the current study raise the importance of integrating nature within school settings. Schools provide an ideal environment to create opportunities for children to engage with nature as these institutions can reach children who otherwise may not have access to nature, including students who live in urban settings, have parents who do not value connectedness to nature, or do not have the resources to interact with nature. Student responses to the interview questions support student acceptability of the NBI activities, including their shared excitement about having opportunities to connect with nature during the school day. Across rural and urban settings, students identify nature and the outdoors as their favorite parts of learning (Streelasky, 2017). Educators may help contribute to their students' enjoyment of school and education by implementing simple

NBI activities into their classroom and creating opportunities for students to experience nature through mindfulness, art, and their senses.

Students' participation in the NBI enhanced their connectedness to nature despite participants already having a strong relationship with nature. These findings evidence the effectiveness of school-based NBIs in strengthening the relationship between children and the natural world. Although participants in this study did not indicate enhanced feelings of wellbeing following the NBI, their participation in the NBI activities contributed to the maintenance of strong ratings of wellbeing. Connectedness to nature and emotional wellbeing both support positive student outcomes that relate to academic success, including prosocial behaviors, stress management, self-discipline, and cognitive restoration (Bolling et al., 2019; McCormick, 2017; Ohly et al., 2016). Educators may consider implementing simple, nature activities into their classroom to promote students' connection with nature and all of the benefits that come from a healthy child-nature relationship. Taken together, schools can provide an accessible and equitable space to reach various populations of students and provide opportunities to connect with nature. It is hoped that the results of this study encourage educators to introduce similar NBI activities to their students, especially those who may be lacking these important nature opportunities outside of their school day.

Conclusion

Findings from this piloted research study support the implementation of simple NBI activities in the school setting. Children who had the opportunity to engage with nature during a two-week intervention period reported a greater sense of connection with the natural world. Although students did not indicate enhanced wellbeing as a result of

their participation in the NBI, they endorsed high levels of wellbeing across the intervention period. This supports the potential of NBI activities in maintaining strong feelings of student wellbeing at school. Student interviews revealed evaluative insight regarding children's enjoyment of the NBI activities, the perceived impact of the NBI on their affective experiences and connection with nature, and potential barriers to intervention implementation. These preliminary findings offer a possibility for schools to encourage students' engagement with nature in the classroom to help promote their relationship with nature and tap into the benefits that come with having a healthy connection with the natural world.

Appendix A: Study Description Email

Dear Parent or Guardian,

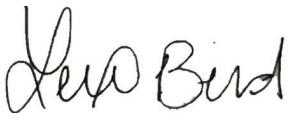
Hello! My name is Lexi Bird, and I am pursuing a doctoral degree in School Psychology at the University of Kentucky. I am currently collecting data for my dissertation topic related to children's relationship with nature, and I am looking forward to conducting my research through the summer school program offered at Wauzeka-Steuben School. As your child is attending summer school, I would like to know if you would be interested in allowing your child to participate in my study. I have included more information about this research below, including a link to a consent form to confirm your decision. If you do not wish to have your child participate in this study, he/she will simply participate in their summer school activities as scheduled. The tasks involved in this study will only be completed by children with consent to participate.

My research will explore how simple, nature-based activities in the school setting may increase children's sense of connection with nature, as well as their overall wellbeing. The goal of this study is to better understand the importance of providing children with opportunities to engage with nature, to encourage child-nature relationships and to promote the many benefits of experiencing nature. This research involves short, nature-based activities in addition to regularly scheduled summer school activities. Specifically, your child may be asked to engage in activities such as journaling about nature or experiencing nature through their senses. Your child will also be asked to complete two short surveys about their relationship with nature and how happy they feel. Your child may also be asked interview questions about their thoughts on the nature activities. I will examine how children's connectedness with nature and their overall wellbeing changes during their time in summer school, and how these factors are further influenced by nature-based activities.

I would very much appreciate your child's participation in this study. The link provided below will take you to a consent form that includes additional information about my research. Please let me know if you have any questions (email: arbi233@uky.edu). Thank you!

https://uky.az1.qualtrics.com/jfe/form/SV_1NfoIGtIjd3ULB4

Sincerely,



Lexi Bird, MS

Appendix B: Informed Consent Form

BUILDING CHILDREN'S CONNECTION TO NATURE IN THE SCHOOLS

We are asking you to choose whether or not to allow your child to volunteer for a research study about strengthening school-age children's connection to nature. We are asking you because your child is between the ages of 9-12 years old and attending summer school classes. This page is to give you key information to help you decide whether to participate. We have included detailed information after this page. Ask the research team if you have questions. If you have questions later, the contact information for the research investigator in charge of the study is below.

WHAT IS THE STUDY ABOUT AND HOW LONG WILL IT LAST?

Evidence shows that there are several positive benefits of spending time in nature and feeling connected to nature (e.g., enhanced wellbeing, lower stress). Childhood is a critical period to build this connection to nature, as children have more open perspectives about the world around them. This study will introduce several nature-based activities to students (e.g., drawing, journaling, mindfulness) as a means to build this sense of connection with the natural world.

By doing this study, we hope to learn if short, nature-based interventions in the school setting will effectively strengthen children's connection with nature, as well as their overall wellbeing. Your child's participation in this research will last a total of two weeks during the summer school program.

WHAT ARE KEY REASONS YOU MIGHT CHOOSE TO ALLOW YOUR CHILD TO VOLUNTEER FOR THIS STUDY?

You might choose to allow your child to volunteer for this study because there are many benefits that children can access through engaging with nature, such as decreased stress and enhanced overall wellbeing. Your willingness to take part in this study will help others understand effective pathways to promote the relationship between school-age children and nature, as this relationship has been observed to decline in modern times. For a complete description of benefits and/or rewards, refer to the Detailed Consent.

WHAT ARE KEY REASONS YOU MIGHT CHOOSE NOT TO ALLOW YOUR CHILD TO VOLUNTEER FOR THIS STUDY?

To the best of our knowledge, there will be no significant risks or discomforts in this study beyond what your child would typically experience in everyday life. For a complete description of risks, refer to the Detailed Consent.

DOES YOUR CHILD HAVE TO TAKE PART IN THE STUDY?

If you decide to allow your child to take part in the study, it should be because you really want to allow them to volunteer. You will not lose any services, benefits, or rights you would normally have if you choose not to allow them to volunteer.

As a student, if your child decides not to take part in this study, their choice will have no effect on their experience or participation in summer school activities.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS OR CONCERNS?

If you have questions, suggestions, or concerns regarding this study or you want to withdraw from the study contact Lexi Bird or Kathleen Aspiranti of the University of Kentucky, Department of Educational, School, and Counseling Psychology at arbi233@uky.edu or 859-257-6697.

If you have any concerns or questions about your rights as a volunteer in this research, contact staff in the University of Kentucky (UK) Office of Research Integrity (ORI) between the business hours of 8am and 5pm EST, Monday-Friday at 859-257-9428 or toll free at 1-866-400-9428.

DETAILED CONSENT:

ARE THERE REASONS WHY YOUR CHILD WOULD NOT QUALIFY FOR THIS STUDY?

There are no reasons why your child would not qualify for this study unless they are not between the ages of 9-12 years old and not attending summer school classes at Wauzeka-Steuben School.

WHERE WILL THE STUDY TAKE PLACE AND WHAT IS THE TOTAL AMOUNT OF TIME INVOLVED?

The research procedures will be conducted at your child's school in Wauzeka, WI during summer school sessions. The research procedures will be conducted in your child's summer school classroom or outside on the school playground. Your child's summer school teacher will be present throughout the intervention. Your child will be assigned to the intervention group or the no intervention group, based on the summer school class they are attending. For example, all children in class A will complete intervention activities, and all children in class B will not complete the activities. If your child is assigned to the intervention group, they will do the intervention activities for about 15-20 minutes a day for two weeks. All students enrolled in the study will complete 2 surveys at both the beginning and end of the two weeks, which will take 5-10 minutes each time. Lastly, students assigned to the intervention group will participate in a semi-structured group interview, asking about their experience throughout the intervention. This will take about 10 minutes.

WHAT WILL YOUR CHILD BE ASKED TO DO?

Your child will be asked to complete two short surveys at the beginning of the summer school session. These surveys will ask questions about their thoughts about nature as well as how they are feeling. Over the course of two weeks, your child may participate in 8 sessions of 15-20 minute, nature-based activities if they are assigned to the intervention group. These activities include experiencing sights and sounds of nature, drawing or journaling about nature, role playing nature-based scenes, etc. Children assigned to the intervention group will participate in these nature-based activities in addition to regularly scheduled summer school activities. Children assigned to the no intervention group will only participate in the regularly scheduled summer school activities and complete the surveys. At the end of the two weeks, your child will complete the same two surveys they did at the beginning of the intervention. If your child participated in the nature-based activities, they will be asked to engage in a group student interview and asked questions about how they liked the intervention. This interview will take about 10 minutes and will not be recorded. The primary researcher, Lexi Bird, will lead the nature-based activities and gather survey data from your child. As a parent, you will be asked basic demographic information about your child, including their age, race/ethnicity, and gender. This information will be used to compare potential group differences in children's relationship with nature. No information from the student school records will be viewed or recorded.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

To the best of our knowledge, there will be no risks or discomforts in this study beyond what your child would typically experience as part of the summer school program.

WILL YOUR CHILD BENEFIT FROM TAKING PART IN THIS STUDY?

We do not know if your child will get any benefit from taking part in this study. However, your child may experience a greater sense of connection with nature. Additionally, your child may experience enhanced overall wellbeing as a result of participating in this study. Your willingness to take part will help others understand how to strengthen children's relationship with the natural world.

IF YOU DON'T WANT TO TAKE PART IN THE STUDY, ARE THERE OTHER CHOICES?

If you do not want to be in the study, there are no other choices except not to take part in the study.

WHAT WILL IT COST YOU TO PARTICIPATE?

There are no costs associated with taking part in this study.

WHO WILL SEE THE INFORMATION THAT YOU GIVE?

When we write about or share the results from the study, we will write about the combined information. Your child will not be personally identified in the written materials. We will keep your name, your child's name, and other identifying information private.

We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. A number will be used to identify your child. During the study, all information will be kept either in a locked cabinet at the researcher's office or in a password-protected electronic database. We will keep private all research records that identify your child to the extent allowed by law.

You should know that in some cases we may have to show your information to other people. For example, the law may require us to share your information with:

- Authorities, such as child or adult protective services, if you or your child report information about a child being abused; if you or your child pose a danger to yourself or others; and/or
- To ensure the study is conducted properly, officials at the University of Kentucky may look at or copy pertinent portions of records that identify your child.

We will make every effort to safeguard your data, but as with anything online, we cannot guarantee the security of data obtained via the Internet. Third-party applications used in this study may have Terms of Service and Privacy policies outside of the control of the University of Kentucky.

CAN YOUR CHILD CHOOSE TO WITHDRAW FROM THE STUDY EARLY?

Your child can choose to leave the study at any time. They will not be treated differently if they decide to stop participating in the study. If your child chooses to leave the study early, data collected until that point will remain in the study database and may not be removed.

WILL YOUR CHILD RECEIVE ANY REWARDS FOR TAKING PART IN THIS STUDY?

Your child will not receive any rewards or payment for taking part in the study.

WILL YOU BE GIVEN INDIVIDUAL RESULTS FROM THE RESEARCH TESTS/SURVEYS?

If you request feedback on your child's study experience by contacting the primary researcher, we can provide you information on how your child did.

WHAT ELSE DO YOU NEED TO KNOW?

Lexi Bird, the primary researcher, is a graduate student at the University of Kentucky. She is being guided in this research by Kathleen Aspiranti, PhD. There may be other people on the research team assisting with data analysis, etc. at different times during the study.

WILL YOUR INFORMATION BE USED FOR FUTURE RESEARCH?

Your information collected for this study will NOT be used or shared for future research studies, even if we remove the identifiable information like your child's name.

INFORMED CONSENT SIGNATURES

This consent includes the following:

- Key Information Page
- Detailed Consent

You are the research volunteer or are authorized to act on behalf of the research volunteer. You will receive a copy of this consent form after it has been signed.

_____ _____

Signature of Parent or Guardian, Date

_____ _____

Printed name of Parent or Guardian Relationship to Child

_____

Printed name of Child

Appendix C: Child Assent Form

Building Children's Connection to Nature in the Schools

You are invited to be in a research study being done by Lexi Bird from the University of Kentucky. You are invited because you are a young student coming to summer school.

If you agree to be in the study, you will be asked to take a couple short surveys and you may or may not do a few extra activities at summer school. These activities include drawing, journaling, practicing listening to nature, and using your imagination for about 15-20 minutes each day for two weeks here at summer school. If you do these activities, you will be asked one or two questions about the activity each day. You will take two short surveys that will take 5-10 minutes before and after two weeks of summer school. You may or may not also complete a group interview with your peers after the two weeks of summer school. This group interview will take about 10 minutes.

There is no payment for being in this study.

Your family will know that you are in the study. If anyone else is given information about you, they will not know your name. A number or initials will be used instead of your name.

If something makes you feel bad while you are in the study, please tell your teacher or Lexi Bird. You can also tell your parent if something makes you upset. If you decide at any time you do not want to finish the study, you may stop whenever you want.

You can ask Lexi Bird questions any time about anything in this study. You can also ask your parent any questions you might have about this study.

By verbally saying yes, you are agreeing that you want to be in the study. If you do not want to be in the study, do not say yes. Being in the study is up to you, and no one will be mad if you do not say yes or even if you change your mind later. You agree that you have been told about this study and why it is being done and what to do.

_____ _____

Name of Person Agreeing to be in the Study Date

_____ _____

Name of Authorized Person Obtaining Informed Assent Date

Appendix D: Student Demographics Questions

What is your child's name?

How old is your child?

- 9 years
- 10 years
- 11 years
- 12 years

Which of the following best represents your child's racial or ethnic heritage? (Please select all that apply):

- American Indian or Alaska Native
- Asian
- Black or African American
- Hispanic or Latinx
- Native Hawaiian or Other Pacific Islander
- White
- Other:

What gender does your child identify as?

- Male
- Female
- Non-Binary
- Other:

Appendix E: Participant Attendance Chart

	Name	Pre-CNI	Pre-Wellbeing	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8	Post-CNI	Post-Wellbeing
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

Appendix F: NBI Session Outline

Session	CNI Factors (Cheng & Monroe, 2012)	Learning Outcomes ("students will be able to")	Learning/Assessment Activities ("the activities that will help them to meet these learning outcomes")
1	Sense of oneness	Students will recognize how nature impacts their senses (e.g., touch, sight, sound, smell, taste)	Mindfulness: students will engage in a mindfulness activity that encourages them to experience nature through their senses; discussion about their different experiences of nature through various senses
2	Empathy for creatures	Students will take the perspective of nature (e.g., plants, animals)	Journaling: students sit outside; students are prompted to make up a short story of a day in the life of a creature, plant, etc.
3	Enjoyment of nature	Students will identify positive emotions they experience through engaging with nature	Picture framing (arocha.ca): students create a picture frame out of paper and are prompted to "frame" a nature scene that makes them feel good/happy; discussion for students to share their "picture"
4	Sense of oneness	Students will recognize that humans are a part of the natural world	Sensory map (arocha.ca): students sit out in nature; students are prompted to draw an "x" on their paper to show where they are; students will draw pictures and symbols of what is around them on their map, based on what they sense around them
5	Sense of responsibility	Students will understand how one's behaviors affect the natural world	Freeze improve (arocha.ca): 3 students volunteer to act out an animal scene or environmental issue (using pest poison in garden, company is bulldozing a forest with beautiful scenery and animals); students in the audience can call out "Freeze!" and jump in to change the scenario based on one they thought of
6	Enjoyment of nature	Students will regulate their thoughts and feelings through contact with nature	Mindfulness: students will engage in a mindfulness activity incorporating elements of nature; discussion about how the activity impacted students' thoughts/feelings (calm, happy, etc.)
7	Sense of responsibility	Students will make decisions that promote the well-being of nature	Build an animal habitat: students will use elements of nature to create a habitat for a common creature in their area (e.g., squirrel, bird next, worm)
8	Empathy for creatures	Students will demonstrate empathy and compassion toward nature	Journaling: students sit outside and observe a scene in nature; students are prompted to write or draw a picture pretending to be a plant or creature in nature; prompted to write about how the creature feels in various situations

Lesson 1: Nature Through the Senses

LESSON OBJECTIVE:

- Students will recognize how nature impacts their senses (e.g., touch, sight, sound, smell, taste).

MATERIALS NEEDED:

- Access to outdoors and/or elements of nature

CONNECTION TO NATURE:

- Sense of Oneness

STRUCTURE/ACTIVITIES: (Time required: 10-15 minutes)

- Have students sit upright outdoors, without touching their neighbor.
- Tell students that they will be imagining what it's like to be different parts of nature. Say:

  "When we go outside, we can see and feel so many wonderful things. Things like trees, and the wind, and the clouds, and the sun. In many ways we are like these beautiful parts of nature, and for this exercise we'll be like the tree and the wind and the sun.

  So let's lower or close our eyes and sit tall like a tree. We extend our hands way out and stretch our fingers, like branches and leaves. Let's squeeze our fingers together and then let go and feel them wiggle, like they are blowing in the wind.

  And now, with the wind blowing, let's be like the wind and take two big, slow breaths. Breathing in... and breathing out, blowing out the wind. Breathing in... and breathing out, blowing out the wind.

STRUCTURE/ACTIVITIES CONTINUED:

And now the sun comes out and warms the tree and the wind. As it shines on the tree, we feel our body. Can you feel your fingers and feel your toes? What else can you feel—just by noticing?

As the sun shines on the wind, we feel our body breathing. Can you feel your belly moving up and down? Can you feel the air flowing in and out of your beautiful body?

And with the sun up high in the sky, brightening and warming the whole world, you too can warm the world—with your kindness. Think of someone who can use a little kindness—like your sister or brother, or a friend, or your teacher. And as you think of them, wish for them, 'May you be happy,' imagining them smiling like the sun.

You deserve happiness too. So now wish for yourself, 'May I be happy,' and smile like the sun. And as you smile like the sun, feel your body sitting tall like a tree and feel your breath blowing like the wind. And then gently open your eyes and look around. You are amazing!"

- Encourage students to think about and discuss the reflection questions about the activity.

REFLECTION:

- What were some things in nature your body noticed through your senses (sight, touch, sound, smell, taste)?
- How does your body feel after completing today's nature activity?

RESOURCES:

- Rogers, S. (2017). *Be like nature: Mindfulness for young children*. Greater Good in Education. https://ggie.berkeley.edu/practice/be-like-nature-mindfulness-for-young-children/#tab__2

Lesson 2: Taking Nature's Perspective

LESSON OBJECTIVE:

- Students will take the perspective of nature (e.g., plants, animals).

MATERIALS NEEDED:

- Notebook or paper
- Writing utensils (markers, crayons, pencils, etc.)

CONNECTION TO NATURE:

- Empathy for creatures

STRUCTURE/ACTIVITIES: (Time required: 10-15 minutes)

- Have students sit outdoors and provide paper and writing utensils.
- Tell the students that they will be imagining a moment in the life of a plant or animal. Say:

  Think of a plant or animal that you would like to be for a day. This could be a deer, bird, butterfly, sunflower, or any plant or animal you can think of. Does everyone have a plant or animal in mind? Pretend you are the plant or animal and draw a scene or write a story that tells about your day. As you're working, imagine what your plant or animals is thinking and feeling.

- When all students finish, encourage students to share their picture or story with the group. Discuss the activity reflection questions.

REFLECTIONS:

- Share your story or picture with the group.
- What was the plant or animal in your story or picture thinking? What were they feeling?

Lesson 3: Positive Feelings in Nature

LESSON OBJECTIVE:

- Students will identify positive emotions that they experience through engaging with nature.

MATERIALS NEEDED:

- Paper cut out as a frame
- Markers, crayons, and/or colored pencils

CONNECTION TO NATURE:

- Enjoyment of nature

STRUCTURE/ACTIVITIES: (Time required: 10 minutes)

- Have students sit outdoors and provide the paper picture frame and coloring utensils.
- Tell the students that they will be "framing" a scene in nature that makes them feel good or happy. Students can color and decorate their picture frame. Say:
  Hold up your picture frame and look through the frame. Move your picture frame around until you "frame" a nature scene that makes you feel good. You might feel happy or calm or excited. You may want to "frame" a couple different nature scenes that make you feel good.
- Encourage students to describe their nature scene to the group. Discuss the activity reflection question.

REFLECTIONS:

- Tell us about the nature scene that you framed. What pieces of nature (e.g., trees, the sky, grass) made you feel good or happy?

REFLECTIONS:

- Rocha, A. (n.d.). *Simple nature activities for kids.* Good Seed Sunday. https://arocha.ca/wp-content/uploads/2017/03/cp_simple-nature-activities.pdf

Lesson 4: Humans in the Natural World

LESSON OBJECTIVE:

- Students will recognize that humans are a part of the natural world.

MATERIALS NEEDED:

- Paper or notebook
- Pencils, colored pencils, markers, etc.

CONNECTION TO NATURE:

- Sense of oneness

STRUCTURE/ACTIVITIES: (Time required: 10 minutes)

- Have students sit outdoors and provide the paper and writing utensils.
- Tell the students that they will be exploring and drawing nature through their senses. Say:

  Spread out and find a spot to sit in the grass. Mark an "X" on your paper. That "X" represents where you are on your map. Use your senses to locate the parts of nature that are around you. What do you see? Feel? Smell? Touch? Make up pictures, symbols, and words for all of the things you sense around you.
- Tell students that they are apart of nature like the symbols on their maps.
- Encourage students to share their experience of the nature around them through their senses. Discuss the activity reflection question.

REFLECTIONS:

- Tell us about the different parts of nature that you drew on your map. What senses did you use to locate these parts of nature?

REFLECTIONS:

- Rocha, A. (n.d.). *Simple nature activities for kids.* Good Seed Sunday. https://arocha.ca/wp-content/uploads/2017/03/cp_simple-nature-activities.pdf

Lesson 5: My Behaviors Affect Nature

LESSON OBJECTIVE:

- Students will understand how one's behaviors affect the natural world.

MATERIALS NEEDED:

- Slips of paper with written environmental scenarios

CONNECTION TO NATURE:

- Sense of responsibility

STRUCTURE/ACTIVITIES: (Time required: 10 minutes)

- Split students into groups of 3 or 4. Tell the students that they will be acting out an environmental problem and solution. Say:
  Each group will pick a piece of paper at random, which has an environmental problem written on it. Your group will work together to think of a solution to the problem. After you come up with a solution, your group will act out how you decided to solve your environmental problem.
- Give the students 5-10 minutes to think of their solution and plan how they will act out the scenario. Have each group perform their environmental problem and solution act.
- Discuss the activity reflection question with students.

REFLECTIONS:

- How did human behaviors and actions affect nature in your scenario, both positively and negatively?

Lesson 6: Mindful Thinking in Nature

LESSON OBJECTIVE:

- Students will regulate their thoughts and utilize critical thinking skills through contact with nature.

MATERIALS NEEDED:

- Access to outdoors
- Rocks, pine cones, etc. of different shapes/sizes

CONNECTION TO NATURE:

- Enjoyment of nature

STRUCTURE/ACTIVITIES: (Time required: 10-15 minutes)

- Have students sit in a circle outdoors, within reach of one another.
- Tell the students that they will be only using their sense of touch to explore pieces of nature. Instruct students to close their eyes and move their hands behind their backs and hand them a rock/pine cone/etc. Say:

  I'm handing each of you a (rock/pine cone/etc.). Take a couple minutes to get to know your (rock/pine cone/etc.) by feeling. Pay attention to its size, bumps, holes. Is it smooth? Rough?
- After a few moments, collect the (rocks/pine cones/etc.) Pass them out again randomly and instruct students to pass the rocks around behind their back until they find their rock.
- Discuss the activity reflection questions with students.

REFLECTIONS:

- What was difficult about this activity?
- What did you find to be most helpful for you in finding your (rock/pine cone/etc.)?

REFLECTIONS:

- Rocha, A. (n.d.). *Simple nature activities for kids.* Good Seed Sunday. https://arocha.ca/wp-content/uploads/2017/03/cp_simple-nature-activities.pdf

Lesson 7: Responsible Decision-Making

LESSON OBJECTIVE:

- Students will make decisions that promote the well-being of nature.

MATERIALS NEEDED:

- Access to a green space with twigs, rocks, leaves, etc.

CONNECTION TO NATURE:

- Sense of responsibility

STRUCTURE/ACTIVITIES: (Time required: 10-15 minutes)

- Tell the students that they will be building a habitat for an animal that lives in that environment. Say:

  Find a partner or group of 3 to build an animal habitat together. Think of an animal that lives in this area. A squirrel, bird, worm, rabbit. You can use only materials in nature to build your habitat. Work together to find twigs, rocks, leaves, dandelions to use for your habitat. You will have about 5 minutes to build a habitat for your animal.
- Give the students 5 minutes to build the habitats. Encourage students to show their creations to their peers.
- Discuss the activity reflection question.

REFLECTIONS:

- Tell us about the animal habitat your group built. Why did you choose the structure or materials of the habitat for that particular animal?

Lesson 8: Empathizing with Nature

LESSON OBJECTIVE:

- Students will demonstrate empathy and compassion toward nature.

MATERIALS NEEDED:

- Notebooks/paper
- Writing utensils (e.g., pencils, markers, crayons)

CONNECTION TO NATURE:

- Empathy for creatures

STRUCTURE/ACTIVITIES: (Time required: 10-15 minutes)

- Have students sit outdoors and provide paper and writing utensils.
- Tell the students that they will be pretending what it's like to be a plant or animal in their environment. Say:

  Look around and find a piece of nature that you would like to pretend to be for a few moments. You might see a dandelion, a bird, an insect. When you find your plant or animal, take a couple minutes to think about what it might be thinking or feeling. For example, a flower in the sunlight might be feeling happy. You can also find a few different plants or animals that you want to pretend to be. You can write down or draw what your plant or animal is feeling or just think about it.

- When all students finish, discuss the activity reflection question.

REFLECTIONS:

- Share your thoughts or drawings with the group. What do you think your plant or animal was feeling? What made you think it was feeling that way?

Appendix H: Connection to Nature Index

In front of you is a list of statements that I am going to read to you one-by-one. For each statement, I would like for you to mark the choice that describes how much you agree or disagree with each statement. Marking in the "1" category (strongly disagree) means you do not agree with the sentence at all. Marking in the "3" category (Unsure) means you don't know if you agree or disagree with the sentence. Marking in the "5" category means you completely agree with the sentence.

Do you have any questions? Feel free to ask me any questions you have throughout the survey.

I like to hear different sounds in nature.	1	2	3	4	5
I like to see wild flowers in nature.	1	2	3	4	5
When I feel sad, I like to go outside and enjoy nature.	1	2	3	4	5
Being in the natural environment makes me feel peaceful.	1	2	3	4	5
I like to garden.	1	2	3	4	5
Collecting rocks and shells is fun.	1	2	3	4	5
Being outdoors makes me happy.	1	2	3	4	5
I feel sad when wild animals are hurt.	1	2	3	4	5
I like to see wild animals living in a clean environment.	1	2	3	4	5
I enjoy touching animals and plants.	1	2	3	4	5
Taking care of animals is important to me.	1	2	3	4	5
Humans are part of the natural world.	1	2	3	4	5
People cannot live without plants and animals.	1	2	3	4	5
My actions will make the natural world different.	1	2	3	4	5
Picking up trash on the ground can help the environment.	1	2	3	4	5
People do not have the right to change the natural environment.	1	2	3	4	5

Appendix I: Wellbeing Check Card

In front of you is a list of statements that I am going to read to you one-by-one. For each statement, I would like for you to mark the choice that describes how you have been feeling over the last 2 weeks. I want you to mark if you felt that way *none of the time, rarely, some of the time, often,* or *all of the time.* Do you have any questions? Feel free to ask me any questions you have throughout the survey.

I have things to look forward to.	None of the time	Rarely	Some of the time	Often	All of the time
I've been helping other people.	None of the time	Rarely	Some of the time	Often	All of the time
I feel relaxed.	None of the time	Rarely	Some of the time	Often	All of the time
If I have problems, I know what to do about them.	None of the time	Rarely	Some of the time	Often	All of the time
I find it easy to pay attention.	None of the time	Rarely	Some of the time	Often	All of the time
I feel like I have friends.	None of the time	Rarely	Some of the time	Often	All of the time
I've been able to make my own choices.	None of the time	Rarely	Some of the time	Often	All of the time

Appendix J: Structured Interview Questions

1. What were some of your favorite parts of the nature activities you got to do?

2. Were there any nature activities that you did not like or would like to change?

3. Do you feel closer to nature after doing all of the nature activities? How do you know that you do or do not feel closer to nature?

4. How do you feel after spending time outside or in nature?

5. What are your thoughts about doing some of these nature activities during the school year?

Appendix K: Fidelity Checklist

Task	Yes	No	Comments
Interventionist had all materials needed for activity			
Interventionist introduced activity according to lesson plan			
Interventionist led children through activity, making an effort to maintain child engagement			
Interventionist asked children reflection questions listed on the lesson plan and facilitated a discussion			

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Yoon, E. (2023). Marginalized children's views of school choice in global cities: The significance of neighbourhood and nature. *Journal of Childhood Studies, 48*(3), 48-64.

VITA

ALEXIS ROSE BIRD

EDUCATION

December 2020	**Master of Science in Education** *University of Kentucky;* Lexington, KY
May 2019	**Bachelor of Science in Psychology** *Viterbo University;* La Crosse, WI

CLINICAL EXPERIENCE

July 2023- June 2024	**Deer Valley Unified School District;** Phoenix, AZ Inspiration Mountain School *School Psychology Intern* (Supervised Doctoral Training)
August 2022- May 2023	**Jessamine County Public Schools;** Nicholasville, KY Jessamine Early Learning Village *School Psychology Intern* (Supervised Doctoral Training)
August 2021- July 2022	**University of Kentucky Healthcare;** Lexington, KY Adolescent Medicine—Department of Pediatrics *School Psychology Practicum Student* (Supervised Doctoral Training)
September 2020- May 2021	**Jessamine County Public Schools;** Nicholasville, KY Rosenwald-Dunbar Elementary/West Jessamine Middle *School Psychology Practicum Student* (Supervised Doctoral Training)
September 2019- December 2019	**Fayette County Public Schools;** Lexington, KY Tates Creek High School *School Psychology Practicum Student* (Supervised Doctoral Training)

CONFERENCE PRESENTATIONS

Allen, M., Yee, M., Tomas Flores, L., Graham, L., Woods, I. L., & **Bird, A**. (2023, February 7-10). *SWPBIS: How are culturally diverse students presented in*

research? [Conference poster]. National Association of School Psychologists, Denver, CO, United States.

Bird, A. (2022, April 2). *Bringing nature into schools: A meta-analysis of interventions.* [Conference poster]. 2022 Spring Research Conference, University of Kentucky, Lexington, KY, United States.

Tomas Flores, L., Yee, M., Woods, I. L., & **Bird, A.** (2022, February 15-19). *Funding school-based services during a pandemic.* [Conference poster]. National Association of School Psychologists, Boston, MA, Unites States.

Tomas Flores, L., **Bird, A.,** Yee, M., & Woods, I. L. (2021, August 12-15). *Identifying social justice within professional associations through print and digital media.* [Conference poster]. American Psychological Association Conference (virtual).

Bird, L. & Ware, E. A. (2019, April 11-13). *The role of empathy in strengthening children's connection with nature* [Poster presentation]. National Council on Undergraduate Research, Kennesaw, GA, United States.

RESEARCH EXPERIENCE

August 2020- June 2022	**Research Assistant,** University of Kentucky Psychoeducational, Evaluation, Assessment, and Cultural Equity (PEACE) Lab
October 2020- December 2020	**Research Assistant,** University of Kentucky Bridging Research Efforts and Advocacy Toward Healthy Environments (BREATHE) Lab
June 2018- May 2019	**Research Assistant,** Viterbo University Advanced Research Program

TEACHING EXPERIENCE

January 2020- May 2020	**Teaching Assistant,** University of Kentucky Psychology Department—Experimental Psychology
August 2020- December 2020	**Teaching Assistant,** University of Kentucky Psychology Department—Developmental Psychology

PROFESSIONAL DEVELOPMENT

Behavior Solutions MTSS Training (November 2023)
Deer Valley Unified School District, Phoenix, AZ

Safe Crisis Management Training (September 2022)
Jessamine County Public Schools, Nicholasville, KY

Autism Diagnostic Observation Schedule (ADOS-2) Training (May 2021)
Kentucky Autism Training Center (Virtual)

NASP PREPaRE Workshop (3rd Ed.) (February 2021)
Kentucky Association for Psychology in Schools (Virtual)

Ally Development Training (October 2020)
University of Kentucky, Lexington, KY

PROFESSIONAL AFFILIATIONS

National Association of School Psychologists
Student Member (October 2021 – Present)

Kentucky Association for Psychology in the Schools
Student Member (September 2020 – May 2023)

Student Affiliates in School Psychology
Student Member (August 2019 – May 2022), University of Kentucky
Doctoral President (June 2020 – May 2021), University of Kentucky

International Honor Society in Psychology (Psi Chi)
Student Member (August 2018 – May 2019), Viterbo University