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## **Creating Outdoor Learning Opportunities For Neurodiverse Students: An Outdoor Learning Curriculum for Neurodiverse Students**

Erin Barnes

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Creating Outdoor Learning Opportunities For Neurodiverse Students: An Outdoor  
Learning Curriculum for Neurodiverse Students

by

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A capstone submitted in partial fulfillment of the requirements for the degree of  
Master of Arts in Natural Sciences and Environmental Education

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## DEDICATION

To my students, who inspire this project, to my family and friends, for your continuous encouragement and support. Thank you to my Capstone Committee. Your guidance and patience helped me complete this project. Special thanks to my content expert and peer reviewer, who helped shape this Capstone. I have learned a great deal from you.

“There needs to be a lot more emphasis on what a child CAN do,  
instead of what he cannot do ”.  
- Temple Grandin

## TABLE OF CONTENTS

## CHAPTER ONE:

Introduction.....	6
Personal Journey to Environmental Education.....	8
Benefits of Outdoor Learning.....	10
Unique Challenges of Outdoor Learning for Setting IV Schools.....	12
Relevance to the Profession.....	13
Positionality Statement.....	13
Summary of Chapter Two.....	14

## CHAPTER TWO: Literature Review

Introduction.....	15
Neurodiversity.....	16
Benefits of Outdoor Learning for Neurodiverse Students.....	17
Barriers to Outdoor Learning for Neurodiverse Students.....	26
Recommendations for Practice.....	29
Summary of Chapter Two.....	35

## CHAPTER THREE: Project Description

Introduction.....	37
Project Description.....	37
Method.....	40
Setting.....	41
Audience/Participants.....	41
Assessment of Effectiveness.....	42

	5
Timeline.....	42
Summary of Chapter Three.....	43
CHAPTER FOUR: Conclusion	
Learnings From the Capstone Project.....	44
The Process.....	45
Valuable Literature.....	46
Strengths and Limitations.....	47
Possible Future Work.....	48
REFERENCES.....	50

## CHAPTER ONE

### Introduction

The benefits of outdoor education are well-researched and documented. Spending time in nature reduces stress levels and positively impacts mental health (Freidman & Morrison, 2021; Li et al., 2019; Wilson, 2022). Despite the benefits of outdoor education, many students need access to nature areas or nature experiences in their school settings. Lack of access to outdoor learning is especially true for students in more restrictive special education settings. Students in special education have limited access to outdoor activities due to a lack of accessibility and safety concerns. As a career special education teacher, I chose to investigate ways to provide outdoor learning opportunities and nature experiences that meet the needs of neurodiverse learners in special education programs.

Neurodiverse or neurodivergent are non-medical terms used to describe a spectrum of neurological differences for individuals with variations in their mental functioning. While the term neurodiverse can apply to multiple identities, it is most commonly used for autism spectrum disorder (Baumer & Frueh, 2021). The term neurodivergent is a response to deficit-based language that instead embraces a diversity in human cognition as differences rather than disability (Baumer & Frueh, 2021). Throughout this capstone, I will use identity-first language instead of person-first language to refer to persons who identify as neurodivergent. Kenny et al. (2016) found that many in the neurodiverse community prefer identity-first language. According to a report by the National Institutes of Health (2023), members of the disability community have expressed that identity first language affirms an important part of their identity. Autism and neurodiversity advocate Lydia Brown (n.d.) state, “*when we say “Autistic*

*person,” we recognize, affirm, and validate an individual’s identity as an Autistic person”.* The preference for identity-first or person-first language can vary from person to person. Not all individuals in neurodiverse communities express the same preference. However, since multiple references prefer identity-first language, neurodiverse students will be used for this capstone project.

The neurodiverse students I work with attend a school that exclusively serves students with significant, sometimes overlapping disabilities. Setting IV schools is a government designation for the most restrictive, non-residential, public education environment. Students in setting IV schools are separated from traditional schools due to their levels of need that can't be served in community schools. The separate setting limits the amount of enrichment that students may receive. Special classes and experiences are often unavailable, and safety concerns frequently prevent kids with significant behavior concerns from going outdoors. Outdoor learning is an important learning modality for students receiving special education services. However, providing outdoor learning opportunities in setting IV schools can be challenging. The capstone project addresses this lack of access to outdoor education by asking: *How can special education teachers create outdoor learning opportunities for neurodiverse students?*

This chapter will explore how my experience working as a special education teacher has influenced my desire to create more outdoor learning opportunities for neurodiverse students in setting IV schools. It describes the background of my work in setting IV schools and the importance of providing outdoor learning opportunities for students in these types of settings. The chapter will also explain how outdoor learning will significantly impact my students. I will also touch on the perceived barriers to



learning outdoors for neurodiverse students. The chapter will summarize the points in this chapter and introduce the remaining chapters in this paper.

### **Personal Journey to Environmental Education**

I was fortunate to grow up in a time when I could explore and play outdoors, often without guidance or even adult supervision. My experiences in nature have provided me with a set of skills I might not otherwise have gained. A sense of independence, finding calm, curiosity, connection, and knowledge. I learned all these skills outside the classroom, on my own, out in nature. The experiences of the students I teach are significantly different from mine. Researcher Carl Dunst (2020) notes that neurodiverse students have fewer learning opportunities in community settings than their neurotypical peers. This is particularly true for students receiving special education services in highly restrictive settings. Time in nature was especially beneficial to me and my development. Because of the benefits I experienced as a child learning outdoors, I believe all children and students should have the same opportunities. I chose to pursue my Master's in Environmental Education because I wanted to bring my experiences in nature growing up to students with limited access to similar experiences. I hope my research will demonstrate ways outdoor education can be accessible even to students in highly restrictive settings.

The students I work with are neurodiverse emergent learners who often have challenges that require a more restrictive environment due to their learning differences. Most of their time is spent indoors, and most classrooms do not have windows. In addition, many students in my school are highly focused on screens and technology and spend most of their free time using digital media. While I have had some success taking

students outdoors, these experiences are short and lack the structure necessary to create comprehensive outdoor learning experiences. Limited time spent outdoors and the overuse of technology limit exposure to learning opportunities and the social, emotional, and physical benefits of outdoor learning.

My teaching career has been spent primarily in highly restrictive settings in special education, such as setting up IV schools. Setting IV schools are designed to provide high levels of support and unique programming to meet the wide range of needs of neurodiverse students. The curriculum, environment, and instructional support are individualized for the students, and the focus is on giving the students the skills they need to return to their neighborhood schools. Many of the students in these schools have difficulty with self-regulation. They experience periods of extreme stress that result in disruptive behaviors such as elopement, self-injury, aggression, and other unsafe behaviors. Difficulty with self-regulation is often why students are referred to a setting IV school. Due to concerns about these behaviors occurring in uncontrolled environments, many students need more access to educational experiences outside of the classroom.

Throughout my teaching career, I have tried various ways to provide experiential learning experiences for my students. Some of these have included project-based learning, bringing in outside experts to teach special classes, and bringing my students out for short, structured community outings. This year, my role has shifted from classroom teacher to curricular support teacher in the area of wellness. As part of my role as a wellness teacher, I would like to incorporate more outdoor experiences into the lives of my students. I intend that my research will demonstrate ways outdoor education can be accessible even to students in highly restrictive settings.

In the fall of 2023, I took a small busload of neurodiverse students to the Tamarack Nature Center. Before the field trip, I contacted Tamarack Nature Center to sign my students up for their programming. It was our school's first participation in an outdoor program. Setting up the experience, I explained to the naturalist the needs of my students, and she worked with me to devise ways to modify the experience to make it more accessible.

My students eagerly took turns using a cider press. I watched as their eyes fixed on the sight of colorful apples turning to mush, making liquid. They couldn't wait for their turn to move the wheel. Even the most shy students eagerly approached the press. Later, in the garden, the students ran their fingers over the plants, sniffed flowers, and collected acorns. Despite the concerns about unsafe behaviors, the students were safe and highly engaged. The experience was a resounding success. Although our trip to the nature center was successful, most of our students could not attend due to concerns about safety and accessibility. Out of our 65 students, only 23 could visit the nature center. Watching my students who could attend, so engaged and eager to explore, made me think about how to bring those experiences closer to the school, to create a place of exploration right outside the school doors. I want all of my students to be able to experience something like Tamarack Nature Center.

### **Benefits of Outdoor Learning**

I want to bring outdoor education to highly restrictive settings because of the enormous benefits of time spent in nature. Outdoor learning positively impacts cognitive, social, and emotional development. For students with disabilities, "the natural environment creates a supportive and inclusive setting that promotes engagement,

reduces stress, and enhances learning experiences" (Salsabila et al., 2023). Preliminary research suggests that outdoor learning experiences improve communication skills (Friedman et al., 2022). These benefits align with my students' sensory, emotional, social, and health goals.

The positive impacts of outdoor learning for neurodiverse students have increased interest in creating nature-based special education programs. In my school district, a setting IV elementary school that serves neurodiverse students is located next to a nature reserve and has access to 5 acres of forest. The school, Karner Blue, incorporates nature-based learning throughout the day. Karner Blue was designed to create a space where students can feel confident, safe, and free to explore. According to the lead outdoor educator at the school, "The school forest helps [the students] internalize and use the skills we're trying to teach in the classroom" (Pleticha, 2019). Students at the school demonstrate the impact of outdoor learning through increased communication, better emotional regulation, and increased engagement (Pleticha, 2019).

The schools' success with outdoor learning demonstrates the unique benefits of spending time in nature for neurodiverse students. The focus of outdoor learning for the school is more than just science; it encompasses all aspects of social, emotional, and behavioral learning. Staff and parents say increased social-emotional skills are the program's most significant benefit (Pleticha, 2019). The school's documented successes align with the positive impact of nature-based learning reported in the research. Although the program has been successful, not all schools, including mine, have access to dedicated nature areas.

## **Unique Challenges of Outdoor Learning for Setting IV Schools**

Karner Blue's proximity to a large nature area makes outdoor learning safe, accessible, and feasible. It is also the only setting IV school in the state with a dedicated outdoor learning space. For schools like mine that do not have access to safe outdoor spaces, student access to nature is a challenge. In addition, barriers such as mobility, sensory needs, behavioral accommodations, and concerns about elopement inhibit the development of outdoor learning programs at sites without access to a school forest.

While these may be barriers in any setting, setting IV schools have additional restrictions that make access even more difficult. Students in setting IV schools are often there due to unpredictable and dangerous behavior to self or others, and they are also more likely to be unaware of safety hazards and require 1:1 staff intervention. Because of this, staff are less likely to be open to taking their students outdoors. Staff attitudes and willingness to engage in outdoor learning can also be a barrier. An investigation into special education teachers' attitudes toward outdoor learning identified a lack of teacher training, funding, limited greenspaces, and unfamiliarity with outdoor learning activities as the most significant barriers to implementing outdoor learning into their programs (Lappa et al., 2017). In my experience, taking students out in nature has been met with skepticism about the appropriateness and safety of outdoor learning for neurodiverse students.

Despite these barriers, research indicates that outdoor learning benefits neurodiverse students. This project addresses barriers by providing lessons that are accessible and can be used in the classroom, outside of the building, and in the community's outdoor green spaces. Creating activities specifically designed for highly

restrictive school settings will open up opportunities for neurodiverse students to experience the many benefits of learning in nature.

### **Relevance to the Profession**

The state of Minnesota launched the "Children's Outdoor Bill of Rights" initiative in 2022. The initiative states that "Exploring, playing, and experiencing the outdoors in childhood leads to better physical and mental health, improved performance in school, more positive self-image, stronger social skills, and more fulfilling lives" and that "each and every Minnesota child is entitled to experience outdoor recreational activities and discover the natural environment regardless of where they live, learn, or play" (Minnesota Children's Cabinet, 2022). To realize this vision, there needs to be greater access to outdoor learning, especially for students in highly restrictive education settings.

### **Positionality Statement**

I have been a special education teacher working with neurodivergent students for 17 years. I do not identify as a member of the neurodivergent community. However, I have spent most of my career teaching, observing, and learning with neurodivergent individuals. Throughout my career, I have seen myself as an advocate for including neurodivergent students in places that have been inaccessible, including the outdoors. Although my work as a special education teacher has been focused on having neurodivergent students adapt and adopt the behaviors and cultural practices of neurotypicals, I believe that neurodiversity is not a disability. Neurodivergence is an expression of human diversity. I acknowledge that my positionality will influence this project.

## Summary

This chapter describes how I became interested in pursuing my research question about how to create inclusive outdoor learning experiences in setting IV schools. It describes the benefits and barriers of incorporating outdoor programs for students with disabilities. As a child, time spent in nature gave me critical social-emotional skills and influenced my desire to enable my students to have the same experiences and outcomes. My career as a special education teacher working in the most restrictive special education settings has led me to explore ways to create more enrichment opportunities for my students. Outdoor learning has been shown to increase engagement, promote mental and physical health, and enhance social communication skills. Outdoor learning has been identified as a priority by the state of Minnesota through the "Children's Outdoor Bill of Rights" initiative.

This capstone project will create resources for teachers to implement outdoor learning experiences for neurodiverse students that can be used in multiple environments. This capstone is meant to support populations of students in highly restrictive special education settings. Chapter Two will explore research on the benefits, barriers, and best practices of outdoor learning. Chapter Three will describe the capstone project and explain how the project will address the specific needs of students in setting IV schools and provide solutions to the barriers to implementation while highlighting the benefits of outdoor learning. Chapter Four will reflect on the project, provide recommendations for how to use the resources created, and discuss modifications that can be made for future use.

## CHAPTER TWO

### Literature Review

#### Introduction

This literature review aims to answer the question: *How can special education teachers create outdoor learning opportunities for neurodivergent students?* This chapter summarizes the literature that will be used to answer this research question and inform the capstone project. The literature review will focus on three main themes: the benefits of outdoor learning, barriers to outdoor learning, and facilitating outdoor education for neurodiverse students. The end of the chapter will describe the need for more outdoor learning opportunities designed specifically for neurodiverse learners.

The first section reviews the literature on the benefits of outdoor education. It first describes the social-emotional, physical, and academic benefits and then explores how outdoor learning specifically benefits neurodiverse students. The literature indicates a wide range of benefits to outdoor learning for neurodiverse students. Multiple studies suggest that outdoor learning increases social skills, sensory integration, emotional regulation, attention restoration, and positive physical and mental health impacts (Chawla, 2015; Friedman et al., 2022; Salsabila et al., 2023).

The following section will review the literature on the barriers to incorporating outdoor learning into school programs that serve neurodiverse students. It will explore the actual or perceived barriers that can impact the implementation of outdoor learning and discuss the literature highlighting the need for modifications to address these barriers to facilitate outdoor learning opportunities for neurodiverse students.



The last section will discuss elements of curriculum design for facilitating Outdoor Learning for neurodiverse students. This section will review the Guidelines for Excellence created by the North American Association for Environmental Education (NAAEE), curriculum, and resources from Project Learning Tree (PLT) and Green School Yard America, which have established frameworks for outdoor learning that will inform the capstone project. It will also review the research into outdoor space design, modifications for outdoor spaces, accommodations, and recommendations for designing lessons for neurodiverse students. This literature review aims to explore the research to answer the question: *How can special education teachers create outdoor learning opportunities for neurodivergent students?*

### **Neurodiversity**

Neurodiversity encompasses a wide range of diagnoses, including autism, attention deficit disorder, down syndrome, as well as many other mental health conditions. Neurodiverse persons often share characteristics that include differences in sensory processing, communication, learning styles, and behaviors (Baumer & Frueh, 2021). Neurodiverse individuals may also experience differences in social skills, gross motor functioning, and emotional regulation challenges (Barakat et al., 2019; Li et al., 2019). Students who fall under the umbrella of neurodiversity have differing cognitive abilities. While some neurodiverse individuals may have an IQ at typical or above average levels, some neurodiverse students are at a developmental level that does not correspond to their same-aged peers.

## **Benefits of Outdoor Education for Neurodiverse Students**

Outdoor learning has many benefits that support student well-being. Time spent in nature improves cognitive, mental, and physical health and increases social and emotional skills (Barakat et al., 2018). For students receiving special education services, outdoor learning provides a hands-on approach that has been shown to increase the development of self-help skills and self-advocacy skills that cater to student's unique interests and increase overall independence. These skills align with the social, emotional, and independent living goals prevalent in students' individualized education plans (Wilson, 2022). This section provides an overview of the research into outdoor learning and will also explore the literature about how outdoor education can be especially beneficial to neurodiverse students.

While outdoor education benefits all students, outdoor learning can be especially beneficial for neurodiverse students. Neurodiverse students experience differences in social communication and social interaction, a strong need for sameness and routine, and are more likely to experience mental health issues (Friedman et al., 2022). Outdoor learning has the potential to mitigate the impact of these differences on the functioning of neurodiverse students. The next section of this theme will discuss how the benefits of outdoor learning impact neurodiverse students and students diagnosed with developmental disability. Each section will begin by describing the differences in the functioning of neurodiverse individuals and then discuss the benefits specific to each area.

### *Social Skills*

Differences in social skills are referenced in the literature as an area of need for neurodiverse students. Neurodiverse students experience challenges picking up on social cues, making eye contact, turn-taking, understanding nonverbal cues, and social communication (Wilson, 2022). Difficulty with social skills has been shown to increase anxiety and stress, and neurodiverse students are more likely to be bullied or excluded due to these differences (Freidman & Morrison, 2021). Social skill classes and interventions meant to teach students social interaction behaviors considered "typical" are a common part of the curriculum for neurodiverse students. (Friedman & Morrison, 2021). Importantly, outdoor learning can effectively aid students' social skill development (Friedman et al., 2022; Li et al., 2019).

Outdoor settings provide neurodiverse students with opportunities for social development by allowing students to engage in peer interactions in an unstructured setting. A case study of two special education teachers and five neurodiverse students found that students who participated in outdoor social skills lessons increased progress toward meeting their social communication goals (Freidman & Morrison, 2021). Barakat et al. (2018) found that outdoor play increased collaborative language and parallel play skills. Outdoor learning activities decrease anxiety and provide neurodiverse students with the freedom to express themselves without the constraints of highly structured social settings such as schools. Multiple research studies have shown that neurodiverse students participating in outdoor learning demonstrate more spontaneous interactions with peers and more confidence in social interactions (Zachor et al., 2016; Friedman & Morrison, 2022; Li et al., 2019).

In summary, increased social skills are one benefit of outdoor learning for neurodiverse students. The literature provides numerous examples of how time outdoors increases confidence and allows students to interact with peers in a non-traditional setting. Outdoor settings allow students to engage in social communication at their own pace. Increased social skills is one example of how increasing outdoor learning opportunities can benefit neurodiverse students.

### ***Sensory***

Sensory processing differences are a common trait among neurodiverse students. According to Marco et al. (2012), 96% of neurodiverse individuals experience hyper or hyposensitivity to sensory stimuli. The National Autistic Society (n.d.) noted that these differences can include sensitivity to sights, sounds, smells, tastes, touch, balance, and body awareness. This sensory sensitivity can affect how neurodiverse students feel and behave in different environments.

Outdoor learning can provide relief from overwhelming sensory experiences. It can provide a space for students to meet their sensory needs in various ways (Friedman et al., 2022). Hanscom (2016) notes that sensory experiences in outdoor settings integrate and organize the brain and sensory systems. Li et al. (2019) also stated that outdoor learning can increase tolerance for new sensory experiences. Learning in outdoor settings helps neurodiverse students regulate their sensory systems and contributes to lower stress levels that can support more inclusive learning experiences (Shabrina et al., 2023). Research has also found that stimulating sense systems can positively impact social and emotional skills (Nel et al., 2017).

Sensory benefits in outdoor settings were a central theme in the literature, with Nel et al. (2017) indicating that time spent outdoors enables students to engage all their senses. Outdoor settings provide variety, change, and challenges that enhance sensory and motor systems (Nel et al., 2017). Examples of beneficial sensory stimulating activities outdoors include locating patterns, colors, and textures in nature, playing with loose parts (pinecones, rocks, leaves, sticks), climbing, walking through mud and water, and exploring sensory gardens (Christensen & Romero, 2016). A case study by Friedman et al. (2022) found that outdoor settings allow students to "take what they need" and engage in sensory-seeking activities at their own pace and comfort.

While the research indicates that many neurodiverse students find their sensory perceptions soothed or heightened in outdoor settings, some neurodiverse students may have challenges adapting to the different sensory experiences outdoors. Neurodiverse students may require preparation and accommodation to participate in outdoor activities (Friedman et al., 2023). Strategies to accommodate the sensory needs of neurodiverse students will be discussed further in a later section of this literature review. However, most of the research reviewed for this course has found that the sensory benefits of being in nature indicate that outdoor learning is a valuable intervention for neurodiverse students.

### ***Attention and Focus***

Another common characteristic of neurodiverse students is challenges with attention and focus. They may have difficulty with joint attention, hypo or hyperfocus on stimuli, and a decreased ability to filter out distractions (Ridderinkhof et al., 2018). Difficulty with attention and focus impacts cognitive and behavioral challenges and can

inhibit the development of executive functioning and social development necessary for academic achievement and behavioral regulation (Ridderinkhof et al., 2018). The research in the literature has found that outdoor learning and time spent in nature can increase the restoration of directed attention used for executive functioning and joint attention skills (Stevenson et al., 2019).

A study by Stevenson et al. (2018) used mobile eye tracking to investigate how time spent outdoors influences cognitive restoration. The study found that a 30-minute walk significantly increased directed attention. The findings of this study are also supported by research conducted by Chawla (2015), which found that just a 20-minute walk outdoors improved student performance on concentration tests comparable to the effects of common ADHD medication. These studies align with teacher observations of increases in sustained attention following outdoor learning activities. A research study that examined teachers' perspectives on the impact of outdoor learning found that teachers reported improved attention spans and a reduction of off-task behavior during outdoor learning sessions (Szczytko et al., 2018). Additionally, Chawla (2015) found that exposure to green space enhances student working memory and increases attentiveness. These studies demonstrate the impact of short outdoor experiences on student attention and focus. One of the theories about how exposure to nature increases attention and focus is Attention Restoration Theory.

A recent area of study, Attention Restoration Theory (ART), supports outdoor learning as a way to increase attention and focus. Typical school environments present students with higher-level cognitive tasks and behavioral regulation demands that fatigue students' ability to remain focused and engaged (Li et al., 2019). These cognitive tasks

require students to direct attention toward one stimulus while ignoring irrelevant stimuli, and this ability to filter irrelevant stimuli fades over time (Li et al., 2019). ART theorizes that nature provides "intrinsically fascinating" stimuli that can be observed and admired without additional mental effort (Stevenson et al., 2019). This theory proposes that attention fatigue can be remedied by spending time in nature (Stevenson et al., 2019), which allows students to return to higher cognitive functions, such as direct attention when they return to the classroom (Byström et al., 2019). This is particularly important for neurodiverse students, who are significantly impacted by inattentiveness and self-regulation (Li. et al., 2019).

Outdoor learning and its benefits for increasing focused attention are prevalent throughout the literature. In some studies, it is theorized that the increase in attention following time spent outdoors can also be attributed to allowing students to explore areas of high interest freely (Friedman et al., 2022). One study found that playing with loose parts is an immersive and soothing experience for most study participants. They spent long periods of time focusing on natural objects such as sand, mud, twigs, leaves, and others (Li et al., 2019). Researchers also observed that being outdoors allowed neurodiverse students to spend more time choosing objects and experiences that engaged their focus and allowed their brains and bodies to recover from high-demand settings such as school buildings (Friedman et al., 2022). Learning outdoors provides neurodiverse students with the opportunity to focus on their interests and validates their autonomy. Outdoor learning empowers neurodiverse students to follow their curiosity, which is not always possible in structured learning environments.

In summary, the literature indicates that outdoor learning has many benefits for restoring attention and focus in neurodiverse students. Just 20-30 minutes of outdoor activity has increased the directed attention necessary to perform cognitive tasks in neurodiverse students (Chawla, 2015). ART theorizes that outdoor learning allows students to encounter "intrinsically fascinating" stimuli that have restorative effects on student cognition (Stevenson et al., 2019). Time outdoors allows students to explore their interests outside of the traditional school environments and contributes to increased focus following time spent outdoors (Friedman et al., 2022).

### ***Mental Health and Emotional Wellbeing***

The research overwhelmingly supports that time spent in nature improves mental health and increases emotional well-being (Barakat et al., 2018; Friedman et al., 2022; Li et al., 2019). Sarivaara et al. (2022) found that teachers reported their students demonstrated decreased restlessness and increased relaxation after outdoor learning experiences. Another study by Li et al. (2019), which interviewed parents and caregivers of neurodiverse children, found that parents reported that their children smiled and laughed more when they were in nature. Friedman et al. (2023) report that neurodiverse individuals stated that spending time outdoors helped them feel calmer and reduced stress.

These are just a few examples in the literature that demonstrate the positive impacts of outdoor learning on the emotional well-being of neurodiverse students. Emotional and mental health support is especially important for neurodiverse students, as research shows that they are disproportionately diagnosed with mental health conditions such as anxiety and depression (Friedman & Morrison, 2022). Due to differences and



challenges in social communication and emotional regulation, neurodiverse children have a more significant need to reduce stress and relaxation than their neurotypical peers (Wilson, 2022). Adapting to the demands of a school environment requires more sustained effort for neurodiverse students, and outdoor learning can provide respite from the demands of a school environment (Freidman & Morrison, 2022). Barakat et al. (2018) indicate that being outdoors has a restorative effect on neurodiverse students by reducing stress. One of the theories on how nature reduces stress is called Stress Recovery Theory.

Stress Recovery Theory (SRT) proposes that exposure to nature increases positive emotional affect (Li et al., 2019). The main premise of SRT is that the act of viewing nature can elicit positive emotional responses that can serve as a buffer to negative thoughts and emotions (Wilson, 2022). Visual features in nature, such as curves, color gradation, slow-moving water, and natural features that are both uniform and varied have been found to create feelings of restoration (Byström et al., 2023). SRT also theorizes that individuals can recover more quickly from stress after exposure to natural settings (Friedman & Morrison, 2021). A study examining how horticultural therapy impacts physiological responses to stress found that children experienced increased relaxation and decreased stress after engaging in horticultural interventions (Shao et al., 2020). Reducing stress and increasing feelings of mental and emotional well-being are important benefits of outdoor learning.

### ***Teacher Wellbeing and Retention***

The restorative effects of outdoor learning are not limited to students. Although not the intended purpose of this capstone project, one interesting finding in the literature suggests that outdoor learning can have additional benefits for teachers. A case study by

Friedman & Morrison found that participating teachers felt less tired and burnt out after incorporating outdoor learning into their school day (2022). Another study indicates that teachers reported feeling more relaxed after spending time outdoors (Friedman et al., 2023). This is unsurprising given the well-researched and documented evidence that time spent outdoors positively impacts mental health.

This finding is essential as teacher burnout is a serious concern, especially in special education, causing high turnover rates that impact student learning and emotional well-being (Shen et al., 2015). Special education teachers report higher stress levels, emotional exhaustion, and negative feelings about their work that impact feelings of self-worth (Park et al., 2020). The US Department of Education reports that most states need more special education teachers. Anecdotal reports cited in the literature indicate that involving teachers in outdoor learning can potentially mitigate teacher burnout. A report on the efficacy of outdoor education mentoring for teachers found that teachers reported increased work satisfaction after incorporating outdoor lessons into their school day (Erickson, 2012).

### ***Summary of Benefits***

The benefits of outdoor education led to the development of the research question: *How can teachers create outdoor learning opportunities for neurodivergent students?* This section highlights those benefits to support the importance and necessity of developing outdoor learning opportunities for neurodiverse students. To provide comprehensive and beneficial outdoor learning experiences, it is also important to explore the barriers to inclusive outdoor education for neurodiverse students. This

literature review will discuss the barriers to implementing outdoor learning opportunities for neurodiverse students.

### **Barriers to Outdoor Learning for Neurodiverse Students**

The previous section of this literature review highlighted the many benefits of outdoor learning for neurodiverse students. Despite the benefits, neurodiverse students need help with access, safety, and availability of trained staff than typical peers when accessing outdoor learning. This section will review the literature on barriers to outdoor learning and potential solutions to overcoming these barriers. It will also uncover issues potentially impacting how teachers incorporate outdoor learning for neurodiverse students.

#### ***Accessing the Outdoor Learning***

Neurodiverse students can face more barriers in accessing outdoor learning. Increased sensitivity to sensory stimuli, such as weather conditions and a need for more awareness about safety, often prevent neurodiverse students from accessing the outdoors (Li et al., 2019). The literature also indicates that greenspace design often lacks sufficient features that accommodate the safety needs of neurodiverse students. Additionally, many neurodiverse students have limited opportunities to explore risk and may need additional instruction on assessing risk in outdoor settings (Friedman et al., 2023).

Sensitivity to unpredictable sensory stimuli can cause some neurodiverse students to avoid outdoor settings. As one neurodiverse writer stated in a blog post about outdoor recreation, "*The outdoors are a sensory nightmare. There are bugs, for one thing: one million little legs to crawl on you, to tickle your arm hair in the worst way. There are elements: heat, choking humidity, cold and blustery wind*" (Rote, n.d.). One case study

found that neurodiverse students needed help with adapting to different weather conditions and that there were times when outdoor learning was inaccessible due to a lack of appropriate outdoor clothing (Friendman & Morrison). Another case study noted that some children were more hesitant about going outside on cold or rainy days (Friedman et al., 2022). A student interviewed for a case study reported that while she liked outdoor learning, the change in weather made it less appealing (Freidman et al., 2022). These sensory sensitivities can be mitigated by providing spaces for students to calm, such as shaded areas and small enclosed spaces made of natural materials (Wilson, 2022), as well as ensuring that students have access to weather appropriate clothing and adequate nutrition. Accommodating the unique sensory needs of neurodiverse students can increase access to outdoor learning opportunities. Sensory sensitivities are just one important consideration in facilitating outdoor learning. Student safety in outdoor settings is another barrier to outdoor learning for neurodiverse students.

Safety is a critical factor influencing neurodiverse students' participation in outdoor learning. A common characteristic of neurodiverse students is a need for more awareness about their surroundings. A study that interviewed parents found that traffic danger, wandering, and fear of tripping and falling for children with locomotive issues were common concerns (D Li et al., 2019). Elopement is a vital safety concern. Neurodiverse children can become preoccupied with stimuli in outdoor settings. As a result, neurodiverse students can be impulsive when pursuing or escaping outdoor stimuli and may run away, requiring constant supervision (Shannon et al., 2021). This impulsivity and a lack of awareness about safety hazards can inhibit access to outdoor learning for neurodiverse students.

### *Teacher Perceptions of Outdoor Learning*

The literature indicates that the need for proper training for special education teachers in outdoor learning environments is a barrier to outdoor learning for neurodiverse students (Lappa et al., 2017). A case study that looked at teacher attitudes towards outdoor learning found that while most special education teachers found great value in outdoor learning for their students, lack of time, support from administrators, and feeling under-prepared to teach outdoors contributed to negative teacher attitudes towards outdoor learning (Lappa et al., 2017). Another case study by Friedman and Morrison (2021) followed two special education teachers with minimal experience teaching outdoors. The teachers in the study indicated that time constraints, safety, and a lack of experience impacted their confidence in leading outdoor learning opportunities. However, the teachers involved in the study expressed that the more they took their classes outdoors, the more comfortable they felt leading outdoor learning opportunities (Friedman & Morrison, 2021). The literature suggests that increased professional development for special education teachers in outdoor learning could increase participation in outdoor learning opportunities (Lappa et al., 2017).

Teacher attitudes and perceptions of the outdoors may also influence student attitudes and experiences in outdoor learning. One report in the literature found that staff comfort with the outdoors can influence teacher attitudes (Friedman et al., 2022). Adults may feel out of place in outdoor environments, creating some pushback about taking their classes outdoors (Friedman et al., 2023). Having adults participate in outdoor sessions without students or inviting staff to recreate outdoor learning sites is one suggestion to increase staff involvement and comfort in these types of settings (Freidman et al., 2023).

While the barriers referenced in this section impact outdoor learning experiences for neurodiverse students, the literature reviewed in the next section provides examples of how teachers can adapt and reduce these barriers. Reviewing the obstacles to outdoor learning is essential so teachers can effectively prepare for these challenges. This section reviewed the literature on barriers to outdoor learning for neurodiverse students. The barriers most frequently cited in the literature are sensory challenges, student safety, teacher training, and teacher attitudes (Friedman et al., 2023; Lappa et al., 2017; D Li et al., 2019). These barriers are important to explore as they are part of the answer to the research question: *How can special education teachers create outdoor learning opportunities for neurodiverse students?* To provide neurodiverse students with effective outdoor learning opportunities, exploring the benefits and barriers is important. The next section of this literature review examines the literature for practice recommendations that will enhance the benefits of outdoor learning and address the barriers to incorporating outdoor learning for students with disabilities.

### **Recommendations for Practice**

To create inclusive, effective outdoor learning opportunities, the literature outlines practices that support neurodiverse learners. In a guide to facilitating nature-based learning for neurodiverse students by Friedman et al. (2023), the authors suggest best practices for leading outdoor learning opportunities for neurodiverse students: safety, structure and routine, and staff responsiveness. In addition to these practices, the design and accessibility of greenspace are important to provide students with safe and engaging outdoor learning opportunities. This next section will explore the literature on recommendations for effective outdoor learning for neurodiverse students.

### *Importance for Safety*

Safety is an important consideration when taking students outdoors.

Neurodiverse students sometimes lack awareness of their surroundings and require constant supervision (Shannon et al., 2021). Common safety concerns cited earlier in this chapter include elopement, locomotive challenges, and traffic safety. These concerns are present throughout the literature, and recommendations are made to improve safety and foster student awareness of their environment and how to assess risk.

To address safety concerns, the literature proposes modifications to outdoor space design and regular risk assessment of outdoor sites. Recommended modifications include providing enclosed spaces with limited exit and entry points, private areas for emotional regulation, various sensory stimuli, and sound and light buffers to accommodate differing sensory needs (Li et al., 2019). The literature also suggests that teachers perform regular site assessments to identify potential hazards such as downed branches, hazardous wildlife or open water, and any changes caused by weather conditions. The literature also noted that regular site assessments help teachers prepare students for changes in the outdoor environment (Freidman et al., 2023). The guide for professional practice for nature-based programs published by the North American Association for Environmental Education (NAAEE) states that teachers should also ensure that students have appropriate clothing, develop and communicate emergency policies and practices, secure tools, and use safety gear (NAEE, 2019).

Involving students in performing regular risk assessments alongside teachers can teach students how to be safe in the outdoors (Friedman et al., 2023). Inviting students to point out weather conditions, point out safe places to climb, and have students define the

barriers of outdoor learning areas, allowing them to observe their environment, empowers neurodiverse students to build awareness of their surroundings (Friedman et al., 2023).

The National Association of Environmental Education (NAAEE) notes that learning to recognize risk and avoid hazards is an important developmental skill. Examples of student-led risk assessment include having students identify hazards they may encounter (NAAEE, 2019).

Safety is a necessary consideration for outdoor learning. Allowing students to take risks is a valuable learning opportunity (Bradley & Male, 2017). One study found that when neurodiverse students play outside, they are often closely monitored and redirected (Friedman et al., 2023). However, a case study that interviewed students found that the students stated that they enjoyed being able to explore and take risks (Bradley & Male, 2017). This can be challenging, providing enclosed spaces with limited exit and entry points, private areas for emotional regulation, various sensory stimuli, and sound and light buffers to accommodate differing sensory needs (Li et al., 2019). Maintaining safety is a recommended training priority so that students can have more ability to engage with the outdoors freely.

### ***Necessity for Structure and Routine***

A key characteristic of neurodiverse individuals is a need for routine and sameness. A study by Christensen and Romero (n.d.) states that students do best when they include structure and routine. Developing outdoor learning opportunities that have structure and routine provides neurodiverse students with a sense of comfort and reduces stress (McPherson, 2023). A guide to facilitating nature-based learning for neurodiverse students by Friedman et al. (2023) states that consistent routines, boundaries, and



expectations are beneficial and make outdoor learning more accessible. Having a daily visual schedule, notifying students of changes to the learning site, having a routine for transitions, using songs, sound cues, or games to facilitate transitions, and having students participate in safety awareness activities are essential structures to have in place for neurodiverse learners. (NAAEE, 2019). Examples of outdoor learning routines cited in the literature include having a set meeting place, an opening meeting that invites students to notice changes in the environment, provides options for activities, having time for free play of an auditory signal for when it is time for students to return and do a closing activity (Friedman et al., 2023). To provide neurodiverse students with access to effective outdoor learning opportunities, teachers should incorporate clear, predictable routines and support.

### ***Staff Responsiveness and Training***

Earlier in this chapter, one of the barriers often cited is teacher willingness, ability, and comfort to assist in outdoor learning opportunities. A study by Lappa et al. (2017), which interviewed special education teachers about their perspectives on outdoor learning, found that increased professional development is needed to assist special education teachers in creating outdoor learning opportunities. The study also emphasizes that support from administrators is essential to ensure that teachers feel supported in incorporating outdoor learning into the school day (Lappa et al., 2017). Another study recommended the following strategies to assist special educators with training: co-teaching to strengthen pedagogical thinking and reflection and mentoring from experienced outdoor educators (Sarivaara et al., 2022). Multiple studies suggest that

special education teachers should be supported to increase their confidence and skill in facilitating outdoor learning opportunities.

A case study by Friedman and Morrison (2021) demonstrates how two special education teachers develop confidence in leading outdoor learning opportunities. The case study followed two special education teachers who had yet to experience incorporating outdoor learning into their day. The study found that with reflection, collaboration, and practice, the teachers increased their comfort in leading outdoor learning programs and found it beneficial for their students (Freidman & Morrison, 2021). Friedman et al. (2023) mention that some staff members may be uncomfortable in outdoor spaces. The study suggests incorporating outdoor learning sessions for staff to increase their connection to the outdoor learning environment. The study also suggests that teachers receive further information on how outdoor learning benefits neurodiverse students (Freidman et al., 2023).

### ***Accessing Greenspace for Outdoor Learning***

To effectively provide outdoor learning opportunities for neurodiverse students, it is important to consider how students can access greenspace near their schools. The literature provides examples of how forest schools, nature centers, and other large nature areas can accommodate the needs of neurodiverse students. In their work, *Nature as a Healer for Autistic Children*, Barakat et al. (2018) provide the following guidelines for calming outdoor spaces that support neurodiverse students: a quiet location, design for safety and security, a shaded space, places for challenge and rest, areas for calming, areas for coordination and motor skills, and having visual supports located or available for nonverbal communication at outdoor learning sites. Li et al. (2019) recommend that

outdoor learning spaces have limited entry and exit points to prevent elopement, provide private spaces for calming, maintain spaces to reduce hazards, provide open-ended play, and incorporate a variety of sensory stimuli to make outdoor learning spaces more accessible for neurodiverse students.

While these recommendations facilitate outdoor learning for neurodiverse students, the literature indicates that not all schools can access these spaces. In a review of the benefits of nature contact for children, Chawla (2015) states that many schools need dedicated green space and that inequities in access to green space in marginalized communities can inhibit outdoor learning for students at these sites. It also proposes that creating access to outdoor learning requires a “mosaic” of green spaces such as parks, urban trails, and areas with tree cover. A resource called “*Where do We Begin? A Toolkit to Move Learning Outdoors*”, developed by the National Outdoor Learning Initiative, outlines strategies to design and create outdoor learning infrastructure at school sites. The toolkit includes step-by-step resources, including how to get started, evaluate outdoor learning options, visualize outdoor spaces, create an outdoor learning diagram, and implement an outdoor learning plan (National Outdoor Learning Initiative, n.d.). Some of the suggestions in the toolkit are forming planning committees, considering comfortable seating arrangements, creating a visual diagram of outdoor space, and using fundraising to purchase materials.

While specially designed or designated nature spaces can be tailored to meet neurodiverse students' needs, time and resources are frequently limited. This may be seen as a barrier in some circumstances. However, there are examples in the literature of teachers using the space available to create meaningful outdoor learning opportunities. In

a case study by Friedman et al. (2021), two special education teachers utilized the space close to the school building for outdoor learning opportunities. These spaces included a small pavilion and an outdoor classroom with covered picnic tables, a playground, and a field behind the school building. The teachers also used a nature trail a short distance from the school. The two special education teachers who participated in the study used these spaces flexibly, depending on the needs of the lesson, weather conditions, and the needs of the students.

The literature includes recommendations for implementing outdoor learning for neurodiverse learners. The examples provided in this section highlight a few examples of how outdoor learning can be adapted to be more inclusive. Important considerations are safety, structure and routine, staff responsiveness and training, and locating and creating accessible green space.

### **Summary of Chapter Two**

In this chapter, I have summarized the research that informs my project and responds to my research question: *How can special education teachers create outdoor learning opportunities for neurodiverse students?* First, I reviewed the literature on the benefits of outdoor learning for neurodiverse students. In this section, I identified common characteristics cited in the literature associated with neurodiverse students. I then highlighted research-based benefits of outdoor learning that are especially relevant and beneficial in mitigating the impacts of these characteristics. In the section on barriers to outdoor learning for neurodiverse students, I identified the most common obstacles to outdoor learning. Research into the barriers is important to consider as they must be addressed to create successful outdoor learning experiences for neurodiverse learners. In

the last section, which looks at recommendations for the practice, I cited research highlighting the importance of creating safe and structured learning in outdoor spaces and noted the importance of teacher training. These recommendations will guide the development of my project.

In Chapter Three, I will describe and summarize how I plan to develop resources teachers can use when creating outdoor learning opportunities for neurodiverse students. A central theme in my literature review was that outdoor learning needs to be more inclusive to accommodate the unique needs of neurodiverse learners (Friedman et al., 2022; Friedman & Morrison, 2021; Wilson, 2022). There is ample evidence about the benefits of outdoor learning in the areas of sensory integration, social skill development, and improving mental health. However, outdoor learning experiences that are explicitly designed with neurodiverse learners in mind continue to be under-researched (Freidman & Morrison, 2021). Chapter Three will describe and summarize how I will develop my project to support outdoor learning opportunities for neurodiverse students.

## CHAPTER THREE

### Project Description

#### Introduction

The research presented in the literature outlines many benefits of outdoor learning for neurodiverse students. To create outdoor learning experiences, teachers need the resources to bring their students outdoors, which are easy to implement and meet the specific needs of neurodiverse learners. To facilitate outdoor learning, this project aims to create one-page outdoor activity guides that special education teachers can use for 20-30-minute activities specifically designed for neurodivergent students. This project addresses the research question: *How can special education teachers create outdoor learning opportunities for neurodiverse students?*

#### Project Description

The literature presented in chapter two highlights recommendations to facilitate outdoor learning opportunities for neurodiverse students. This project modifies existing frameworks to create outdoor learning experiences specifically designed for neurodiverse populations. These learning activities have been designed to be divided into areas that address the specific sensory, social, emotional, and physical health needs of neurodiverse students. The outdoor learning opportunities are structured to build routines that support student learning and support emotional and behavioral regulation. Recommendations for addressing safety concerns and accommodations for students with limited mobility are also included in the design of these outdoor learning activities.

To develop outdoor learning opportunities for neurodiverse students, this project draws from three major sources: the North American Association of Environmental

Education (NAAEE), Project Learning Tree, and Green School Yard America. These sources are research-based and provide various resources for developing outdoor learning programs. Using these resources as a guide, I will create specific learning targets, as well as scaffolded outdoor learning experiences, and a curriculum tailored to meet the needs of neurodiverse students.

The NAAEE is an organization that has focused on creating and gathering resources to support and promote environmental education for the past fifty years. NAAEE is a widely recognized organization with contributions from over thirty countries. NAAEE has created several resources, such as the *Guidelines for Excellence* series, that serve as frameworks for developing environmental education programs. I decided to use resources created by the NAAEE to design my outdoor learning opportunities, as the resources provided can be tailored to meet the needs of neurodiverse students.

Green School Yards America is a national organization that promotes the creation of green spaces for schools that serve all ages. Green School Yards America has a free online resource library to assist schools in creating outdoor learning spaces. The School Start-Up Toolkit is one of the most useful resources for creating this project. This toolkit guides educators and administrators on how to design and implement outdoor learning that meets the needs of their schools. In addition, this resource provides activity guides for outdoor learning, which I will utilize as a model for my project.

The NAAEE (2016) *Guidelines for Excellence* serve as a framework to identify key characteristics of outdoor learning programs and provide guidelines for practice. While the NAAEE materials cover a wide range of key characteristics and guidelines,

this project selects the most applicable to special education settings and neurodiverse students. The selected NAAEE (2016) guidelines include:

- Guideline 1.3. Culturally appropriate goals, objectives, and practices.
- Guideline 2.2. Authentic experiences
- Guideline 2.3. Child-directed and inquiry based
- Guideline 3.1. Use of the natural world and natural materials
- Guideline 3.2 Play and the role of adults
- Guideline 4.1 Social and Emotional Growth
- Guideline 4.2 Curiosity and questioning
- Guideline 4.6 Physical health and development
- Guideline 5.1 Space and places to enhance development
- Guideline 5.5 Health, safety, and risk

Project Learning Tree (PLT) is a national organization that promotes outdoor education. PLT provides instructional materials and professional development and partners with state organizations to support the specific needs of local communities. It is widely used throughout the United States and has been recognized as an important resource for outdoor learning. I will use PLT's resources as a model for developing my outdoor learning lessons. While Project Learning Tree's curriculum is wide-ranging and covers local and national standards across all core academic areas, this project will adapt the curriculum to one that centers on health and wellness. The aim of this project is to create shorter, more accessible activities that can be delivered within timeframes that enable teachers to quickly access materials for outdoor learning opportunities within a 20-30-minute class period.



Green School Yards America is a national organization that promotes the creation of green spaces for schools that serve all ages. Green School Yards America has a free online resource library to assist schools in creating outdoor learning spaces. The School Start-Up Toolkit is one of the most useful resources for creating this project. This toolkit guides educators and administrators on how to design and implement outdoor learning that meets the needs of their schools. In addition, this resource provides activity guides for outdoor learning. Green School Yard America's *Living School Yard Activity Guide* models how outdoor learning opportunity cards are structured. The *Living School Yard Activity Guide* includes short one-page activity guides that align with the goal of this project. The project will also draw from this resource to identify and adapt activities that can be used for neurodiverse learners.

### **Method**

The outdoor learning guide is a collection of activities divided into sections based on targeted learning outcomes: sensory enhancing activities, social skills, emotional wellness activities, physical health, and leisure skill development. Learning outcomes will be measured using "I can" statements and teachers' assessment of student learning through observable outcomes. The activity guides contain a one-page document describing the activity, materials needed, activity structure and routine, learning outcomes, and scaffolded adaptations. Each section will be color-coded by target learning outcome and divided into digital folders. The organization of outdoor learning activities is designed to assist teachers in selecting learning opportunities that match the needs of their students. Teachers may also print out the activity pages and laminate them to be more easily accessed and used in outdoor settings. The activity guide also includes

models of social stories that teachers can use to prepare their students for going outdoors. It also includes visual formative assessments that enable non-verbal students to express levels of enjoyment, preferences, and nonpreferred activities.

### **Setting**

This activity guide was developed specifically for setting IV special education settings. These settings serve neurodiverse students and students diagnosed with developmental disabilities in grades 6-12. It is important to note that in this setting, students' grade levels and ages do not always align with their developmental level. Students in this setting are assessed using the Minnesota Department of Education's Early Childhood Indicators of Progress (ECIP). Therefore, the activities are adapted from materials that are targeted to early childhood development standards.

### **Audience/Participants**

This project was not designed for a specific class but as an add-on resource to guide teachers in facilitating outdoor learning opportunities for their neurodiverse students. The activity guide enables teachers to incorporate outdoor learning that fits into their class schedules at a time and place that is appropriate for their students. While the activities are designed for students, the audience that will access this resource is special education teachers. Teachers are frequently pressed for time; as noted in the literature, many feel unprepared to guide outdoor learning. This project will address and accommodate the needs of special education teachers by being easy to access, clearly communicating learning objectives, and being simple enough to implement in a shorter time frame.

The students who participate in outdoor learning opportunities have a wide range of needs and abilities. Not all students will be able to access all outdoor learning opportunities, and some will require additional instruction on how to learn safely in outdoor settings. However, this program intends to allow teachers to select activities that are appropriate for their students.

### **Assessment of Effectiveness**

To ensure that the outdoor activities meet the NAAEE *Guidelines for Excellence guidelines*, I will use NAAEE's *Early Childhood Environmental Education Rating Scale (ECEERS)*. ECEERS is a formative assessment tool used to evaluate how outdoor learning programs align with outdoor learning guidelines developed by the NAAEE. To assess how teachers use the outdoor learning activities, a survey will be used for teachers to evaluate the outdoor learning activities. The survey will ask teachers how often they accessed the resource, their ease of use, and their observations of student engagement in outdoor activities. The survey will be sent out using Google Forms. To assess student experiences of the outdoor learning opportunities, I will create a visual formative assessment that enables students to answer questions about the activity and provide feedback.

### **Timeline**

The first three chapters of this project were completed during the spring semester of 2024. During this time, I reviewed the literature relevant to my research question, collected resources to develop my project, and began to outline the framework for the project. After completing chapters one through three, I created working drafts of the outdoor learning activities in late April and May. In the summer semester of 2024,

beginning in June, I completed the drafts of my project for review. After review, I completed the project and a draft of chapter four in July. At the end of summer semester 2024, I submitted the final project and paper in August.

### **Summary**

Chapter three describes the capstone project and the intended use of the project. The chapter details the project design and includes descriptions of the resources that will be used and adapted for neurodiverse students. The chapter also provides an overview of the methods used to develop the project and the intended learning outcomes. The setting for the project and intended audience are also included in the chapter. Also included is a description of how the project will be assessed to measure the use and effectiveness of the outdoor activities. The end of the chapter concludes with a timeline for the completion of the project. Chapter Four will discuss the outcomes and reflections on the development and implementation of the project.

## CHAPTER FOUR

### Conclusion

#### **Learnings From the Capstone Project**

My project aimed to answer the question: *How can special education teachers create outdoor learning opportunities for neurodiverse students?* I set out to determine the most effective way for special education teachers to access and implement outdoor learning for students in unique education settings. As I explored the resources available, I noticed that what is available requires additional adaptations to meet the needs of the students in my school. I work in a federal setting IV district that serves students with higher-level needs and provides highly structured programming that supports equal access to education for neurodiverse students. Many of the students in my district experience learning differences that require additional supplemental supports such as visual schedules, social stories, and visual communication supports. The need to provide extra support led me to explore how I could create outdoor learning experiences that are not only adapted for neurodiverse learners but also provide the support needed to facilitate those experiences.

The research process led me to discover how outdoor learning can benefit neurodiverse students. These benefits include increased social-emotional wellness, focus and attention, and increased physical activity. I noted that the benefits found in the research aligned with the needs of the students I serve. From this research, I began to outline activities that could directly address these benefits and meet my school's early learning standards to measure student progress.

As I began designing these activities, I realized that outdoor learning could also support academic learning in the classroom. I initially did not intend to include academic subjects such as literacy and math; however, I wanted to explore how outdoor learning can support academics. I discovered that outdoor learning opportunities could also supplement academic lessons and enable students to receive the social-emotional and wellness benefits of spending time outdoors. As a licensed and experienced special education teacher educated in environmental education, I am uniquely situated to design outdoor learning that meets the needs of neurodiverse students.

### **The Process**

The first step toward creating outdoor learning activities was to assess potential outdoor learning sites that would be safe and accessible for my students. As I explored that site, I found that different areas could be used depending on student needs. Some students require being closer to the building in a grassy area, while other groups of students could venture out further to nearby greenspaces. Creating activities adaptable to multiple outdoor learning sites was an important first step.

After I identified the appropriate sites for learning, the next step was to determine the early learning standards I wanted to address in each activity and the environmental education guidelines that would align with the activity. I then researched and brainstormed different activities that met those standards. As I reviewed activities from nonprofit organizations such as Project Learning Tree and Greenschool Yards America, I created different versions of these activities that met the needs of neurodiverse students. I then created visual supports accompanying each activity and compiled them into one Google Drive folder for organization.

Once I organized the activities and visual supports into Google Drive folders, I thought that would be sufficient for teachers to access. However, as I used these activities with students, I noticed that having online materials was less efficient than I had hoped. I had the opportunity to practice a few outdoor learning activities during summer school with two groups of 5 neurodiverse students in my setting IV district. One of the big things I discovered was that compiling all lesson materials into bins was much more accessible. These bins facilitated the transition to the outdoor learning areas, and I didn't need to worry about whether I had everything I needed for the activity. I then determined that to implement these activities and make them accessible to other teachers; it would be important to compile these materials into different bins and store them in a central location to create an outdoor learning library.

### **Valuable Literature**

The most valuable works I found in my literature review were from research done by Samantha Freidman. Friedman and other colleagues have authored many studies about how to adapt outdoor learning for neurodiverse learners. Their work *Facilitating Nature-Based Learning With Autistic Students* (Friedman et al., 2023) included many recommendations that guided the creation and structuring of the activities I created. Some of the recommendations include creating structure, routine, and safety. While developing my project, I made sure that I incorporated these elements into the design.

Friedman and their colleague Scott Morison completed a case study titled, *"I just want to stay out there all day": A Case Study of Two Special Educators and Five Autistic Children Learning Outside at School* involving two special education teachers that incorporated outdoor learning into their social skills curriculum. Reading through this

study, in which two special education teachers who were untrained in environmental education were able to guide their students in outdoor learning experiences, provided me with an example of how to create my project. The teachers in this study created outdoor learning opportunities that supplemented their social skills instruction. While their initial attempts were messy and disorganized, as they continued adapting their lessons, they discovered that outdoor learning was an effective way to support the learning that happens inside the classroom.

### **Strengths and Limitations**

This summer, I led a small group of neurodiverse middle school students through the outdoor learning activities I created for this project. Exploring how these learning opportunities could be incorporated into the school day was extremely valuable. Through this experience, I identified certain strengths and limitations that will guide the process of continuing to evolve this project to better meet the student needs.

One of the strengths of this project is that it can be adapted to meet a wide range of student learning styles and needs. Special education teachers can modify activities depending on their classroom needs. For example, I created a lesson incorporating physical activity and sensory elements using a station format. Students participated in frog-themed activities that supplemented classroom lessons about frogs. While I intended for students to follow the stations in order, they were more engaged when they could explore each station at their own pace. This example demonstrates that while structure is important, creating activities that allow for flexibility in instruction assists teachers in leading activities in a way that meets the specific needs of their students.



One limitation I encountered was that many students required additional practice transitioning to outdoor learning spaces. Because outdoor learning is not part of the typical daily schedule, the students had challenges remaining in the outdoor learning space and were easily distracted by other stimuli outdoors. The challenges with the transition to outdoor learning meant additional pre-teaching of transitioning and learning outdoors is needed to guide effective instruction outdoors.

Another limitation I discovered was the need for adequate staffing during outdoor learning. With the support of additional staff, it was easier to maintain student engagement and prevent students from eloping from the site. Pre-teaching outdoor learning expectations could alleviate the need for more staff support. However, students with higher levels of need require more staff support, which may only sometimes be possible. During one of my outdoor lessons, I needed more staff support, and the students scattered all over the schoolyard. I spent more time chasing after students than guiding the lesson. For the outdoor learning activities to be successful, it is essential to be flexible and provide these opportunities on days when classrooms are fully staffed.

### **Possible Future Work**

The implications of this project are that more students will be able to access outdoor learning. The state of Minnesota's "Children's Outdoor Bill of Rights" initiative strives to give every learner in the state an opportunity to experience learning outdoors. This project is one step towards creating more inclusive and accessible outdoor learning opportunities. I hope this project will continue to expand and that different school programs within my district will start to implement outdoor learning into their school day.

A future expansion of this project could involve collecting data to measure the impact of outdoor learning on neurodiverse students. Measuring student engagement, attention and focus in the classroom, and emotional regulation would provide teachers with information on whether outdoor learning benefits their student populations. In addition, since these activities align with early learning standards, some of this data could measure how outdoor learning can support student Individualized Education Plan (IEP) goals and objectives.

Creating this project has allowed me to see how outdoor learning opportunities can address all areas of student learning. Providing neurodiverse students with enrichment in outdoor spaces should be a regular part of the school curriculum. The many benefits of being outdoors, coupled with the limitless possibilities for learning, have inspired me to continue to grow this project and share it with other teachers in my school building by creating an outdoor learning library. Ultimately, I hope that our school building will become a model for how special education teachers can create outdoor learning opportunities for all of their students.

## References

- Barakat, H. A. E. R., Bakr, A., & El-Sayad, Z. (2019). Nature as a healer for autistic children. *Alexandria Engineering Journal*, 58(1), 353-366.  
<https://doi.org/10.1016/j.aej.2018.10.014>
- Baumer, M., & Julia Frueh, M. (2021, November 23). *What is neurodiversity?*. Harvard Health. <https://www.health.harvard.edu/blog/what-is-neurodiversity>
- Bradley, K., & Male, D. (2017). Forest School is muddy and I like it”: Perspectives of young children with autism spectrum disorders, their parents and educational professionals. *Educational and Child Psychology*, 34(2), 80-96.  
<https://doi.org/10.53841/bpsecp.2017.34.2.80>
- Brown, L. (2024). *Identity-first language*. Identity First Language.  
<https://autisticadvocacy.org/about-asan/identity-first-language/>
- Chawla, L. (2015). Benefits of nature contact for children. *Journal of planning literature*, 30(4), 433-452. <https://doi.org/10.1177/0885412215595441>
- Dring, C. C., Lee, S. Y., & Rideout, C. A. (2020). Public school teachers’ perceptions of what promotes or hinders their use of outdoor learning spaces. *Learning Environments Research*, 23(3), 369-378.  
<https://doi.org/10.1007/s10984-020-09310-5>
- Dunst, Carl J. (2020). Revisiting Rethinking Early Intervention. *Topics in Early Childhood Special Education* 20 (2): 95-103.  
<https://doi.org/10.1002/9780470755778.ch10>

Dupuis, J., & Jacobs, D. (2021). Making Environmental Education Accessible for All Students: Inclusion of students with emotional and behavioral disabilities.

*Journal of Science Education for Students with Disabilities*, 24(1), 4.

DOI: 10.14448/jsesd.13.0004

*Early Childhood Environmental Education Programs : Guidelines for Excellence.*

(2016). NAAEE, North American Association For Environmental Education.

*Early Childhood Environmental Education Rating Scale (ECEERS).* (2015). NAAEE,

North American Association For Environmental Education.

Erickson, Deanna M. (2012). *The Effects of Outdoor Education Mentoring on Teacher*

*Job Satisfaction* (Unpublished master's thesis). University of Minnesota Duluth.

*Environmental Education Materials: Guidelines for Excellence.* (2021).

NAAEE, North American Association for Environmental Education.

Fan, M. S. N., Li, W. H. C., Ho, L. L. K., Phiri, L., & Choi, K. C. (2023). Nature-Based

Interventions for Autistic Children: A Systematic Review and

Meta-Analysis. *JAMA Network Open*, 6(12), e2346715-e2346715.

doi:10.1001/jamanetworkopen.2023.46715

Friedman, S., Gibson, J., Jones, C., & Hughes, C. (2022). ‘A new adventure’: a case

study of autistic children at Forest School. *Journal of Adventure Education and*

*Outdoor Learning*, 1-17. <https://doi.org/10.1080/14729679.2022.2115522>

Friedman, S., James, M., Brocklebank, J., Cox, S., & Morrison, S. (2023). Facilitating

Nature-Based Learning With Autistic Students. *Childhood Education*,

99(4), 14-23. <https://doi.org/10.1080/00094056.2023.2232275>

- Friedman, S., & Morrison, S. A. (2021, May). "I just want to stay out there all day": A Case Study of Two Special Educators and Five Autistic Children Learning Outside at School. In *Frontiers in Education* (Vol. 6, p. 668991). Frontiers Media SA. <https://doi.org/10.3389/feduc.2021.668991>
- Friedman, S., Noble, R., Archer, S., Gibson, J., & Hughes, C. (2023). Respite and connection: Autistic adults' reflections upon nature and well-being during the Covid-19 pandemic. *Autism*, 27(8), 2483-2495. <https://doi.org/10.1177/13623613231166462>
- Green Schoolyards America*. (n.d.). Green Schoolyards America. <https://www.greenschoolyards.org/>
- Hanscom, A. J., & Louv, R. (2016a). *Balanced and barefoot: How Unrestricted Outdoor Play Makes for Strong, Confident, and Capable Children*. New Harbinger Publications, Inc.
- Kenny L., Hattersley C., Molins B., Buckley C., Povey C., and Pellicano E. (2016). Which Terms Should Be Used to Describe Autism? Perspectives from the UK Autism Community. *Autism*, 20 (4), 442-462. doi:10.1177/1362361315588200
- Lappa, C., Kyparissos, N., & Paraskevopoulos, S. (2017). Environmental education at the special school: Opinions of special education teachers. *Natural sciences education*, 46(1), 1-10. <https://doi.org/10.4195/nse2017.02.0004>
- LEARNING IS IN OUR NATURE - Project Learning Tree*. (2021, June 30). Project Learning Tree. <https://www.plt.org/>

- Li, D., Larsen, L., Yang, Y., Wang, L., Zhai, Y., & Sullivan, W. C. (2019). Exposure to nature for children with autism spectrum disorder: Benefits, caveats, and barriers. *Health & Place, 55*, 71-79. doi: 10.1016/j.healthplace.2018.11.005
- Marco, E. J., Hinkley, L. B., Hill, S. S., & Nagarajan, S. S. (2011). Sensory processing in autism: a review of neurophysiologic findings. *Pediatric research, 69*(8), 48-54. <https://doi.org/10.1203/PDR.0b013e3182130c54>
- National Outdoor Learning Initiative. (2022). *Where Do We Begin? A Toolkit to Move Learning Outdoors*. [www.greenschoolyards.org/libray](http://www.greenschoolyards.org/libray)
- Nel, A., Joubert, I., & Hartell, C. (2017). Teachers' perceptions on the design and use of an outdoor learning environment for sensory and motor stimulation. *South African Journal of Childhood Education, 7*(1), 1-11. <https://doi.org/10.4102/sajce.v7i1.482>
- Ohly, H., White, M. P., Wheeler, B. W., Bethel, A., Ukoumunne, O. C., Nikolaou, V., & Garside, R. (2016). Attention restoration theory: A systematic review of the attention restoration potential of exposure to natural environments. *Journal of Toxicology and Environmental Health, Part B, 19*(7), 305–343. <https://doi.org/10.1080/10937404.2016.1196155>
- Park, E.-Y., & Shin, M. (2020). A meta-analysis of Special Education Teachers' burnout. *SAGE Open, 10*(2), 215824402091829. <https://doi.org/10.1177/2158244020918297>

- Patchen, A. K., Rakow, D. A., Wells, N. M., Hillson, S., & Meredith, G. R. (2024).  
Barriers to children's outdoor time: teachers' and principals' experiences in  
elementary schools. *Environmental Education Research*, 30(1), 16-36.  
<https://doi.org/10.1080/13504622.2022.2099530>
- Ridderinkhof, A., de Bruin, E., Van den Driesschen, S., & Bögels, S. M. (2020).  
Attention in children with autism spectrum disorder and the effects of a  
mindfulness-based program. *Journal of attention disorders*, 24(5), 681-692.  
<https://doi.org/10.1177/1087054718797428>
- Rote, L. (2023, February 9). *Unmasking my autism: How outdoor recreation forces me to  
be myself*. Unmasking My Autism: How Outdoor Recreation Forces Me to Be  
Myself.
- Salsabila, S., & Muna, Z. F. L. (2023). Analysis of Nature-Based-Learning for Children  
with Autism Spectrum Disorder in Elementary School Age: A Systematic  
Review. *Special and Inclusive Education Journal (SPECIAL)*, 4(1), 50-55.  
<https://doi.org/10.32003/igge.911409>
- Sarivaara, E. K., Keskitalo, P., Satu-Maarit, K., Lakkala, S., & Kunnari, A. (2022). Let's  
go out! A group-based intervention in outdoor adventure education as a special  
educational support. <http://dx.doi.org/10.46827/ejes.v9i9.4443>
- Slobodin, O., Heffler, K. F., & Davidovitch, M. (2019). Screen media and autism  
spectrum disorder: a systematic literature review. *Journal of Developmental &  
Behavioral Pediatrics*, 40(4), 303-311.  
<https://doi.org/10.1097/dbp.0000000000000654>

- Sterman, J., Naughton, G., Froude, E., Villeneuve, M., Beetham, K., Wyver, S., & Bundy, A. (2016). Outdoor play decisions by caregivers of children with disabilities: A systematic review of qualitative studies. *Journal of Developmental and Physical Disabilities, 28*, 931-957. <https://doi.org/10.1007/s10882-016-9517-x>
- Szczytko, R., Carrier, S. J., & Stevenson, K. T. (2018, June). Impacts of outdoor environmental education on teacher reports of attention, behavior, and learning outcomes for students with emotional, cognitive, and behavioral disabilities. In *Frontiers in Education* (Vol. 3, p. 46). Frontiers Media SA. <https://doi.org/10.3389/feduc.2018.00046>
- Waite, S. (2009, April). Outdoor learning for children aged 2–11: Perceived barriers, potential solutions. In *Fourth international outdoor education research conference, La Trobe university, Beechworth, Victoria, Australia* (Vol. 15, p. 18).
- Wilson, Ruth (2023). Naturally Inclusive: Engaging Children of All Abilities Outdoors. *Children, Youth and Environments, 33*(3), 198-200.
- Wooldridge, S. (2023, April 19). *Writing Respectfully: Person-First and Identity-First Language*. National Institutes of Health. [Science, Health, and Public Trust | National Institutes of Health \(NIH\)](https://www.nih.gov/science-health-and-public-trust/national-institutes-health-nih)
- Zachor, D. A., Vardi, S., Baron-Eitan, S., Brodai-Meir, I., Ginossar, N., & Ben-Itzhak, E. (2017). The effectiveness of an outdoor adventure programme for young children with autism spectrum disorder: A controlled study. *Developmental Medicine & Child Neurology, 59*(5), 550-556. <https://doi.org/10.1111/dmcn.13337>



