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## **Nature's Classroom: Designing a Practical Environmental Education Curriculum**

Kendra Karwacki

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Nature's Classroom: Designing a Practical Environmental Education Curriculum

by

Kendra Karwacki

A capstone project submitted in partial fulfillment of the requirements for the degree of  
Masters of Arts in Education: Natural Science and Environmental Education.

Hamline University

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## CHAPTER ONE

### Introduction

#### Overview

One fall day, two students from the after-school farm program picked up a walnut on the ground. They spent the next 45 minutes brainstorming and experimenting with different techniques to open it. I have never been happier for students to ignore the planned activity. The sense of joy and accomplishment the students felt when they finally got the walnut open and could investigate the inside was unsurpassed. It is this type of authentic inquiry-based learning experience that makes environmental education poignant and motivating.

However, implementing environmental education programs in public schools faces many barriers. The research question came from my struggles with practicality: *What factors do informal educators need to consider when developing environmental education curricula for formal primary education settings?* In the long term, I aspire to create a collection of practical and high-quality curricula for various grade levels for teachers to implement in public classrooms in a similar geographic area. However, for this capstone, the target audience is K-2 classrooms. The emphasis is being placed on programs that are practical to implement and do not put extra responsibilities on already overworked teachers.

This chapter focuses on my experiences with environmental and outdoor education and how they influenced me—followed by my professional experience as a teacher and the ensuing belief in the need for environmental education to combat the

environmental crisis. Finally, the last topic reviews some of the curricula and programs that influenced the design and structure of the environmental education program.

### **Personal Journey**

A field trip to a local nature center began my journey into environmental education. I was fortunate to experience annual school outings to learn about the local flora and fauna from knowledgeable and engaging naturalists in my home state of Minnesota. Based on the formal school experience, I also begged my parents to attend summer camps there. Over ten years, the most meaningful camp experience was a summer focused on habitat restoration. The campers actively worked on restoring the natural wetland and deciduous forest habitats, including removing invasive species and building nesting habitats for native bird species. For years afterward, when hiking around the nature center, I felt such a sense of accomplishment and agency that my actions contributed to a beloved green space.

After participating in years of camp, I became a Junior Naturalist, or youth volunteer, at the same nature center. The experience of assisting summer camp programs led to a passion for outdoor education and recreation, working with children outdoors, and sharing ecological and cultural knowledge. I learned about working with kids, developed informal education programs, and improved my ecosystem knowledge there. Based on this experience, working with children outdoors became a passion, which led me to join an overnight summer camp as both a cabin counselor and a climbing instructor. My time at summer camp focused more on outdoor recreation and social-emotional learning (SEL). Youth often would transform from apprehension, even

terror, to pride as they overcame their fear of horse riding or rock wall climbing. It was clear that outdoor recreation is a vessel for emotional growth.

Based on the experience of working with children, I began working as a primary teacher with underprivileged students in an inner-city school district. Despite best efforts, there were too many barriers to developing and implementing a rigorous environmental education program in the classroom. These obstacles are expanded on later in this chapter. I want to use this project to research why so many teachers face these challenges and how I, as an informal science educator, can make this process more accessible.

### **Professional Rational**

To quote the viral protest sign, “1. It’s Warming 2. It’s US 3. We’re Sure 4. It’s Bad 5. We Can Fix It” (McKibben, 2016). In the current era, we expect severe weather. Every year, hurricanes, fires, droughts, and floods worsen, causing a staggering loss of human life and economic and environmental devastation (International Panel on Climate Change [IPCC], 2022). Often, the most vulnerable populations are experiencing the most disastrous impacts of climate change, further increasing local, national, and global economic and health disparities.

With the importance of addressing climate indisputably, education is a central tool to address this crisis. The United Nations, in 2015, stressed the importance of environmental education in not one but two of its Sustainable Development goals. Within Goal Four about providing quality education is the target “by 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles” (p. 21, 2015). Furthermore, in Goal Thirteen on addressing climate change,

world leaders stressed the need to “improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.” (p. 27, 2015). In 2021, the UNESCO World Conference on Education for Sustainable Development adopted the Berlin Declaration on Education for Sustainable Development. Further, it elaborated on the power of education to address environmental emergencies:

We are confident that education is a powerful enabler of positive change of mindsets and worldviews and that it can support the integration of all dimensions of sustainable development, of economy, society and the environment, ensuring that development trajectories are not exclusively orientated towards economic growth to the detriment of the planet, but towards the well-being of all within planetary boundaries. (United Nations Educational, Scientific and Cultural Organization. ([UNESCO], 2021, p. 1)

In light of the environmental crisis, educators must reach as many people as possible with environmental education. Public education teachers are uniquely positioned to influence a large cross-section of society and make positive changes.

Despite being very aware of the need for bringing environmental education into the classroom, teachers need support with implementing new environment-based science curriculums. The first hurdle I encountered in the classroom was finding time during the school year to implement an EE program during the school year. Since the passage of No Child Left Behind (NCLB), schools have emphasized reading and math instruction for students to pass standardized testing (Ravitch, 2010). Funding and resources were other challenges I encountered when building and implementing an EE curriculum for my

students. Funding shortages made me spend hundreds of dollars out of my pocket every year for basic supplies. The additional idea of buying all necessary materials for EE materials was too large an imposition. The National Education Association supported this anecdote and estimated that for the 2022-2023 school year, teachers will spend, on average, \$820 for school supplies (Litvinov, 2022). Additionally, many teachers need more background knowledge about environmental processes, issues, and the evolving science behind climate change to teach students effectively (Meighan & Rubenstein, 2019). These factors provide barriers to implementing environmental education curricula in schools.

In addition to obstacles specific to environmental education, I encountered many challenges implementing all new curricula in the classroom. First, teachers need more training and professional development to prepare to implement a new curriculum. Moreover, even when programs offer professional development, it is often a one-time event that leaves teachers struggling once they begin using a new curriculum. Additionally, the time it takes to review and prepare a new curriculum is very time-consuming. In the current era of education, expectations on teachers are increasing, and the additional requirements for learning new curricula are time prohibitive. Finally, purchasing a new curriculum and its materials can be prohibitively expensive for schools' and teachers' budgets. The cost requirement often increases the disparity between affluent and economically disadvantaged students' access to environmental education programs.

As a classroom teacher, I initially desired to create an environmental education program for my students. Unfortunately, because of the regular responsibilities of a

teacher, there was never time to complete the project. I am excited to finally create an environmental education program that addresses the barriers to implementation. This project is just one small way to change attitudes and address climate change (UNESCO, 2021).

### **Existing Resources**

One of the modern teaching practices is “do not reinvent the wheel.” So many good ideas and programs exist that creating all lessons, units, and interventions from scratch is inefficient. Instead, teachers adapt high-quality materials to fit the specific needs of their students and classrooms. Respectively, many existing programs inspired this project in terms of structure and content.

#### ***The Illinois Holocaust Museum’s Teaching Trunks***

The Illinois Holocaust Museum’s Teaching Trunks program inspired the structure of the environmental education curriculum program. The museum offers trunks with a premade curriculum “to create meaningful age/grade-appropriate lessons employing award-winning fiction and nonfiction, historical references, and other educational materials” (*Teaching Trunks*, 2022, para. 1). While the content of this program is not related to environmental education, informal educators can replicate the structure in other fields. The museum provides trunks for different grade bands (K-2, 3-4, 5-6, 7-12) with different areas of focus to provide age-appropriate activities and concepts around the topic of the Holocaust. Additionally, the physical trunks come with all materials required to fully implement the unit in the classroom, including lesson plans, reading materials, and artifacts. By providing all necessary materials, the educator spends less time planning

and prepping for the unit, making implementation faster and improving fidelity.

Additionally, the trunks are free to schools to increase access to underserved schools.

### ***Driven to Discover***

Driven to Discover is a program presented by the University of Minnesota that offers tools and resources that “support student engagement in ecology-based citizen science and science practices: asking questions and defining problems, planning and carrying out investigations, and communicating findings” (Thompson et al., 2018, para. 1). They have a variety of programs, mainly aimed at middle school-age youth, that educators can use in both formal and informal educational settings. It includes detailed lesson plans, timelines, and standards but requires the educator or school to provide additional, often consumable, materials. The activities get participants outside doing the process of citizen science with the flexibility to allow students to choose topics to research their interests. The units are free to download, and the University offers optional teaching and coaching for a fee.

### ***Other Environmental Education Curriculum***

Since the 1977 Intergovernmental Conference on Environmental Education in Tbilisi and the increasing awareness of the need for immediate and drastic action to prevent climate change and preserve our world, many curriculums and programs have been created to address this. The quality and target audience of these programs varies greatly. The number of programs and individual activities can overwhelm educators looking to incorporate environmental education into their instruction for the first time. Additionally, some famous, high-quality programs require paid training before implementation. While this model improves fidelity for usage, it also is a barrier for

teachers who are already overwhelmed with their current work level or in underserved communities where the cost makes the program inaccessible.

## **Summary**

As a youth, I experienced the many benefits of environmental education. Later, as a teacher, I wanted to expose students to the same positive experiences for personal development and the need for education to address the climate crisis. However, too many barriers existed, and this aspiration was never attained. As an informal educator, I am interested in making an EE program functional in a traditional school setting by answering the research question: *What factors do informal educators need to consider when developing environmental education curricula for formal primary education settings?*

In chapter two, this paper will explore the research around effective environmental education, curriculum development, and faithful curriculum implementation. Chapter three outlines the development process for a practical and feasible formal settings environmental education curriculum. Finally, chapter four reflects on the curriculum development process and addresses the next steps for implementation.

## CHAPTER 2

### Literature Review

#### Introduction

Children spent increasingly less time outside and more time in front of screens (Sigman, 2019). This trend created a generation of children who increasingly feel separate from the places they call home (Louv, 2008). Environmental education (EE) was a tool teachers used to meet students' developmental needs for time spent in green space while still teaching rigorous content. However, environmental education pedagogy drastically differed from the traditional teaching methods teachers were familiar with and added additional expectations to teachers' already overfilled workload. This project looked to answer the question: *What factors do informal educators need to consider when developing environmental education curricula for formal primary education settings?* Environmental education was a broad discipline that combined various smaller fields. According to the North American Association for Environmental Education (NAAEE), EE was "a process that helps individuals, communities, and organizations learn more about the environment, develop skills to investigate their environment and to make intelligent, informed decisions about how they can help take care of it" (North American Association for Environmental Education [NAAEE], p. 8, 2012). Environmental education aimed to improve environmental literacy, a person's ability to make informed decisions based on ecological concerns (2012).

Within the field of EE, many subfields focused on more specific goals. One subfield was climate education, which focused on the causes and effects of climate change and strategies for mitigation and adaptation (UNESCO, n.d.). A related subfield

was sustainability education or education for sustainable development. Sustainability education was similar to climate education, emphasizing learning and implementing solutions to ongoing environmental problems, but put more emphasis on solutions (Southern Oregon University, 2021). Additionally, traditional environmental science courses and environment-based education (EBE) fell under EE. The primary difference was that environmental science usually used traditional classroom-based teaching methods, and EBE focused on learning about local ecological systems and issues and implementing real-life solutions (Ernst, 2009). Outdoor education, any form of education that happens outside, was often integrated with EE but can be any education that happens outside, not just about the environment. Finally, outdoor recreation, “activities that occur outdoors in an urban and man-made environment as well as those activities traditionally associated with the natural environment” (Phipps, 1991, p. 1), is often combined with environmental education. Each different facet of EE had different associated outcomes and challenges. For this project, because the target participants were five to eight-year-olds, the focus was incorporating outdoor education with EE in a formal education setting.

The literature review discusses several topics about incorporating EE into the formal classroom. The first topic addresses the benefits of EE programs to explain why EE should take up precious learning time and convince skeptics that it is essential. Second, the paper addresses the barriers to incorporating EE with formal schooling and identifies possible solutions. The final subtopic provides an overview of three models for EE programs that influenced this project, their unique characteristics, and their benefits: place-based education, nature journaling, and community partnerships.

## **Benefits of Environmental Education**

Given the myriad environmental and societal crises, various governmental and non-governmental organizations presented EE as a powerful tool for creating a just and sustainable world. Environmental education first became a focus of international attention during the Intergovernmental Conference on Environmental Education. The Belgrade Charter in 1975 laid out the definition of EE as

To develop a world population aware of and concerned about the environment and its associated problems and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions to current problems and the prevention of new ones. (UNESCO, 1975)

Over the last 46 years, the significant addition to this definition was the inclusion of sustainable development. The Berlin Declaration on Education for Sustainable Development framed the goals of EE as addressing "the climate crisis, mass loss of biodiversity, pollution, pandemic diseases, extreme poverty and inequalities, violent conflicts, and other environmental, social and economic crises that endanger life on our planet" (UNESCO, 2021, p. 1). The intersectionality of environmental, social, and economic concerns was the heart of the modern EE movement.

The primary goal of EE was to address the environmental crisis and its relationship to societal and economic hardships. However, EE had other positive educational outcomes. This literature review will also discuss EE's benefits on participants' academic achievement, social-emotional learning, and physical health.

## ***Environmental Improvement***

Environmental Education's goal is to improve the natural environment and human communities. Environmental Education was built on three pillars to reach this goal: knowledge, attitudes, and skills. If all three goals were met, the desired outcome was pro-environmental behavior, which benefits both the human and the more-than-human world. The more-than-human world is a view of the world that critically reminds readers that the natural world has intrinsic value and the power to influence the human world.

**Knowledge.** The first goal of an EE program was for the participants to gain a deeper understanding of the environment, the impact of human actions on the environment, and possible solutions to those impacts. According to Ardoin et al. (2018), 68% of studies on the outcomes of EE programs analyzed changes in environmental knowledge. Of those studies, 98% identified a positive correlation between participation in EE programs and an increased understanding of environmental science and its related fields (Ardoin et al., 2018). Studies of various outdoor EE programs showed increased environmental knowledge using pre-and post-tests in plant identification and care, environmental degradation and invasive species, and ecosystem relationships (Bogner, 1998; Fančovičová & Prokop, 2011; Farmer, Knapp, & Benton, 2007). Environmental education programs, especially those held outdoors, were reliable places to teach participants knowledge about ecology.

Participants in EE programs not only gained expertise in environmental areas but also retained that knowledge. Bogner (1998) argued that participants in an EE program held in a national park retained information one month after the program. Farmer, Knapp, and Benton (2007) expanded on the findings and determined that fourth graders who

participated in a one-day EE program at a national park recalled key takeaways one year later. Both of these studies covered short-term programs, and long-term knowledge retention is encouraging for the impact of EE programming.

**Attitudes.** The second element of EE was changing attitudes toward the environment. According to a literature review, 61% of studies of EE programs reviewed participants' attitudes or dispositions toward the environment, and 86% found an increase in pro-environmental attitudes (Ardoin et al., 2018). Participation in EE correlated with more positive reported attitudes toward the environment (Ballantyne & Packer, 2002). Farmer, Knapp, and Benton (2007) established that this positive correlation continued for at least a year after participation in the EE program. However, they could not discount other influences contributing to the students' pro-environmental attitudes. Furthermore, young children often had negative attitudes toward nature because of fear (Chambers & Radbourne, 2014). Outdoor EE programs effectively changed those perceptions and instilled an “ethic of care and respect for the more-than-human world” (2014, p. 124). More specifically, hands-on outdoor activities caused long-term positive attitudes toward the project they engaged in (Fančovičová & Prokop, 2011). Finally, EE exposed participants to various branches of science and improved students' attitudes toward future careers in environmental science-related fields (2011; Ward et al., 2016). These firsthand activities and experiences in green spaces in EE created pro-environmental attitudes and were an essential pillar towards pro-environmental behavior.

**Skills.** The third established facet of EE was developing relevant skills. A literature review concluded that 26% of EE program studies looked at skill development, and of those programs, 90% identified a positive relationship between participation in EE

programs and science skill development. Frequently the skills developed were specific to the EE program hands-on activities, such as developing gardening skills, identifying species, and using science tools (Chambers & Radbourne, 2014; Fančovičová & Prokop, 2011; Newman et al., 2010; Ruiz-Gallardo, Verde, & Valdés, 2013). Further, participants in EE programs developed a better understanding of the scientific method. Ward et al. (2016) discovered that high school students who participated in an inquiry-based EE program had a more robust understanding of the scientific method, generated better hypotheses, and designed better research projects. With K-12 students, Bourdeau and Arnold (2022) suggested that hands-on, student-led exploration of aquatic creatures will help students understand the inquiry cycle thoroughly; however, this was just a suggestion that researchers have yet to study empirically. Miller (2007) noticed that children in nature-based early-childhood programs began to develop the ability to ask research questions and conduct experiments by following their natural curiosity for the natural world. Regardless of age, student-centered EE programs facilitated the development of science skills that apply to situations outside the program.

**Pro-Environmental Behavior.** Knowledge, attitudes, and skills are the three base pillars of EE to reach the outcome of creating pro-environmental behavior. The literature has explored the relationship between EE and pro-environmental behavior less extensively than other outcomes. In a literature review, Byerly et al. (2022) observed mixed results in a review of 36 education-based behavioral interventions. However, Ardoin et al. (2018) discovered that 83% of studies found a positive correlation between EE and pro-environmental behavior. In the research that supports a connection between EE and pro-environmental behavior, Ballantyne and Packer (2002) identified that outdoor

EE led 41% of youth participants to desire to change their behavior in natural areas and their households to impact the environment positively. Wells and Lekies (2006) proposed that EE alone does not cause long-term pro-environmental behaviors; instead, the critical influence was childhood participation in wild and domesticated nature spaces. So far, the evidence was inconclusive but promising about the direct impact of EE on long-term pro-environmental behavior. However, emphasizing time spent outdoors within EE programs closed the disparity and increased the likelihood of EE programs being an effective catalyst for promoting pro-environmental behavior.

### ***Academic Improvement***

Schools were under immense pressure to prepare students for college and careers, as measured by standardized test scores, as will be addressed later in this literature review. Considering that requirement, including an EE curriculum in schools positively impacted students' academic performance and the development of necessary academic skills determined by state-mandated reading, writing, math, and science standards.

**Academic Performance.** When formal school systems implemented EE programs, students displayed improved academic performance. In an era of accountability, standardized test scores and student achievement were significant determining factors in curriculum implementation. For instance, when Vermont schools implemented EE programs, students performed better on standardized tests in all subject areas (Ghent et al., 2014). This direct and indirect test score improvement may be linked to how EE programs provided a meaningful context for standards-based learning in science, reading, math, and writing (Eick, 2012). Sobel (2020) provided an example of regular journaling after outdoor nature exploration motivated the students to write more,

and teachers noted improved writing abilities. Additionally, research shows that EE programs helped girls maintain science grades and not lag behind their male peers during adolescence (Stevenson et al., 2021). While it may seem that spending time on EE programs in schools would reduce students' time on core subjects, the interdisciplinary nature of EE and its high engagement improved student achievement.

**Academic Skills.** Beyond standardized tests, many educators were concerned about students learning critical academic skills that can be used in the classroom and beyond. In a study of 400 high school students across 11 schools across socio-economic status and location, students enrolled in school-based EE programs had higher self-efficacy, control, goal orientation, and task value, collectively defined as achievement motivation (Ernst & Monroe, 2004). Additionally, EE improved engagement and attendance with school (Chambers & Radbourne, 2014). This trend was particularly effective with specific demographic groups, including boys and indigenous students (2014). Teachers saw these improvements across subject areas by improving achievement motivation and student engagement, not just during the EE program. These programs also improved higher-level academic skills, including critical thinking and inferring (Ernst & Monroe, 2004; Chambers & Radbourne, 2014). Similarly, students showed skill transference, the ability to apply skills learned in one environment to another (2014). Considering the variety of academic skills students can learn and improve through EE and transfer to other subject areas within formal schooling and without, it was worthwhile to spend academic time on EE.

### ***Social-Emotional Learning (SEL)***

Many schools have become increasingly concerned about students' social-emotional learning (SEL) after the lockdowns and virtual learning during the COVID-19 pandemic. The Collaborative for Academic, Social, and Emotional Learning (2022) defined SEL as,

The process through which [people] acquire and apply the knowledge, skills, and attitudes to develop healthy identities, manage emotions and achieve personal and collective goals, feel and show empathy for others, establish and maintain supportive relationships, and make responsible and caring decisions. (para 1.)

Due to the student-centered nature of EE, it was an opportunity to build SEL skills in school. Research showed that EE programs help students manage their emotions and develop empathy. Parents of children involved in Forest Fridays, a program where students spent multiple hours outside on academic and non-academic activities every Friday, anecdotally described their children as happier than before (Sobel, 2020). In more rigorous studies, students showed increased empathy, self-esteem, and self-confidence levels when involved in EE programs (Chambers & Radbourne, 2014; Ruiz-Gallardo, Verde, & Valdés, 2013). Therefore, EE programs were an effective tool for helping students develop healthy emotional skills.

Environmental education programs also helped build strong relationships and school communities. Sixth-grade students participating in EE developed robust relationships with one another and built vital relationship-building skills, such as communication, group problem-solving, and dispute resolution (Sobel, 2020). These relationships went beyond a single classroom. A school community garden encouraged students across grade levels to voluntarily work together during recess (Chambers &

Radbourne, 2014). Altogether, strong relationships within a school and between the school and the larger community can be developed during EE programs.

This increase in pro-social behavior during EE program participation also decreased disruptive behavior throughout the school day (Ruiz-Gallardo, Verde, & Valdés, 2013). In addition, Ruiz-Gallardo, Verde, and Valdés (2013) noticed that garden-based educational programs with at-risk high school students decreased school failure and dropout rates.

Environmental Education proved to be a potent context for SEL learning, particularly in emotional regulation, relationship building, and promoting pro-social behavior.

### ***Physical Health***

A final benefit of EE was the positive impact on participants' physical health. Although there were not many studies on the impacts of EE on physical activity, the published studies noticed that 83% of studies concluded a statistically significant increase in physical activity or a decrease in sedentary activity (Miller et al., 2021). That was unsurprising, especially for outdoor EE programs such as Forest Fridays, where it was common for students to walk five miles in one school day (Sobel, 2020). Environmental education also encouraged increased exercise outside the program; youth participants reported being more likely to play outside instead of watching TV at home and encouraging their parents to walk to the store instead of driving (Sprague, Berrigan, & Ekenga, 2020). In addition to encouraging physical activity, research showed that EE increases healthy habits. Sprague, Berrigan, and Ekenga (2020) found that garden-based EE participants from urban, low-income communities were likelier to eat more fruits and vegetables. Finally, there was a correlation between providing EE and communities prioritizing having outdoor spaces free from harmful chemicals and providing shade

protection from ultraviolet light (Bell & Dymont, 2008). Expanding EE programs in schools was one tool for meeting state-mandated physical education standards and encouraging students to live healthy lifestyles.

### ***Conclusion***

Including EE in the formal school curriculum was a multifaceted approach to meeting various goals. As a tool for addressing the environmental crisis, EE programs improved participants' knowledge about environmental systems and human impacts, enhanced participants' attitudes towards the natural world, and taught vital science skills. Combined, these three pillars positively influenced pro-environmental behavior. Moreover, EE programs helped students meet necessary goals when incorporated into the school curriculum. Research showed that participation in EE programs improved students' academic performance and taught various academic skills to meet state-mandated reading, writing, math, science, and art standards. Additionally, students built crucial social-emotional skills and developed healthier habits in EE programs.

However, this research did not state that every EE program will necessarily manifest all the possible positive outcomes described in the previous research papers. While developing an EE program, curriculum developers determined the desired outcomes. The lesson plan deliberately included the lessons and activities that directly addressed those desired outcomes.

Despite the many benefits of EE, especially in schools, there were many practical issues with incorporating additional EE programs into the school curriculum. The next topic will identify the significant challenges researchers have pinpointed and possible solutions to said barriers.

## **Barriers to Environmental Education**

Environmental education had a wide range of benefits. However, various barriers slowed the incorporation of EE into formal education. Teachers reported feeling unprepared to teach EE (Meighan & Rubenstein, 2019) and were pressured to deliver high scores on standardized tests (Ernst, 2007, 2009). Additionally, they faced challenges such as a shortage of resources (Ernst, 2007, 2009) and green space (Oberle et al., 2021), scheduling conflicts within the school (Patchen et al., 2022), inadequate preparation time (Blanchet-Cohen & Reilly, 2013), and safety concerns (Ernst, 2012). It was essential to review and address these barriers when building an EE curriculum that centers on the practicality of implementation.

### ***Teacher Preparedness***

Teacher preparedness was the fundamental barrier to implementing EE and outdoor education programs in traditional schools. Educators often reported feeling they need more pedagogical content knowledge to engage students with nature (Meighan & Rubenstein, 2019; Miller et al., 2022; Patchen et al., 2022). Educators of students as young as early childhood felt they need more background knowledge (Ernst, 2012). This lack of confidence resulted from only ten percent of pre-service teachers being exposed to environment-based education practices (Ernst, 2009). Teachers expressed that professional development before and during the implementation of EE programs would address this deficiency (Meighan & Rubenstein, 2019; Barnett et al., 2006). Other surveys added mentoring as a possible avenue to increase teachers' confidence in incorporating EE into their teaching practices (Oberle et al., 2021). The pedagogy in EE

was different from a traditional formal school curriculum. Educating and supporting teachers' move towards EE was essential to successfully incorporating EE in schools.

### ***Focus on Core Curriculum***

Once educators had the knowledge and confidence to incorporate EE into their teaching, the next barrier to overcome was the emphasis on the core curriculum of reading, writing, and math and the correlated standardized testing. The passage of the No Child Left Behind Act (NCLB) in 2002 was intended to hold schools and teachers accountable for student growth, but in reality, it only shifted the focus to test scores at the expense of authentic learning (Ravitch, 2010). Although Congress repealed NCLB in 2015, its influence was still felt in education classrooms in recent years.

The most commonly communicated barrier for EE in the classroom reported by teachers and administrators was the focus on standardized test scores (Ernst, 2007, 2009; Meighan & Rubenstein, 2019). The demand for continuous progress on standardized testing in schools has pressured teachers to dedicate a significant amount of class time to a curriculum that adheres to mandated standards, such as the Common Core State Standards. The focus on a standards-based curriculum reduced the time that teachers can spend on outdoor learning and EE (Oberle et al., 2021; Patchen et al., 2022). The lack of time for EE was a barrier as early as early childhood education programs, where kindergarten preparedness is a focus (Ernst, 2012). Interviewed teachers suggested they would be more likely to use EE materials if they helped meet state standards (Monroe, 2002). In addition to focusing on the core subjects, teachers have seen an increasingly crowded curriculum in recent years, with the expectation that they address various social issues in schools alongside the traditional curriculum (Miller et al., 2022). While the

focus on standards and standardized testing has come under scrutiny, it is essential to consider how EE can incorporate state-mandated standards to increase the appeal of including EE programs in schools.

### ***Resources and Funding***

Upon integrating EE into their curriculum, educators faced the challenge of acquiring additional resources, including curriculum, materials, and funding to cover these expenses. Multiple studies identified funding as a significant obstacle to implementing EBE or EE curriculum (Ernst, 2007, 2009; Meighan & Rubenstein, 2019; Monroe, 2002). Many materials needed to bring students outside were expensive and not readily available in classrooms; teachers stated that they needed help accessing grants (Miller et al., 2022; Patchen et al., 2022). One of the most significant categories of needed materials for implementing EE was gear for taking students outside in inclement weather, such as rain jackets and warm coats (Oberle et al., 2021). Oberle (2021) suggested establishing a gear-lending library across the school to reduce the financial burden of providing students with the necessary gear for outdoor education. Another financial struggle with implementing EE programs was funding transportation to off-site green spaces (Barnett et al., 2006). This barrier will be explored fully in the next subtopic. Considering how informal educators reduced or eliminated financial barriers is essential when developing a practical EE program.

### ***Access to Green Space***

Access to outdoor green spaces where students can participate in EE was essential. However, the lack of funding for transportation was a significant barrier for many schools (Oberle et al., 2021; Meighan & Rubenstein, 2019; Ernst, 2007; Patchen et

al., 2022). While grants can lighten the burden, applying for grants was time-consuming and often did not cover the complete expense (Oberle et al., 2021). It was crucial to tailor the curriculum to be accessible for smaller-scale on-site green spaces to address this barrier (Barnett et al., 2006). It was also essential for environmental educators to assist teachers and administrators in recognizing on-site and local locations for EE (Ernst, 2014). Another barrier in locating appropriate green spaces for school-based EE was considering the medical and physical accessibility for both students and teachers (Patchen et al., 2022). While finding appropriate and accessible green spaces was challenging, programs overcame these challenges by reframing what qualifies as green space with assistance from informal science partners.

### ***Scheduling***

Now that educators have the necessary materials and a location to provide students with outdoor EE, programs and planning must address various logistical barriers. The first logistical challenge is scheduling. Strict schedules mandated by district or administration policies and a lack of flexibility often impeded the ability to teach EE or take students outside to learn (Oberle et al., 2021). Even with flexible schedules and administrative support, aligning student schedules, teacher schedules, and location availability was challenging (Patchen et al., 2022). Additionally, EE looked very different from the regular classroom structure. Schedule changes increased student and teacher stress, leading to increased classroom management concerns, especially for neurodivergent students who rely heavily on regular schedules (2022). Oberle provided a possible solution to addressing concerns about scheduling, “several teachers explained that pre-scheduling outdoor learning throughout the school year is an effective strategy to

ensure consistency and continuity” (Oberle et al., p. 257, 2021). While finding time to include outdoor learning and EE was difficult, careful planning and communication overcame this barrier.

### ***Teacher Planning Time***

As discussed in the subtopic *Scheduling*, careful planning decreased scheduling conflicts. However, relying on additional planning time contributed to the next barrier, a lack of teacher planning time. If teachers were new to EE, implementing it often took considerable planning time, especially in multicultural schools (Blanchet-Cohen & Reilly, 2013). Teachers across the board reported that lack of planning time was a barrier to implementing EE in their classrooms (Ernst, 2009; Meighan & Rubenstein, 2019; Ernst, 2007; Monroe, 2002). School administrators also saw a lack of planning time as a barrier for their teachers to implement EE; one school principal reported, “I think what it takes is some dedicated planning time for people to like- because you know, you get the business of the day-to-day and you got papers to grade and you got all that going on so, I think those are the barriers too. It’s not desire, it’s not capacity. It’s more just like the opportunity to sit down and think it through and plan it out.” (Patchen et al., p. 7, 2022)

The lack of dedicated planning time often led to teachers working on their personal time to prepare for EE lessons (Miller et al., 2022). Educators already have many duties, so it is vital for EE curriculums not to add additional responsibilities for implementation.

### ***Safety Concern***

Once an EE curriculum is ready to be initiated in a school setting, there were still safety concerns about bringing students outside the classroom. A teacher's personal risk tolerance and a school community's risk tolerance affected attitudes toward EE (Oberle et al., 2021). Moreover, teachers overly worried about risks often underestimated the benefits of taking students outside (Meighan & Rubenstein, 2019). Surveys also revealed that concerns about safety and liability from school administrators were significant challenges for EE programs (Ernst, 2012). These fears often manifested as well-meaning but restrictive policies limiting EE opportunities (Patchen et al., 2022). Policies such as strict low adult-to-child ratios, pre-planned screening of volunteers, and guardian consent when leaving school grounds made EE challenging (Oberle et al., 2021; Patchen et al., 2022). Oberle suggested strong relationships with families as an avenue to overcome these barriers but conceded that this strategy perpetuated current inequalities in access to EE (2021).

Other safety concerns existed in the outdoors. Teachers often expressed fears of wildlife, from stinging insects to large carnivores, as barriers to bringing students outside (Oberle et al., 2021; Miller et al., 2022; Patchen et al., 2022). Additionally, urban hazards, such as proximity to busy roads and unsafely discarded needles, provided a challenge for outdoor education (Patchen et al., 2022; Oberle et al., 2021). However, the weather was the most considerable safety concern when taking students into nature. High temperatures, low temperatures, and precipitation contributed to fears when bringing students outdoors. This fear was compounded by the lack of appropriate outerwear (Oberle et al., 2021; Ernst, 2012; Miller et al., 2022). Beyond being uncomfortable,

teachers also needed to consider how inclement weather can exacerbate pre-existing medical conditions (Patchen et al., 2022). However, when teachers asked students about their attitudes toward being outside, they had significantly fewer safety concerns (Miller et al., 2022). A teacher recalled a conversation where “I [the teacher] said to them, “Who’s wet?”, and they all put their hands up, and “Who cares?” and they all shoot their hands down” (Miller et al., p. 11, 2022). There were many and varied safety concerns about bringing students outside for instruction. However, implementing some practical strategies and listening to the students minimized these risks, and the school EE programs achieved many positive outcomes.

### ***Summary***

Unfortunately, the barriers to implementing EE into formal schooling varied. Due to its inherent nature, environmental education significantly differed from the traditional teaching model that many educators were accustomed to. However, the benefits of EE provided a strong case for finding strategies to overcome these challenges. It was the role of informal educators to address these obstacles when designing programs and curricula to streamline and simplify the incorporation of EE into formal instruction.

### **Models**

Environmental education was a wide field of pedagogy and was constructed in various ways based on the target population, specific goals, and time availability. For incorporation into a formal school setting with elementary students, this paper focuses on three models: place-based education, nature journaling, and community partnerships.

### ***Place-Based Education***

Place-Based Education (PBE), also called place-responsive education or pedagogy of place, was an education model that builds on creating a sense of place. Sense of place was the “emotive bonds and attachments people develop or experience in particular locations and environments, at scales ranging from the home to the nation” (Foote & Azaryahu, 2009). PBE provided the context for an EE program by centering the local environment and the relationships between human communities and the more-than-human world (Chambers & Radbourne, 2014). This model emphasized hands-on experiences in and about natural phenomena (Kudryavtsev, Stedman, & Krasny, 2012). Additionally, PBE was multidimensional, incorporating natural science, history, geography, literacy, and writing (Ontong & Le Grange, 2015). A PBE model for EE balanced the goal of influencing positive environmental change and meeting the goals of traditional education.

Place based education was a significant departure from traditional educational pedagogy. It emphasized experiential learning with direct experiences and included instruction and indirect experiences (Kudryavtsev, Stedman, & Krasny, 2012). Active engagement in a place, such as participating in stewardship activities or maintaining community gardens, increased attachment to the specific place and natural spaces (2012). Experiential learning experiences were emphasized because frequent, long-term, positive experiences with green spaces increase place attachment (2012). Sedawi, Assaraf, and Reiss (2021) found that, when exposing participants to unhealthy environments, it was also essential to expose them to healthy ecosystems. Nevertheless, PBE also included a more traditional, instruction-based pedagogy through cultural experiences such as

“stories, myths, literature, promotional materials, folklore, paintings, music, films, history, casual conversations, and memory” (Kudryavtsev, Stedman, & Krasny, 2012, p. 10). Place-based education needed to emphasize cultural and indigenous knowledge in addition to Western science (Sedawi, Assaraf, & Reiss, 2021). The variety of teaching strategies anchored by building a sense of place made PBE an appealing model for school-based EE programs.

Incorporating the PBE model into EE was necessary for effective outcomes. The focus on developing a strong sense of place was assumed to be a decisive determining factor for pro-environmental behavior by providing hope and optimism for positive environmental changes (Kudryavtsev, Stedman, & Krasny, 2012; Sedawi, Assaraf, & Reiss, 2021). PBE also helped bridge the gap between the classroom and the community (Kudryavtsev, Stedman, & Krasny, 2012). By combining the personal, biophysical, political-economic, and sociocultural dimensions of education, PBE provided context and engaged students in EE (Sedawi, Assaraf, & Reiss, 2021). PBE provided a framework for solid and influential EE programs.

### ***Nature Journaling***

Nature journaling was an EE practice in which participants recorded their observations, thoughts, and questions about nature to build creativity, critical thinking, and scientific skills (Cuenca, 2020). While nature journaling invokes an image of white men taking observations of a so-called pristine wilderness, educators used modern nature journaling in any environment, urban, suburban, or rural (Warkentin, 2011). Journaling was an interdisciplinary pedagogy that combined science, literacy, mathematics, and the arts (Hu, 2022). In addition to the traditional academic skill sets, nature journaling

emphasized a whole-child approach to teaching and learning, building various skills alongside the traditional school subjects (2022). Nature journaling was a model for environmental education easily incorporated into formal schooling. It provided a different pedagogical approach that provides opportunities for skill and knowledge development beyond the traditional school priorities.

When incorporated into an EE program, nature journaling incorporated three different focuses. The first was observation-focused nature journaling, emphasizing student-led sensory engagement with green spaces. This emphasis focused on building on a child's natural curiosity and autonomy (2022). The second was relationship building with themselves, other people, and the environment and emphasizing the interconnectedness of the human and more-than-human world (2022). The final style of program-based nature journaling was curriculum connected, using the journaling experience to teach and reinforce knowledge and skills stated in state standards, including literacy, math, and science (2022). EE programs met environmental and educational goals by finding a balance between these three styles of nature journaling.

All styles of nature journaling were strong models for providing positive outcomes for EE programs. Time spent on nature journaling built a personal connection with nature, especially for people with less perceived access to outdoor spaces (Cornell & Ivey, 2012). A personal connection with nature was essential for developing a sense of place and healthy and sustainable behaviors (Hu, 2022). Nature journaling, in formal programming and out, was a vital tool for reaching the aims of EE.

### ***Community Partnerships***

There was limited research about the benefits of or best practices for partnerships between schools and informal education institutions, such as museums or science centers. Informal education institutions provided learning from a constructivist view of education in which real-life experiences build upon previous knowledge to develop new understandings (Badger & Harker, 2016). The constructivist approach aligned well with the theory behind EE and outdoor education. Formal educators have long considered community partnerships a tool to provide resources and authentic student experiences (Lynch, Eilam, & Fluker, 2017). School-community partnerships were also a tool for countering student disengagement in science (2017). Informal institutions provided these experiences because they emphasize local places students are familiar with (2017). Additionally, school-community partnerships provided professional development for teachers and schools wanting to implement EE in their classrooms (Kenney, Militana, & Donohue, 2003). The nature of informal science institutes provided a unique opportunity to create strong partnerships with local schools and further the goals of EE.

One specific tool for connecting schools and informal science institutions was using teaching trunks, sometimes called educational trunks, learning trunks, traveling trunks, teaching boxes, and other related names. Informal education institutes created teaching trunks and shared them with local classrooms focusing on a specific topic in EE, which is often a local environmental issue (Roy, Petty, & Durgin, 1997). These trunks included a wide variety of materials beyond the curriculum, including books, videos, photos, and maps, but also more specific hands-on materials such as puppets, animal pelts, skulls, plaster casts of animal tracks, and scat samples (1997). Teaching trunks

were not meant to replace a science curriculum but to supplement it (1997). The trunks were a tool for informal educational institutions to reach wider audiences and increase accessibility, especially for low-income, minority, or rural schools (Badger & Harker, 2016). They did not serve as a replacement for museum visits but to “expand the geographical and educational outreach” (p. 359, 2016).

However, teaching trunks had some challenges that must be considered when implementing them into an informal educational institute's educational outreach strategy. The primary hurdle was shipping or transportation costs; the trunks are often large and heavy, which can be especially burdensome for rural communities (Roy, Petty & Durgin, 1997). Another cost hurdle was replacing and maintaining the materials that are handled by a large number of classrooms (1997). Finally, researchers interviewed a teacher about their concerns about using teaching trunks and discussed the possible risk that special interest groups might use them to spread misinformation (1997). However, informal educational institutes overcame these hurdles by weighing the concerns against the benefits.

### ***Summary***

Considering and combining various models was essential because some work better in different situations and reach different outcomes. Three models were integrated to create this curriculum project: PBE, nature journaling, and community partnerships. PBE focused on building a sense of place and connection through hands-on experiences. Nature journaling was built on the sense of place, easily connected to various state-mandated standards, and improved academic achievement. Finally, community

partnerships and teaching trunk addressed many logistical barriers when incorporating EE programs into the school curriculum.

## **Conclusion**

Chapter Two reviewed the published literature to answer the research question: *What factors do informal educators need to consider when developing environmental education curricula for formal primary education settings?* Many benefits were explored, including environmental improvement, academic achievement, social-emotional development, and physical health. Then the chapter examined the cultural, pedagogical, and practical barriers to implementing EE programs in formal education. Finally, three models of EE, PBE, nature journaling, and community partnerships were examined, along with their characteristics and benefits.

Chapter three describes the curriculum project designed for this capstone project in detail, explains the curriculum framework, and specifies the intended setting and population for the curriculum's implementation. Additionally, it provides the timeline for curriculum development, and details for assessment are defined.

## CHAPTER THREE

### Project Description

#### Overview

Environmental education (EE) must be expanded to as many participants as possible to tackle the climate crisis and other environmental degradation disasters the planet faces. Formal schooling is an excellent place to incorporate EE because it reaches a larger diverse population and incorporates many of the knowledge and skills, both academic and social-emotional, that schools are already teaching. However, there are a variety of barriers that have kept EE out of schools thus far. This capstone project addressed the question: *What factors do informal educators need to consider when developing environmental education curricula for formal primary education settings?* I developed a curriculum using place-based EE methods and devised tools and strategies to overcome as many barriers as possible, ensuring maximum reach and fidelity to the program.

This chapter describes the curriculum and how it was developed. The chapter begins with a description of the curriculum and the relevant standards. Then it describes the curriculum writing framework used to develop the curriculum, Understanding by Design (UbD) (McTighe & Wiggins, 2004). Next, the chapter overviews the intended audience for using the EE curriculum. After, the timeline for creating this project is explored. Furthermore, the final section reviews how successful the implementation of this program was.

## **Project Description**

This project aims to improve the environment and local communities while students build academic skills in a curriculum accessible to public school teachers. The project centered around getting EE into the classrooms of kindergarten through second-grade students by aligning the curriculum to state and national standards. The curriculum comes in the form of a teaching trunk, which is lent out to schools by an informal educational institution with all necessary materials for implementation already included to decrease the barriers to implementation (Roy, Petty & Durgin, 1997).

There were 14 lessons, each of which took approximately 30 minutes to complete with students, intended to be completed once a week for one semester. Some lessons were newly developed, and some were compiled from existing EE programs. There were a variety of types of lessons. Most lessons focused on tracking phenological changes to a specific specimen or location in a green space around the school. Other lessons expand the focus of nature journaling to the greater local school community. The last month of the program was spent developing a service-learning project to improve the ecosystem in their local community. These three types of lessons combine to create a curriculum that allows students to develop a deep attachment to their local community or sense of place.

The curriculum employed a place-based approach to environmental education, as it has been shown that place-based education (PBE) is effective in fostering a strong sense of place (Sedawi, Assaraf & Reiss, 2021), which is a crucial factor in promoting positive environmental behaviors (Kudryavtsev, Stedman & Krasny, 2012). Additionally, the nature journaling focus also developed the student's sense of place (Cornell & Ivey,

2012), being age-appropriate and easily differentiated for different students' and classrooms' needs.

The program was developed to meet the state-mandated standards for Washington State, including the Common Core State Standards (CCSS) for reading, writing, and math, the Next Generation Science Standards (NGSS) for science, and the Arts K-12 Learning Standards for art. This addressed one of the significant barriers to implementing EE in the classroom, the focus on standards-based instruction (Blanchet-Cohen & Reilly, 2013). By linking EE content with state-mandated standards, that barrier was overcome.

### **Understanding by Design**

The Understanding by Design (UbD) framework was used to develop this unit of study (McTighe & Wiggins, 2004). UbD followed the model of backward design, where the curriculum developer begins with the end outcomes in mind and works backward to design assessments for tracking said outcomes and lessons to lead students to the desired result last (2004). The framework of UbD mixed well with EE because they both prioritize big understandings and skills gained through meaningful, authentic learning experiences (2004).

This curriculum was developed following the three stages identified in UbD: identify desired results, determine acceptable evidence, and plan learning experiences and instruction accordingly (2004). The goals, enduring understandings, essential questions, and knowledge and skills were developed as part of identifying the desired results. Second, performance tasks and rubrics were developed during the determining acceptable evidence stage using the Goal-Role-Audience-Situation-Product, Performance, and Purpose-Standards and Criteria for Success (GRASPS) model. Third, during the plan

learning experiences stage, specific activities were developed using some examples of weekly nature journaling as outlined in Hu (2022), including sit spots, scavenger hunts, winter tree inquiry, and adopt-a-tree while incorporating the state-mandated standards.

Additionally, the curriculum used multiple templates as provided in *Understanding by Design* (2004) or minor modifications. The 6-page template was used as the basis for the unit plan. The 1-page template was used as the basis for the individual lesson plans (2004).

### **Setting and Population**

The place-based nature of this curriculum required it to be specifically designed for a discrete geographical location. This curriculum was designed to be used by classrooms in the Pacific Northwest. The area had access to many city, state, and national parks and state and national forests, so many students had access to green spaces of different types regularly.

The target locations for implementing the curriculum are three neighboring school districts encompassed by a similar ecosystem. The first district was the most suburban of the three districts. It included a total of 21 schools, 13 of which were elementary schools, and served a total of 9,492 students from pre-kindergarten through twelfth grade. Within the district, 63% of students identify as White, 13% as Hispanic or Latino, 12% as mixed race, 8% as Asian or Asian Pacific Islander, 3% as Black, 05% as American Indian or Alaskan Native, and 0.5% as Native Hawaiian or Other Pacific Islander. Additionally, 20% of students qualified for free or reduced lunch, and 3% were multilingual.

The second district was the smallest, with 15 total schools, six of which were elementary schools. It served a total of 6,259 primarily suburban students. Within the district, 70% of

the students identified as white, 14% as Hispanic or Latino, 11% as mixed race, 3% as Asian or Asian Pacific Islanders, 2% as Black, 0.5% as American Indian or Alaskan Native, and 0.5% as Native Hawaiian or Other Pacific Islander. Additionally, 21% of students qualified for free or reduced lunch, and 3% were multilingual.

The final district was the largest and served both rural and suburban areas. It included a total of 22 schools, 13 of which were elementary schools, and served a total of 14,683 students from pre-kindergarten through twelfth grade. Within the district, 47% of the students identified as White, 22% as Hispanic or Latino, 16% as mixed race, 7% as Asian or Asian Pacific Islander, 5% as Black, 3% as Native Hawaiian or Other Pacific Islander, and 1% as American Indian or Alaskan Native. Additionally, 30% of students qualified for free or reduced lunch, and 6% were multilingual.

### **Timeline**

The curriculum development project began in the fall of 2022. Between September 2022 and December 2022, the process focused on researching EE programs and how best they can be implemented in formal education settings. In February, stages one and two of the UbD process desired results and assessment evidence were completed. March of 2023 was spent developing the learning plan, stage three of the UbD process. During April, the curriculum was reviewed by a content advisor for content and peer editors for clarity and grammar, as well as the creation of auxiliary materials such as a materials list and the pre-and post-program surveys.

There are no plans to implement this curriculum in the foreseeable future, as I have no relationship with any informal educational institution to finance creating the physical teaching trunks or facilitate relationship building with the three local school

districts. However, my desired career future includes working with an informal science institution that can financially support a program such as this. I hope to develop the physical trunks and promote them in local districts.

### **Assessment**

There are two types of assessments associated with this curriculum. First is the assessment of student growth and development built into the curriculum for the teacher to grasp how students progress and provide a basis for standards-based grading requirements. This assessment comes in rubrics, a grading system with which teachers are familiar. The second is the assessments used by the informal educational group to determine the program's overall effectiveness with both students and teachers. This section focuses on the second type of assessment.

Three different assessments measured the use, the ease of implementation, and the EE outcomes on students to determine if the curriculum was effective. To track how much the program is being used, one assessment tracks how many classrooms and students are using the program. The second assessment is a teacher survey to be completed upon the return of the teaching trunk. The survey asks teachers to rank on a 1-5 scale statements about student engagement, preparation time, the fidelity of implementation, perceived student growth in English language arts, science, and art, and students' disposition towards the environment. It also includes open-ended questions about what worked best and what could be improved. The third assessment type is a pre-and post-program anchor chart to be filled out as a whole class activity about students' environmental education dispositions. The post-program anchor chart also includes a section about students' favorite and least favorite parts of the program. These

three assessments together gave me an understanding of the curriculum's usage, practicality, and environmental outcomes.

## **Conclusion**

For this capstone project, I developed an EE curriculum for implementation in an elementary classroom that is focused on overcoming the barriers faced in incorporating EE into the formal school curriculum in response to the research question: *What factors do informal educators need to consider when developing environmental education curricula for formal primary education settings?* Using the UbD curriculum framework developed by McTighe and Wiggins (2004), this program is a place-based nature journaling-centric program that is standards-based and included in a teaching trunk to reduce barriers to implementation. It was designed with the three local school districts and their students in mind over one semester. Finally, it included multiple assessment methods for determining the program's outcomes.

The following chapter discusses the completion of this project and reflection on how the process went. It covers my major learnings, a review of the literature that most influenced the project, and the limitations and future direction of the project. Chapter Four covers possible future research, communicating this project to the greater community, and how the curriculum will benefit the profession.

## CHAPTER FOUR

### Conclusion

#### Overview

This capstone project was conceived as a solution to the barriers I encountered as a formal educator trying to create and implement an Environmental Education (EE) program in the primary classroom. The research question was: *What factors do informal educators need to consider when developing environmental education curricula for formal primary education settings?* Chapter One of the paper addressed my journey with EE and the context for creating this curriculum project. Chapter Two explored the current research on the benefits and barriers to implementing environmental education and three different models for EE programs. Chapter Three described the curriculum project and the development frameworks for creating the EE curriculum. Chapter Four reviews my reflections on the curriculum development process. Additionally, this chapter explores how the literature impacted this project. Then I will overview this project's limitations and future expansions, followed by research recommendations for this field. Finally, this chapter reviews the future of communicating my project and how it will benefit the profession.

#### Major Learnings

While developing this curriculum project, I realized nothing will ever go as simply as expected. My learnings and the changes to the project fall into three categories: limiting the content to dig deeper, curriculum development is a complex process, and developing supplemental materials is time-consuming.

Throughout the curriculum development process, the final curriculum shrunk significantly in coverage to focus on developing critical skills specific to the desired outcomes. Initially, the curriculum included eighteen lessons, one for each week in the semester. However, when considering the need for flexibility in primary schools, the final curriculum only has fourteen lessons. Those fourteen go in-depth and provide students with more opportunities for skill development, specifically in nature journaling and developing a sense of place with their local environment. This focus was chosen because developing a sense of place was one of the primary goals of this curriculum. The direct instruction on ecosystem interactions and implementing a service learning project were eliminated due to time constraints and age-appropriateness for K-2 students. The future of creating curricula focusing on these cut outcomes will be addressed later in this chapter.

The curriculum development process had both expected and unexpected issues. While I had experience creating unit plans using Understanding by Design (UbD) (McTighe & Wiggins, 2004), the process is still not as linear as the framework intends. The official design process of UbD begins with developing the end learning goals and working backward with creating lesson plans last. However, I repeatedly modified my Essential Questions and Enduring Understandings while developing the lesson plans and identifying the time and developmental constraints of the curriculum. These revisions eventually made the curriculum stronger and more specific.

The final significant learning from this project was how many resources must be included in a fully self-sufficient curriculum and how long they take to develop. The project considered teachers' time and knowledge requirements to create an EE

curriculum from scratch. Additionally, I had experience in and out of the classroom creating materials such as anchor charts and rubrics. Therefore, it should not have surprised me that creating resources such as the Student Field Guide would take so long.

In writing this curriculum project, I have grown as a writer and a curriculum developer. By combining my experience as an educator in formal and informal settings with the research on these topics, I better understand the scope and time requirements of developmentally appropriate skill development. Additionally, I am improving at the complex process of high-quality curriculum development. Finally, by developing a wide variety of supplemental materials, I clearly understand the required materials and how best to make them promptly. These skills will benefit me as a EE curriculum developer in the future.

### **Literature Revisit**

Of all the research presented in Chapter Two, two themes substantially influenced the development of this curriculum project. The first was making the lessons standards-based, and the second was building a sense of place with a unit focused on place-based education (PBE).

Creating an EE unit based on state-mandated standards, such as the Common Core State Standards, the Next Generation Science Standards, and the Washington State Arts K-12 Learning Standards, was at the core of this project. Standards-based instruction addressed two significant findings in the research. First, participation in EE programs improves student academic achievement (Ghent et al., 2014). Additionally, one of the significant barriers teachers reported to the practical implementation of an EE curriculum was a focus on the core curriculum and student achievement on standardized tests (Ernst,

2007, 2009; Meighan & Rubenstein, 2019). Accordingly, teachers suggested they were more likely to implement EE curriculums aligned with their state standards (Monroe, 2002). Thus, this project strongly supports the variety of state standards mandated by Washington state.

Before researching this project, I knew creating a standards-based curriculum was a priority; however, I was unaware that researchers have yet to identify what educational activities promote long-term pro-environmental behavior (Byerly et al., 2022). However, researchers recognized the most robust connection to changing behavior after participants developed a strong sense of place (Kudryavtsev, Stedman, & Krasny, 2012). Place-based educational practices that foster this sense of place influenced the curriculum. The curriculum relied on nature journaling to immerse students in their local environment, making this model of education developmentally appropriate for students in kindergarten through second grade. Specifically, this curriculum pulled nature journaling ideas from Hu's 2022 article, including using sit spots and connecting emotions with outdoor spaces. The extensive research on these two types of EE programs significantly influenced this curriculum project's path.

### **Limitations and Expansions**

During the development of this project, many sections were removed due to time constraints. These limitations are opportunities for further developing this curriculum and creating a larger EE curricula project.

As mentioned earlier, I removed several lessons and focused the remaining lessons on developing nature journaling. This choice was made to allow students the time to develop their observation and journaling skills in an age-appropriate timeframe. This

change creates an opportunity in the future to develop additional curriculum resources that focus on developing knowledge about local ecosystems and their interactions and how to implement a service learning project. Breaking up these skills into different curricula allows the development of a deeper understanding of the content. It will enable teachers to choose the best focus for their students and goals. Additionally, creating different units for different grade levels would allow students to work on these skills over a more extended period, develop a stronger sense of place, and develop a broader range of skills.

Subsequently, there are more supplemental materials I would like to create to augment this program. One would be materials to help with the weather and appropriate gear elements, especially for kindergarten students or students with developmental disabilities. This supplemental material would be a velcro board with different weather conditions and outdoor gear options for students to learn weather terminology and how to dress appropriately for inclement weather conditions. Additionally, this curriculum would benefit from pre-unit materials to assist teachers in preparing their outdoor classrooms. Specifically, guides to determining an appropriate outdoor classroom and identifying and addressing any dangers.

Finally, one-on-one meetings between partner teachers and informal science educators familiar with the program before implementation would benefit this project. This session could address various additional barriers to EE implementation in formal school settings that the curriculum does not address. These barriers include gear-lending libraries and determining appropriate and safe outdoor classrooms.

Throughout the capstone project, I discovered various additional materials and resources that would benefit meeting the goal of creating a practical EE program. Some are digital resources that could be made with extra time. In contrast, others require more resources and would depend upon receiving outside funding from a future educational organization.

### **Future Research**

In two areas, academics must complete additional research to determine how to implement EE in formal education settings most effectively.

The first area of research needs to be implementing strategies to overcome the barriers to introducing EE curriculum into traditional classrooms. There was significant research, especially in the form of surveys, into the hurdles to implementing EE programs (Meighan & Rubenstein, 2019; Miller et al., 2022; Patchen et al., 2022; Oberle et al., 2021). Additionally, some research, mainly surveys, into teachers' strategies to overcome these barriers exist (Monroe, 2002; Oberle et al., 2021; Patchen et al., 2022). However, there needs to be more quantitative data or experimental research into the effectiveness of those strategies. These studies could look at how implementing different strategies increases the uptake of EE program implementation to determine which strategies are most effective for increasing the use of EE curriculums in formal education.

There is a need for experimental or correlational research regarding the fidelity of EE program implementation in formal education and how informal science institutions can assist in providing curriculum resources. While there is copious research on the importance of community partnerships between schools and their surrounding communities (Badger & Harker, 2016; Kenney, Militana, & Donohue, 2003; Lynch,

Eilam, & Fluker, 2017), there must be more about school partnerships with informal educational institutions, science or otherwise. Specifically, there needs to be modern research about the characteristics and benefits of using educational trunks and how they can most effectively supplement existing formal school curricula. This research will improve the quality and effectiveness of school-institute collaborations across various subject areas.

### **Communication**

My project aimed to reach more students with a high-quality but still practical EE curriculum for teachers to implement in traditional schools. To achieve this goal, I must contact many teachers and school administrators around the Pacific Northwest. While I do not work for an organization that could provide the funding to complete the entire trunk program now, I could launch the digital materials. This first wave would allow me to get feedback from teachers and students and improve the materials. After attaining a funding source, I could launch the program with digital and physical materials included. Additionally, I would like to add a consultation option to address some of the barriers to EE that the curriculum did not address. This initial release will require a website and social media presence to share and raise awareness of the resources. Additionally, I will contact three local school districts and staff to introduce the program and share the opportunity with them.

### **Benefits to the Profession**

The goal of this project was threefold: increase students' pro-environmental behavior, improve students' academic performance, and do so in a way that does not put undue extra stress on teachers. By developing a student's sense of place, the EE

curriculum will provide students with a strong foundation for making choices that protect their local environments and communities right now and in the future. Additionally, the focus on standards-based learning makes adapting the program more likely and builds students' literacy, writing, and science skills. Finally, the focus on reducing the barriers to implementation again makes it more approachable and reduces the workload on teachers wanting to incorporate EE into their classrooms. This project will provide a new simple way for teachers to benefit their students and school communities.

## **Conclusion**

This chapter is a reflection on the creation of the capstone project. First, it reviewed my significant learnings from this process and how the project changed from the initial design to the final product. Then it reviewed the literature that was most influential in creating the curriculum. Subsequently, the chapter covered the limitations of this project and how that influences future additions and expansions to this current curriculum. Finally, I create a plan for communicating the results of this project to the greater education community and the benefits thereof.

This project stemmed from my experience and struggle with implementing an Environmental Education program in a formal education classroom. Therefore, this project addresses the research question: *What factors do informal educators need to consider when developing environmental education curricula for formal primary education settings?* Environmental education is an essential tool in the fight against climate change and other environmental crises. Furthermore, incorporating it into the classic school curriculum benefits students' environmental behavior. Moreover, it also contributes to their academic performance and social-emotional health. Unfortunately,

teachers are so thinly stretched and facing burnout that adding more expectations is not sustainable. During this project, I discovered the actual range of positive outcomes and explored strategies and tools to make new curriculum implementation more manageable. Finally, I delved into many types of EE programs, many of which were unknown. And although I only incorporated three into this program, the knowledge gained from this experience will be used to develop additional EE curricula.

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