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Integrating Environmental Education into the 4th-grade Classroom

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Integrating Environmental Education into the 4th-grade Classroom

by

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

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CHAPTER ONE

Introduction

Overview

There is growing agreement worldwide that our planet is changing rapidly due to climate change. Similarly, an increasing population of concerned citizens believe we must take action to slow the effects of climate change. According to a study completed in 2013, findings showed that 97% of scientists agree that climate change poses potential threats to our society (Cook et al., 2013). Additionally, the Yale Program on Climate Change Communication has seen a steady increase in the number of Americans concerned with climate change, growing from 40% in 2013 to 56% in 2023 (Leiserowitz et al., 2023). In response to these facts, many countries have made concerted efforts to reduce carbon emissions, and corporations are changing their practices to include more sustainable options. The next step in our efforts should be in the field of education. Environmental Education is needed to continue expanding our global efforts toward a sustainable society and climate change mitigation.

The movement has started in the form of nature-based early education programs as well as a growing number of environmentally-themed high school courses. However, there needs to be more structure and resources available for teachers in middle grades. Additionally, the curriculum demands and time commitments required by teachers of these grades make it challenging to add environmental topics to their everyday teaching. Consequently, teaching environmental education in grades 3-5 is complex. Because of these challenges, this paper aims to answer the following questions: *What are the most effective teaching strategies for integrating environmental education into 4th-grade*

curriculum across different subject areas, and how do these approaches impact students' environmental literacy and engagement with environmental issues? In the coming sections, I describe the impact of environmental education on my life and the impacts I have observed with my students. I also provide a rationale for the inclusion of environmental education. Through the experiences I have encountered, the justification from initiatives, and the effects on learning, this chapter will explain why environmental education is essential to both the well-being of the planet and the individual student.

Personal Background

Environmental education is important to me because, as I was growing up, nature was a significant part of my life. As a family, we spent almost every weekend hiking and camping. There were annual family camping trips with my extended family every summer. While other families took vacations to places such as Disney World, the beach, or big cities, my family went to state or national parks to camp and explore the natural environments around our country. My father was always my environmental educator wherever we went. I fondly remember him teaching my brother and me how to identify trees, plants, rocks, and minerals. He also showed us how to orient ourselves using the objects around us and use clues in nature to understand weather and seasons. We were taught about animals and the circle of life and how to respect and empathize with the natural world. Most importantly, he modeled for us how to stop and appreciate the world around us.

This foundation pushed me to seek ways to get involved in environmental activities as I got older. No environmental education classes were available to me growing up, so I had to get creative. I joined Scouts because I knew they would go

camping and hiking. In high school, I was on the orienteering team and spent weekend days roaming through local natural areas in competitions. In college, I earned my physical education credits by taking canoeing, camping, and hiking classes. As a result of my childhood, I developed a sense of responsibility towards the environment and an awareness of how my actions and behaviors affected the world around me. This sense of awareness and responsibility plays out in my everyday decisions and long-term behaviors. It also influences my passion for teaching.

My experiences growing up and my background affect my views on environmental issues. I am a middle-class white female. I grew up in a suburban area with both parents and two incomes. I was provided opportunities to experience nature regularly. My active lifestyle and unassisted mobility make access to natural areas simple. Additionally, when hiking or camping, I am surrounded by people who look like me, making me more comfortable and willing to spend time outdoors, and consequently more inclined to make decisions based on their environmental impact. Because of these characteristics, as an educator, I must consider the experiences and opportunities of my students and families. Throughout this capstone project, I will analyze information from the viewpoint of multiple groups to consider the perspectives of these groups. As I complete the literature review and project, I will pay close attention to and consider the characteristics of my current students, which will be discussed in greater detail during the project description in chapter three.

Professional Experience

As a teacher, my passion for the environment and nature was not anything surprising to my students. Like my father, I loved pointing out insects and plants on the

playground. I would talk to students about the behaviors of the hawks and falcons that could be seen patrolling the wooded area near our school, as well as the migration habits of the eagles during the winter months in our area. Students would frequently come to school and share information that they learned about animals or places they went over the weekend. After a few years in my first teaching position, a colleague and I started an environmental club at school as a way to get students involved in and raise awareness for environmentally conscious behaviors. We started participating in the Missouri Green Schools Quest, an annual competition requiring us to design and implement a sustainability research project. This program was a big hit with the club members and led to many changes in our building routines. The students made monthly lessons that they put on the news video sent out to teachers. They taught their peers about recycling, water and electricity use, food waste, and other school or local community issues that they thought were important. They issued challenges to students to change their behaviors not only at school but also at home. Our student body would compete in challenges, logging the number of times they turned off lights in their house and taking pictures of things they recycled. We even had a challenge during the holiday season to get creative with gift wrapping instead of using wrapping paper.

The students in the club also made more significant changes to our school and local community. They researched and gave presentations to building and district administration advocating for water bottle fillers in our school and switching out our plastic utensils in the cafeteria for metal silverware. Participating in our 'Green Team' built their sense of place, created a connection with the community in which they lived, and fostered environmental stewardship for the well-being of this community. While

developing their environmental awareness, they were also becoming stronger academically. They were practicing skills needed in the classroom while doing their research, taking data, presenting orally, and writing multiple genres, all in authentic situations.

Seeing the effects of involvement in this club made me want to develop these traits in more students. At this time, I was a third-grade English Language Arts teacher. I began looking for ways to incorporate environmental education content and experiences into my classroom teaching. I started simple, with students writing persuasive essays that advocated for change in an issue they thought was important. Later, we used our Missouri Learning Standards to learn about food webs and keystone species. We were using weekly science journaling to make observations on our playground, investigating, classifying, and making signs to teach others about the tree species around our school, as well as learning about environmental issues and sustainability projects around the world. The effects were exciting: my students were more involved in class, assessments, and performances; they showed growth academically while developing environmental literacy.

The task of incorporating these topics and ideas into my teaching in ways that would satisfy the academic requirements of a third-grade language arts class was exhausting at times. However, it was not something I could give up once I started because of the effect it had on my students. I saw the change in their attitudes and behaviors throughout the year, and this was enough to make me keep going despite the personal time commitment it took to create learning experiences that would satisfy both the state academic standards and the environmental literacy learning goals. However, I know this

is not a reasonable commitment to expect from all teachers. This is why it is important to identify teaching strategies that effectively combine environmental topics with academic skills and standards.

Rationale

Environmental literacy is important for the students growing up in our world today. They will need an understanding of the relationships between human and natural systems to develop solutions that address the needs of our society and planet. This is supported by global and local initiatives that address environmental education concepts in the classroom. In 2015, the United Nations Development Program created the Sustainable Development Goals to challenge our world to meet the varying needs of our societies. Several of these goals align with the need to address environmental well-being. Goal four targets are focused on quality education for all; Target 4.7 specifically addresses the need for environmental literacy in education. This Target states that all students learn and develop skills to lead lifestyles that promote sustainability (United Nations, 2015a). In the success indicator for this goal, the UN went on to say that this goal can be met through government policies related to global citizenship and sustainability curriculum and education.

Goals twelve and thirteen also relate to environmental literacy. The goal 12.8 indicators also expressed the desire to provide access to sustainable development education through national policies (United Nations, 2015b). Similarly, goal 13.3 calls for increasing climate change education to work towards mitigation, adaptation, impact reduction, and early warning strategies (United Nations, 2015c). While sustainable development and climate change mitigation, along with many of the UN's Sustainable

Development Goals, are not issues that middle-grade students will be undertaking, environmental literacy, stewardship, and higher-level thinking skills need to be nurtured during these years to prepare students for addressing these problems in the future.

Additional support for incorporating environmental literacy into the general education setting is the local standards created by the Missouri Environmental Educators Association. In 2013, the MEEA created the Show Me Environmental Literacy Standards to address environmental education in schools. These standards were designed to give teachers environmental literacy concepts to use in their classrooms. They were created in collaboration with the Missouri Department of Conservation and Missouri Department of Elementary and Secondary Education, as well as several other organizations. One goal of this project is to bring awareness to and incorporate these standards into the Missouri curriculum to make environmental literacy education part of our everyday learning, increasing environmental stewardship among our youth. Although there is not yet a policy ensuring these standards are used in districts and classrooms, they lay the foundation for environmental education policy and point to the rising support for addressing environmental literacy within the general education setting.

Environmental education also benefits students academically. Learning that integrates environmental concepts with academic goals improves academic performance, student engagement, and behavior. Lieberman and Hoody found that when teachers integrated environmental learning into their curriculum, there was a 77% increase in student performance, a 98% increase in engagement and enthusiasm, and a 70% increase in behavior (Lieberman & Hoody, 1998).

Summary

As our world becomes more aware of the environmental changes happening to our planet, a shift has slowly begun, and today's youth will be responsible for continuing this progress. My experiences working with students made it clear that the integration of environmental education positively impacts students' academic engagement and performance. This observation is supported by findings from multiple research studies that show positive learning effects when using nature and the environment as a tool for teaching. Furthermore, the growing attention given to developing environmental literacy in students by organizations such as the United Nations and local groups like the Missouri Environmental Educators Association shows a need to include environmental education in the classroom.

In the literature review, I explain the history of and changes in environmental education since its beginning. I also discuss the goals, benefits, and challenges of environmental education in the general education setting. Next, I define environmental literacy and stewardship and discuss how we measure these areas and how they affect the individual and the bigger goal of a global society working together towards a sustainable lifestyle. In answering the question, *What are the most effective teaching strategies for integrating environmental education into the 4th-grade curriculum across different subject areas, and how do these approaches impact students' environmental literacy and engagement with environmental issues?*, I also explore environmental education pedagogies to provide teachers with tools and strategies for incorporating environmental education concepts within their classrooms. In chapter three, I describe the project created for my capstone work, its integration with academic learning, and the desired

impact on environmental learning and stewardship. The final chapter is a reflection on my learning throughout the capstone project, its impact on the learning and teaching community, and an assessment of the effectiveness of the project.

CHAPTER TWO

Literature Review

Introduction

To answer the question, *What are the most effective teaching strategies for integrating environmental education into the 4th-grade curriculum across different subject areas, and how do these approaches impact students' environmental literacy and engagement with environmental issues?*, this literature review will discuss the key aspects of environmental education and methods of implementation.

Environmental education is teaching environmental concepts, creating awareness of environmental issues, fostering pro-environmental attitudes, and developing critical thinking and problem-solving skills needed to take action (EPA, 2023). Through environmental education, students learn about their local environments and broader world ideas. They are encouraged to form opinions on issues and make life and behavior choices that reflect their values. A person's level of understanding and awareness of environmental concepts and issues is called environmental literacy. Similarly, an individual's pro-environmental behaviors and actions are aspects of their environmental stewardship.

The goal of environmental educators is to increase environmental literacy and stewardship through education. The first step to identifying effective teaching strategies for integrating environmental education into the 4th-grade curriculum is understanding environmental education and environmental literacy. This section of the literature review provides a historical overview of environmental education, a more in-depth description of

environmental literacy, as well as the benefits and barriers teachers face when integrating environmental education in the general education classroom.

Environmental Education History

While teaching about the environment existed well before the 1970s, the first major event in the environmental education movement was the Intergovernmental Conference on Environmental Education in Tbilisi, Georgia, in 1977 (UNESCO, 1978). This conference aimed to discuss the state of environmental issues and strategies for solving these problems. Establishing the importance of environmental education and creating guidelines for the profession was vital to the discussions. Very early on in the movement, the importance of mainstreaming environmental education into the general education system was already being discussed. This is evident in the conference report:

Environmental education should be integrated into the whole system of formal education at all levels to provide the necessary knowledge, understanding, values, and skills needed by the general public and many occupational groups, for their participation in devising solutions to environmental questions. (UNESCO, 1978, p. 12)

Further evidence can be found in the report supporting the need for incorporation of environmental education into school curriculum:

Environmental education should not be just one more subject to add to existing programmes but should be integrated into programmes for all learners, whatever their age. (UNESCO, 1978, p. 20)

The actions of this conference prompted the start of environmental education programs around the world.

The next significant development in the field of environmental education happened in 1990 when the United States government passed the National Environmental Education Act. This act was integral to the field because it recognized the increasing environmental issues and created the National Environmental Education and Training Foundation as well as the Office of Environmental Education in the Environmental Protection Agency (1990). This Act helped fund organizations in both formal and informal education to create environmental education programs. Then, in 1994, the North American Association for Environmental Education created an official definition of environmental education in the United States. They stated that environmental education should inform the individuals' ecological, socio-political, and environmental knowledge and build problem-solving skills and environmentally responsible behavior (Coyle, 2005, p. 53). From these significant movements, our current state of environmental education was created. The next step, which will be discussed in the following section, was to define what environmental literacy is and how to develop environmental literacy in students.

Environmental Literacy

Environmental literacy is often thought of as an understanding of our environment and issues involving the environment. However, it is more complicated than basic knowledge or understanding. Environmental literacy is a measure of one's knowledge of environmental relationships and issues, attitudes and beliefs regarding environmental decisions, critical thinking and problem-solving abilities involving environmental issues, and intentional behaviors that benefit the environment or reduce environmental impact (Hollweg et al., 2011). When evaluating environmental literacy, it is assessed on a

spectrum with the levels of the individual components of literacy varying from person to person and even fluctuating from year to year.

Two aspects of environmental education can build an individual's environmental literacy. The first aspect is their understanding of the relationships between natural and human systems. This knowledge brings awareness to the impacts of individual and societal decisions on the natural world. Additionally, it makes one aware of the effects of natural systems and how we move through the world. An understanding of these relationships builds an individual's sense of place. Sense of place is one's connection to and investment in a place, typically where they reside. Kudryavtsev et al. (2012) described a person's sense of place as a combination of one's place attachment, or connections to a place, and place meaning, which is the symbolic or cultural value one attaches to a place. They also found that both place attachment and place meaning positively affect pro-environmental behaviors (Kudryavtsev et al., 2012). This indicates that having a strong sense of place increases pro-environmental behaviors and is necessary for environmentally responsible behaviors.

Creating environmentally literate citizens is the ultimate goal of environmental educators and is important for the management or resolution of environmental issues. The National Environmental Education Foundation's study of Environmental Literacy in the United States showed that Americans have declining faith and understanding in the role they play in protecting the environment. According to this report, Americans are not confident in their ability to affect the environment with their behaviors, are not convinced that energy-saving measures make an impact, and do not understand the key details surrounding the causes and effects of climate change (NEEF, 2015, p. 17-18). Likewise,

McBeth and Volk (2010) found that middle school students possessed adequate environmental knowledge but lacked sufficient affective qualities to foster pro-environmental behaviors. This indicates a need for prominent, continuous environmental education to increase the environmental literacy of American citizens. In addition to the impact on environmental literacy, there are other benefits of environmental education. These benefits will be discussed in the following section.

Benefits of Environmental Education

When educators integrate environmental learning into their regular curriculum, students benefit in more ways than one. The first and most important thing to educators and administrators is the positive impact on student's academic and critical thinking skills. This idea was the driving force behind the 1998 study completed by Lieberman and Hoody. In this study, they argued that using environmental education as an integrating context was beneficial to educators because it improved academic performance (Lieberman & Hoody, 1998). Strong environmental education instruction mirrors strong literacy pedagogy. Many activities typical classroom teachers use, such as journal writing, questioning, problem-solving, and classroom discussions, are also utilized in environmental education lessons. Research has shown that students who participate in environmentally based instruction perform better on state assessments and have stronger critical thinking skills (Evans & Acton, 2021; Gracia et al., 2023; Haggström & Schmidt, 2020; Lieberman & Hoody, 1998; Sharpe & Breunig, 2009). This is critical in the educational field due to the heavy importance placed on student assessment performance.

Another important benefit for students is the impact on social-emotional skills. In the 2000 study done by Russell and Burton, students reported improved interpersonal skills. When interviewed about interpersonal skills, one student responded:

I learned a lot about myself, how I work with others, how to improve myself, how to be patient. How to be an important member of a team. All of those skills a lot of people never learn (Russell & Burton, 2000, p. 297).

Likewise, a significant study done in 1998 by Lieberman and Hoody found vast improvements in students' interpersonal skills, including communication and teamwork, self-discipline, and self-efficacy. One teacher commented on the effects of his program, saying, "[The program] gives a lot of these kids a sense of structure, and a sense of belonging that they don't otherwise have" (as cited in Lieberman & Hoody, 1998, p. 69). Students participating in programs focused on environmental education positively impact their leadership skills, problem-solving abilities, and disposition toward challenges.

Environmental education is beneficial to students in ways that not only improve their academic success but also build interpersonal skills that set them up for success in life. Building these skills benefits not only the students but also the fields of the careers they wish to pursue. Strong leadership and problem-solving skills paired with pro-environmental behaviors will serve to create a bigger impact when it comes to approaching environmental issues. While the benefits of environmental education have been well documented, there are still barriers that make it difficult for environmental educators to gain support in the mainstream education setting. These barriers will be discussed in the following section.

Barriers to Environmental Education

Several barriers make it challenging to develop a strong foundation and support for environmental education in schools. The main factors educators must overcome when implementing environmental education are time and curriculum demands, financial constraints, and educational policies and priorities. Since the creation of the No Child Left Behind Act in 2002, there has been increasing focus placed on reading and math performance. This bill has caused the focus of educational time and resources to be directed to improving assessment outcomes in the tested area of reading and math, leaving less for other areas. Due to this, teachers find it challenging to find time to add environmental learning into their instruction. Additionally, teachers who teach environmental education in their classroom spend more time outside of class finding resources that work and planning lessons that actively engage their students. Any costs incurred for those resources are often covered by the educator, as there is rarely funding available for materials outside of the district-approved curriculum. Stevenson, Carrier, and Peterson (2014) reported that over 75% of teachers lack the time for environmental instruction, and more than 50% of teachers attribute not teaching environmental lessons to the lack of resources. Similarly, Sharpe and Breunig (2009) attributed the loss of environmental courses for students, training programs for teachers, and government funding to the policy reforms of the early 2000s.

Both time for teaching and planning, as well as financial support for curriculum resources, are tied to the current educational policies that drive district priorities. Another factor that makes teaching environmental education challenging, influenced by policy, is support for the teacher and the field. Many teachers who desire to include environmental

instruction in their classrooms have two more hurdles to overcome before they can worry about time and resources; these challenges are driven by the lack of support for environmental education in many areas. First is teacher confidence in their knowledge of educational content; several studies analyzing the advantages and challenges of implementing environmental education cite teacher content knowledge as a barrier and call for an increase in professional development in this area (Dring et al., 2019; Sharpe & Breunig, 2009; Stevenson et al., 2014). In addition to this challenge, teachers with content knowledge must still obtain buy-in from the administration. Often, even when teachers do get approval, it is still a struggle to get their colleagues to view what they are doing as legitimate. One teacher, when interviewed, commented that her principal reprimanded her because she was not following the curriculum (Dring et al., 2019). Another teacher mentioned being exhausted by the need to continually defend the legitimacy of their instruction to other teachers (Sharpe & Breunig, 2009). While the benefits of environmental education have been found to improve student's academic and social-emotional growth, the barriers can be so challenging that many educators do not want to bear the burden of environmental education in their classrooms.

Summary

Not much has changed in the 50 years since environmental education became a global topic of interest. Professionals in the field have defined the core components of environmental literacy and provided importance for the development of these components in students. Much of the reason for this lack of progress is due to educational policy-driven barriers that make it difficult to implement and sustain environmental education in the traditional education setting. Another factor that makes progress in

environmental education challenging is the last component of environmental literacy, environmental stewardship, or pro-environmental action. Navigating these challenges is necessary for educators who wish to implement effective and sustainable environmental teaching in their curriculum. The following section explains another essential aspect for teachers to consider when designing environmental education programs, environmental stewardship. It will also analyze the methods used to measure stewardship and the challenges presented when attempting to measure stewardship with fidelity.

Environmental Stewardship

Within the scope of environmental education, one goal is to foster environmental stewardship. Environmental stewardship can be thought of as the final tier of environmental literacy. After gaining knowledge of both natural and human systems and an understanding of how they interact, as well as an awareness of environmental issues and their impact on these systems, an individual would be equipped to take action. One's environmental stewardship is one's likelihood to make pro-environmental choices and actively participate in creating large-scale changes to one's community or society. When integrating environmental education into a general education curriculum, it is essential to design programs that develop students' environmental knowledge and literacy.

During the early days of the environmental education movement, many environmentalists thought that with awareness and exposure, stewardship would follow. However, Coyle (2005) found in his study, reviewing ten years of research, that this was not the case. The majority of studies indicated that initial environmental programs' impact on a student's environmental literacy was inconsistent. While this is disheartening, it may not be as harsh as it sounds. One reason for the discrepancy

between results may be due to the types of programs and learning. As the field of environmental education has developed, much research has been completed on the methods used to raise stewardship in students effectively. The following section will introduce various forms of environmental stewardship and the part they play in environmental literacy, as well as analyze the most effective ways to increase stewardship in students.

Forms of Environmental Stewardship

Since environmental stewardship is the actions one takes to care for the environment, many think it is simply individual pro-environmental behaviors that comprise stewardship. However, it is more diverse and complex than just one person's choices. Historically, environmental educators have strived to inform individuals of the impact of their choices on the environment to foster pro-environmental behaviors and sustainable practices. However, more recently, there has been an emphasis on the need for community-level stewardship and making large-scale changes in behaviors to affect both the local and global communities (Gibson et al., 2022). Individual stewardship can be seen in choices about products we buy, recycling and energy conservation efforts, or habitat protection and restoration (Bennett et al., 2018). Many of these individual behaviors can also be executed at a community level to increase impact. Additionally, community-level stewardship is needed for more significant issues such as watershed management, protection of natural areas, and policy change. Gibson et al. (2022) stressed the importance of community-level stewardship to address larger environmental issues, such as climate change and threats to biodiversity.

Local forms of environmental stewardship can be observed in urban environmental education programs and environmental justice causes. Urban environmental education focuses on using place-based learning to teach students about the natural and human systems in their community. One goal of urban environmental education is to create a community's environmental identity by building urban ecosystems, creating greenspaces in the form of parks and community gardens, and bringing awareness to the importance of biodiversity to healthy environments (Dzurick et al., 2015). By educating and activating its community members, urban environmental education programs aim to build an individual's sense of place and a community's environmental stewardship.

Likewise, environmental justice is also a community-level stewardship concept. Environmental justice is rooted in the fact that economically disadvantaged communities are often subject to unhealthy environmental issues such as water and air quality, lack of healthy food options, scarce green space, and other policies that harm their citizens' health. By definition, environmental justice is the involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in the decision-making process to ensure that all community members are safe from harmful environmental practices and have access to healthy communities and resources (EPA, 2024). While the connection between environmental justice and stewardship may not be immediately recognized, understanding environmental inequities is essential to developing environmental literacy, especially for students who live in communities impacted by environmental injustices. Environmental literacy gives students the tools to analyze their

community to identify issues and the ability to employ critical thinking and problem-solving skills to develop solutions that address those problems.

Additionally, understanding the health and well-being of one's community provides a lens to assess barriers to one's sense of place and level of stewardship. This idea was discussed in a study on the effects of local learning on connection to one's home environment. In their research, Fisman (2005) theorized that students were unable to form a connection to their home environment because they did not feel safe. The students in the study gained environmental knowledge. However, because their basic safety needs were not met, they could not make connections to the environmental concepts they learned in the classroom and the place where they lived. Individuals who live in economically and environmentally disadvantaged areas may not develop a strong sense of place or pro-environmental behaviors due to their health and well-being. Environmental literacy education that includes environmental justice concepts can help these students develop stewardship that addresses the needs of their community.

Another important area of environmental stewardship is global citizenship. The United Nations (n.d.) defines global citizenship as the belief that individuals are part of multiple communities and groups within their local, national, and global levels and that one must consider how their actions and behaviors affect the well-being of all societies. In recent decades, there has been a focus on global citizenship in education due to the growing globalization of our society (Barrow, 2017). This growing focus is evident in the United Nations Sustainable Development Goals (n.d.-b), which focus on various areas concerning the health and well-being of people and the environment worldwide. Further evidence of the connectedness of global citizenship and environmental stewardship can

be seen in Haigh's key attitudes necessary in the development of student's global consciousness. According to Haigh (2016), global citizenship requires the individual to develop three main attitudes: first, that the individual is a member of humanity as a whole; second, the importance of living within the means of the planet's resources; and third, the ability to consider the ethical impacts of decisions on the planet and communities it contains.

Because of this focus, Meyers' (2010) study on adolescent's understandings and feelings of global citizenship found that most students view global citizenship as a moral responsibility to the people and places of the world. Increasing global citizenship is a move in the positive direction for solving major global environmental issues such as mitigating the effects of climate change, alternative fuel and energy options, and food scarcity. When creating environmental education programs and curricula, educators need to consider the local and global aspects of environmental topics to develop adolescents' knowledge and attitudes towards behaviors and their impacts on the global community.

Increasing Environmental Stewardship in Adolescents

Considering that the primary goal of environmental education is to promote pro-environmental behaviors, understanding the factors that increase stewardship in students is essential to environmental educators. While some factors create barriers to pro-environmental behaviors in students, such as parental influence, social pressures, and lack of self-efficacy, many factors provide a positive influence on their environmental motivators (Huoponen, 2023). The first factor that influences stewardship among children is time spent outdoors. Stevenson et al. (2013) stated that field experiences improved environmental affect and behavior.

Another important aspect of environmental education that improves stewardship is students' level of involvement in learning. Recent studies have evaluated the components of environmental education that foster pro-environmental behaviors (Huoponen, 2023; Korfiatis & Petrou, 2021). Huoponen (2023) found that programs that promote student voice and collaboration increase student ownership, and learning and working on real-world problems build students' self-efficacy and positivity toward environmental issues. Similar characteristics were discussed by Korfiatis and Petrou (2021). Their qualitative study of school garden programs found that students developed stronger ownership, self-efficacy, and pro-environmental affects when participating in a program with a high level of student involvement and decision-making. These studies show that while classroom lessons and activities may be beneficial for increasing environmental knowledge, hands-on, outdoor programs are essential to fostering environmental stewardship in adolescents.

Additionally, well-designed and implemented environmental education can counteract barriers to pro-environmental behaviors. A recent study on the effects of children's beliefs towards climate change on the beliefs of their parents found that environmental education programs that are hands-on and focused on local issues can lead to changes in parental attitudes toward climate change (Lawson et al., 2019). Lawson et al. suggested that families should be encouraged to participate in activities that affect their community to help increase awareness and concern over environmental issues. Encouraging family involvement in environmental education programs can have a positive impact on the community as a whole while mitigating barriers of parental influence and self-efficacy of the student.

Summary

The idea of environmental stewardship has changed dramatically over the last 50 years in response to the changing needs of our planet and societies. The growing understanding of our interconnectedness has prompted individuals and groups to consider the impacts of their choices on people and environments around the globe. Because of this understanding, environmental stewardship requires one to gain knowledge about others' experiences and form moral and ethical perspectives about the quality of life to which one is entitled. Environmental stewardship ensures that members of all communities, both human and biological, are considered when making decisions. To effectively incorporate environmental education into the general education setting and increase students' environmental stewardship, educators must consider the local, cultural, and global characteristics of the class to create stewardship that is meaningful to their student's lives. Urban environmental education, environmental justice, and global citizenship are all areas that inform students of the perspectives and impacts of diverse communities. Pairing this knowledge with outdoor experiences in their communities, both in natural and built environments, as well as involving students in problem-solving activities with real-life situations, will allow students to become stewards of their local and global communities in a way that impacts the quality of life for themselves and the people around them.

Methods for Teaching Environmental Education in the Classroom

Since the beginning of the environmental education movement in the early 1970s, numerous programs have focused on teaching environmental concepts. In schools, some teachers taught about ecosystems, natural and human system relationships, and current

environmental issues. Outside of the traditional classroom, places like zoos, science museums, and parks created programs for children and adults alike that provided information on their focus areas and the factors impacting the health of the planet. As time passed, researchers began to study these programs to determine if they were achieving their objectives. They found that some programs made an impact while others did not. Almost 50 years later, thanks to the research of people such as Lieberman and Hoody (1998), Coyle (2005), McBeth and Volk (2010), and many more, environmental educators have a clearer picture of effective methods for developing environmental literacy. The key to building not only knowledge of environmental concepts and issues but more importantly, creating pro-environmental behaviors and environmental action is building connections to a person's locus of control. Successful programs build a person's sense of place by showing them the value of their local environment and the relationship between the natural and human systems it contains. Another key to successful environmental education programs is engaging students in real-world applications and activities (Coyle, 2005, p. 58-63)

Three main methods were found to be highly effective for building environmental literacy and creating stewardship. These methods are: using the environment as an integrating context, place-based learning, and problem or project-based learning. The remainder of this section will provide more in-depth descriptions of each method and their interconnectedness and reflect on the impacts each method has on a person's environmental literacy and stewardship. Additionally, this section will discuss areas of inclusion and cultural relevancy that teachers should consider when planning and implementing environmental education programs in their classrooms.

Using the Environment as an Integrating Context

Using the environment as an integrating context (EIC) is an instructional method based on multidisciplinary teaching models. This teaching method connects learning in multiple subjects by using a common theme or subject. In the case of EIC, environmental themes are the common theme that ties together learning. The concept of using the environment as an integrating context was first studied in 1998 by Lieberman and Hoody. The study examined the academic impacts of using environmental topics to connect learning in multiple subjects and apply skills to real-life situations. After analyzing the data from standardized test results, they found that all the schools performed higher than other schools in their districts and states (Lieberman & Hoody, 1998, p. 20-21). Additional benefits noted in the study were increased student engagement, collaboration between teachers and students, and stronger relationships between students and their communities.

However, using the environment as an integrating context is a robust method for teaching environmental education for its benefits to environmental literacy and stewardship. Common themes noted in the interviews from the Lieberman and Hoody study noted increased ownership of students' local environment. One observation was that students involved in community-based projects become more civic-minded because they see the effects of their work and develop a sense of pride because of their impact on their communities (Lieberman & Hoody, 1998, p. 28). Integration of environmental education topics into subjects such as English Language Arts or math allows students to practice academic skills while increasing their environmental literacy or participating in problem-solving activities that affect their community. The benefit of integrating

environmental topics into general academic subjects is the level of flexibility in difficulty or cross-curricular integration. As a teacher just beginning to add environmental education to their classroom, using the environment as an integrating context allows them to add small amounts at a time. More experienced teachers, however, can tie together multiple subjects using an environmental theme to connect learning.

One example of using the environment as an integrating context was found in a fifth-grade classroom. The students applied skills working with fractions and decimals to collect and analyze data on pollution and their carbon footprints (Özdemir, 2021). In this study, Özdemir reported that students' understanding of the environmental topics taught deepened throughout their learning and fostered awareness of how their choices impacted the planet. Programs that utilize environmental topics to practice math skills are an important partnership. This gives students practice with necessary math concepts and teaches them how to analyze and interpret data to form understandings. Pairing this with important environmental topics builds awareness of issues affecting our planet.

Integrating environmental topics into English Language Arts is another effective partnership. Students can strengthen both fictional and informational reading and writing skills while gaining knowledge on environmental topics. In an integrated unit on human impacts on the environment, students researched cause-and-effect relationships, wrote a narrative story, and created an animated short for their writing (Robertson et al., 2021). During this study, students refined their ability to analyze cause and effect while reading articles on human impacts on the environment and then applied what they learned in creative narrative writing. Connecting reading and writing to environmental topics is equally important. Reading realistic fiction stories with environmental themes allows

students to connect to abstract ideas they may not have experienced. Writing about environmental issues allows them to make meaning and express opinions on topics they have learned. Developing an understanding of issues and advocating for change are important skills in environmental literacy. Connecting environmental learning to reading and writing helps build these skills.

Place-Based Education

The National Science Teaching Association defines place-based education as a teaching method that connects students and their local communities and environments using project-based activities that address real issues while simultaneously addressing academic requirements (NSTA, 2018). Johnson et al. (2012) developed 18 effective characteristics of place-based programs to quantify the impact this teaching method has on the environmental quality of the communities in which they are based. Among others, they said that effective programs are relevant to learners and hands-on, use the local environment to make authentic contributions to the community, and are interdisciplinary and collaborative. Programs that use a place-based aspect utilize both indoor and outdoor learning spaces. Outdoor spaces can be natural areas on or adjacent to school property or parks and preserves near the school. Place-based learning can also occur in non-traditional outdoor community spaces such as abandoned lots. These programs often work with community groups to identify local concerns, educate students on relevant environmental knowledge, and develop a project to address issues. The Place-based Education Evaluation Collaborative (2010) analyzed place-based programs around the country and reported that place-based education helps foster environmental stewardship

by teaching them about where they live and how to take action to make changes in their communities.

These programs can be highly beneficial to students in urban settings who do not have access to ample natural areas. Flanagan et al. (2019) analyzed the impact of place-based learning on the level of understanding of environmental commons in urban areas. They found that this method improved students' knowledge concerning ecological diversity and the interdependence of human and natural systems and increased their environmental identity. Using a place-based instructional method in urban areas has helped address issues like food insecurity through school gardens like the living wall built by students in the Bronx, NY (NEEF, 2015). Another example is the Right Tree, Right Place program in Columbia, MO, which builds an understanding of the environmental impact of trees in urban areas through education and landscape planning with students (Dzurick et al., 2015).

Project- and Problem-Based Education

Many place-based education programs provide an opportunity for students to participate in service learning or problem-solving projects. Both project- and problem-based learning methods are methods used in education, typically for social studies or science-related concepts. Cornell University describes problem-based learning as a student-centered approach where students learn about a subject by working to solve a problem (2024). Similarly, project-based learning is a teaching method in which students learn by actively engaging in real-world and personally meaningful projects (Buck Institution for Education, n.d.). These methods are similar and are used interchangeably in environmental education research.

Project- and problem-based methods are promoted by educators and researchers because they strengthen social interactions and higher-level thinking skills. Students interviewed in Yolcu's (2023) study reported improved teamwork and social skills as well as stronger research skills and perseverance in the face of challenging situations with peers and research. Likewise, Paredes-Chi and Viga-de Alva (2020) and Asli et al. (2022) reported that students participating in project-based learning were more engaged and cooperative and showed higher levels of self-confidence and performance.

Research shows that these methods can substantially impact students' environmental knowledge and attitudes because of their hands-on, student-led approaches. Project- and Problem-based learning increases environmental literacy by developing environmental awareness and understanding of the individual and societal impact on environmental systems and realizing the current environmental issues and how they may directly impact their lives (Ural & Dadli, 2020; Yolcu, 2023). Student interviews completed during a project-based learning unit on bee extinction revealed that students' understanding of the role of bees in nature, as well as the human impact on bees, deepened and led to increased intention toward environmental action (Asli et al, 2022).

Summary

When using the environment as an integrating context method alongside place-based or project- and problem-based methods, students have the opportunity to make a real impact on their community and local environment. The constructivist characteristics of these methods create learning experiences that are engaging for students and provide a deeper understanding of concepts than traditional lecture methods. Student

experiences in programs such as this increase participants' sense of place and their intention to act in pro-environmental ways, leading to enhanced environmental literacy and stewardship.

Conclusion

Since the first Intergovernmental Conference on Environmental Education in Tbilisi in 1977, professionals in environmental education have worked to define environmental literacy and stewardship (UNESCO, 1978). Environmental educators work to create stewardship at the individual, local, and global levels. While there still exist several barriers that make it hard to implement environmental education in the general education setting, the benefits outweigh the challenges. Using research-based methods to integrate environmental topics into general subjects and creating hands-on projects relevant to the student's lives can make a change for their community and foster pro-environmental behaviors. Additionally, collaborative, student-led problems improve students' social and academic skills and deepen their understanding of topics. Using information gathered while researching the question, *What are the most effective teaching strategies for integrating environmental education into the 4th-grade curriculum across different subject areas, and how do these approaches impact students' environmental literacy and engagement with environmental issues?*, the following chapter will outline procedures for the creation of a 4th-grade unit of study that incorporates environmental concepts into English language arts and builds a foundation for project-based learning.

CHAPTER THREE

Project Design

Introduction

Environmental education's importance to our planet's health has been stressed for over 50 years (Coyle, 2005; National Environmental Education Act, 1990; UNESCO, 1978). Adding environmental education to the general education setting can have a positive impact on students' environmental literacy and build stewardship in today's youth (Huoponen, 2023; Korfiatis & Petrou, 2021; Russell & Burton, 2000; Stevenson et al., 2013). Additionally, multiple studies have shown that incorporating environmental issues and topics into academic learning can have a positive impact on academic performance, student efficacy, behavior, and social interactions (Evans & Acton, 2021; Gracia et al., 2023; Häggström & Schmidt, 2020; Lieberman & Hoody, 1998; Sharpe & Breunig, 2009). These facts led to the research of environmental education instructional methods to answer the question: *What are the most effective teaching strategies for integrating environmental education into 4th-grade curriculum across different subject areas, and how do these approaches impact students' environmental literacy and engagement with environmental issues?*

The result of this research is an environmental education curriculum design addressing place-based environmental issues and topics that align with 4th-grade science standards in Missouri while incorporating learning standards from English Language Arts and mathematics. The following chapter will describe the lessons and project-based learning activities included in the curriculum unit. It also provides information on the students and community that the curriculum unit will serve. Finally, the chapter will

address the assessment of the program for effectiveness and student academic achievement.

Project Description

The project creation for this capstone is a curriculum for a unit of study that incorporates English language arts, mathematics, science, and an environmental education topic relevant to the community. It lasts approximately six weeks and is divided into two sections. Within each section, there are 1-2 science lessons, with the longer lessons being in the beginning, focusing on required science standards and adding in environmental literacy as the unit progresses. The first section uses the environmental topic of pollinator diversity and issues causing pollinator decline to teach about plant and animal structure and function, which addresses the 4th-grade science Missouri Learning Standard, 4.LS1.A.1 - Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and plant production (Missouri Department of Elementary and Secondary Education, 2016b).

It also addresses key ideas from environmental principles, systems, and processes of nature, recognizing, investigating, and solving environmental problems, as well as environmentally responsible behaviors from the Missouri Environmental Literacy Standards (MEEA, 2024). During reading instruction, our read-aloud choice connects to the science and environmental literacy topics and is included in the classroom discussions and journal reflections throughout the unit. In addition, small group texts and independent assignments connect to the topic of conservation, habitat protection, and human impact on the ecosystem to provide additional connections to our theme. Academic instruction that is supported through the unit are English language arts standards R.2.A.1a - Develop

and apply skills and strategies to comprehend, analyze, and evaluate fiction, poetry, and drama from a variety of cultures and times and W.2.C.2a - Compose well-developed writing texts for audience and purpose (Missouri Department of Elementary and Secondary Education, 2016a). Using narrative texts, students make text-to-world connections about human impact on ecosystems and write a narrative story relating to their learning.

The second half of the unit is project-based learning. Lieberman and Hoody (1998) discussed the benefits of project-based learning programs on students' academic performance, and more recent studies by Ural and Dadli (2020) and Yolcu (2023) also support the use of project-based learning due to its positive impact on environmental literacy and stewardship. When designing this portion of the unit, I used the study by Asli et al. (2022) because it closely aligned with the goals I had in mind: making adjustments for the learning goals of my students. I also used the planning tools from Buck Institute for Education's PBL Works to design the project-based portion of the unit (MyPBLWorks, n.d.). The unit is designed to provide information and instruction needed for the project-based learning activities Monday through Thursday, allowing Friday as a full day to work on the project; this provides eight full days of project work. During these days, students research more about insect structure, pollinator gardens, and native plant species using informational texts and other sources provided. Next, students will choose appropriate native plant species and design a pollinator garden to plant on the school grounds. As an assessment of learning, students choose between different presentation options to communicate the information they learned. Once presentations are complete,

students present them to their peers. The final stage of the project is the planting of the garden.

Setting and Audience

As an environmental educator, I wanted to create a unit of study that effectively integrated my district curriculum, Missouri state standards, and environmental literacy concepts. This project was designed for my 4th-grade students. I teach in a rural setting in Missouri. This community is a unique setting as it is closely located to suburban communities but has a small-town feel. It consists of both high and low-socioeconomic families. Residents of this community live in houses with highly manicured lawns or working farms, both of which encourage the use of chemical treatments. I wanted to choose an environmental education topic that could apply to both lifestyles in this community. Because of the rural setting, there are some natural areas but because of the farmland and suburban-style neighborhoods, there is minimal wild, natural growth with native plants to attract pollinators.

These factors, in addition to the 4th-grade science standard that focuses on the structure and function of living things, made the pollinator-plant relationship a great lens for the science aspect of the unit. My students have moderate environmental awareness and pro-environmental attitudes to protecting the planet but low knowledge of topics, as is to be expected of students their age. The goal of the unit is not to change parent behaviors in lawn maintenance but to educate students on the benefits of natural growth areas, the importance of plants that attract pollinators, and the impacts of current social norms in lawn care. Through the completion of the pollinator garden, students will make changes to their community to help create healthy natural areas that sustain pollinators.

For future years, the garden will be able to be used by students in multiple grades to learn about earth and life systems appropriate to their grades.

Timeline

I began the creation of this capstone project in February 2024 with the literature review to build a strong understanding of the state of environmental literacy and stewardship in schools and to investigate best practices in effective environmental education that resulted in pro-environmental attitudes and behaviors. During the summer of the same year, I developed the curriculum for the unit. To begin, I researched how to plan and implement project-based learning effectively. This would be new learning and application for me, and I wanted to ensure I understood the process when writing the lessons. Next, I chose the narrative literature I wanted to use in my reading block to build connections between reading and our science learning. During this time, I also planned lesson topics, aligning them to the state science and environmental literacy standards that were my unit's focus. Last, I researched local plants that would benefit our pollinator garden. The unit will be implemented in the fall of the 2024-25 school year, from early September and continuing until the end of October. In the spring, students will make informational signs for the garden and identification lists with plants and insects so they can locate different species when they walk through the garden.

Assessment

The purpose of this unit was to increase environmental literacy and stewardship while working on academic standards. Because of this, I have designed two assessments to measure the success of the unit. The first assessment is a questionnaire that will be given at the beginning and end of the unit. The questionnaire is an anticipation guide with

several statements about bees, other insects that are considered pollinators, human impact on pollinators, and environmental behaviors connected to insects and plants. The purpose of this anticipation guide is twofold; first, it will be used to activate students' background knowledge about the topic, and second, it will allow me to see the change in depth of understanding about and attitudes towards pollinators. The second assessment is designed to assess their knowledge of the structure of various pollinators that facilitate pollination and how we can positively impact our environment to benefit pollinators. To do this, students have several options; they can create a poster or brochure, write a skit, or make a PSA using iMovie communicating information about the types of insects that are pollinators, how they do their job, why they are needed, and what humans can do to help. Students will visit other classes to present their projects, allowing students to educate others and advocate for a healthier environment in their community.

Summary

This capstone project aimed to design a curriculum unit that built students' environmental literacy and stewardship through environmentally-themed classroom instruction. Through my research question, *What are the most effective teaching strategies for integrating environmental education into 4th-grade curriculum across different subject areas, and how do these approaches impact students' environmental literacy and engagement with environmental issues?* I learned that the most effective environmental education uses students' location and environmental issues to create learning that allows them to address problems and make a difference in their community. Effective learning experiences are also integrated into general education subjects so that students learn authentically.

Because of these characteristics, I chose a topic relevant to my students' community and aligned with science standards for 4th-graders in my state. To incorporate other subjects, I chose read-alouds and small group stories with themes of human impact on animals and environments. This allows students to connect to the environmental standards I focused on and the literacy standards in the state guidelines. The pollinator garden allows students to collaborate to choose appropriate plants to attract pollinators. When planning the garden, I was also able to incorporate math concepts in calculating costs and space used. The garden will benefit both the environment and the school population. In addition to the aesthetic of the garden, teachers from various grades will be able to use the garden for outdoor teaching with grade-level appropriate science topics.

The following chapter will provide additional details on the process of creating the curriculum unit and implementing the project-based learning activity, as well as the project's successes and challenges. It will also revisit and reflect on themes and understandings from the literature review after the curriculum creation process. Lastly, it will discuss the impact of my capstone project on my school and education community.

CHAPTER FOUR

Conclusion

Overview

The objective of this capstone research project was to create a unit of study that addressed 4th-grade state standards while tying in environmental literacy standards. I strived to do this by researching the question, *What are the most effective teaching strategies for integrating environmental education into the 4th-grade curriculum across different subject areas, and how do these approaches impact students' environmental literacy and engagement with environmental issues?* This goal of integrating environmental education into the general education setting is personally important to me because of my environmental advocacy beliefs, but also because of the increasing need for environmental literacy in society to address climate change issues (Reid et al., 2021; Westing, 1993).

In the first chapter of my research paper, I explained my background, history in the field of education, and personal connection to the research question. I also included critical changes to the field of environmental education that have built the foundation for the work I would be doing. The second chapter consisted of the literature review I completed in preparation for the project creation. I provided further information about the historical timeline of environmental education, defined environmental literacy and its components, and discussed some benefits and barriers to implementing environmental education in the general education setting. Chapter two also defines environmental stewardship, describes the various forms one can engage in stewardship, and discusses how environmental stewardship can be increased.

These first two sections of the literature review set the foundation and rationale for my goal of including environmental education in the general education classroom; the last section focused on implementation strategies. In this section I researched three different strategies found to be effective in teaching environmental education; using the environment as an integrating context, place-based education, and project-based and problem-based education.

Chapter three focused on the project creation. In this section, I described the unit of study I created. It outlined the included Missouri state standards for science and English language arts. The project description also identified the research-based instructional framework and resources I used to create the lessons included in the unit of study. The chapter also included details on the setting of the school and community in which I work, where I would be implementing the project, and the demographics of the students typically found in my classroom. Finally, the chapter outlined the timeline for my capstone project, from research to the anticipated implementation of the project as well as my plans for assessment of the project. This final chapter will discuss what I learned during the project creation process, review key points from the literature review, address implications for and limitations of the project created, and provide insight into additional research that could be completed to improve the project. It will also include my plans for sharing my research and project as well as how the project will contribute to the field of environmental education.

Major Learnings

Through my capstone research and project creation process, I learned many things. Some of them were connected to the content of my research, some were

realizations about the curriculum development process, and others were personal understandings about myself as a learner. During the literature review, although I feel confident in the field of environmental science and environmental topics, I deepen my understanding of environmental literacy and stewardship. I expanded my outlook on what literacy looks like and how stewardship is enacted in many different ways around the world. While working on my research I read case studies describing a wide variety of projects all over the world, giving me hope for the future of the field.

When researching instructional methods, one major understanding I had, which was extremely beneficial to the foundation of my project, was the cross-over in effective environmental education strategies with effective classroom instruction strategies. The 1998 study completed by Liberman and Hoody found that integrating multiple subjects under one unifying theme improved the academic engagement and performance of students (p. 19-24). Likewise, both project-based and problem-based instruction have been used in the general education classroom to increase student engagement. As an educator, I was grateful to see that many of the strategies we are already utilizing could be used to create environmentally aligned classroom instruction.

At the beginning of my capstone project, although I knew what I wanted to accomplish, the actual creation of the unit of study was a daunting task. I was unsure what needed to be included and how to create lessons and activities that would fit the project-based structure. After taking a self-paced professional development course on project-based instruction through the National Science Teaching Association, and utilizing the project-based learning resources available to teachers through the Buck Institute for Education (n.d.) website, I felt prepared to begin. The creation of each lesson

and activity in the unit plan was also challenging. Throughout the work of writing the plans, I continuously made revisions when I felt that the activities didn't align with the project-based structure and reorganized concepts that I wanted to teach so that student learning would flow logically. In addition to writing the lessons for the unit, I also had many resources to create in the form of handouts, worksheets, graphic organizers, and sorting activities. The amount of work needed to create a unit of study was the biggest challenge I had during the capstone process.

The last major understanding I had was in the creation of the pollinator garden. While my ultimate goal was to create a pollinator garden on school grounds, I did not think about the fact that creating the garden was a one-time event. Because of this, I changed the project to a student-led education presentation about the environmental issue of pollinator habitat loss. I do, however, still intend to create a school garden after the first time teaching the unit. Not wanting to lose the activity requiring students to research, plan, and design their own garden, I chose to make the focus to create a garden that could be planted at their home. This activity allows the students to use their learning to make real-life changes in their community.

Key Points of the Literature Review

While completing the research for my capstone project, several key points helped direct my approach to the structure of the unit I created. The first point was my learning about increasing environmental stewardship in children. (Huoponen, 2023; Korfiatis & Petrou, 2021). In their studies on fostering pro-environmental behavior, both Huoponen (2023) and Korfiatis and Petrou (2021) found keys to increasing environmental stewardship in children are to build their self-efficacy and promote student ownership of

local environmental issues. This grounded my idea of connecting the 4th-grade science standards around the structure and function of organisms to the issue of habitat loss for local pollinators. Further support for the theme of my unit could be found in the research from Lawson (2019) who found that families are more likely to adopt pro-environmental behaviors with influence from their children. This idea led to the hope that through the learning in my unit, families would be encouraged to create pollinator habitats at home, increasing the amount of pollinator habitat available in the community.

Also key to planning effective environmental instruction, is using topics that are place-based. The Place-based Education Evaluation Collaborative (2010) found that keeping learning focused on the student's local community helped increase environmental stewardship and build an understanding of advocacy. Flanagan et al. (2019) found that place-based learning improved understanding of the importance of ecological diversity and the interdependence of human and natural systems. These concepts are integral to building a person's environmental literacy and was the core goal in my desire to create instruction that integrated environmental learning into the classroom instruction.

The most influential idea from the literature review was my research on project- and problem-based instruction. The research of both Ural and Dadli (2020) and Yolcu (2023) indicated an increase in students' environmental literacy and Asli et al. (2022) and Paredes-Chi and Viga-de Alva (2020) found that project- and problem-based instruction strengthened student's cooperation and intrapersonal skills. One study, done by Asli et al. (2022) directly aligned with the theme of my project idea and was extremely helpful when thinking about the direction I wanted to take when creating the unit. Overall, the

research on project- and problem-based instruction supported and provided direction for my project creation.

Implications and Limitations

My goal in creating this unit of study was to incorporate environmental education into my classroom to build the environmental literacy of my students. This strategy of including environmental issues combined with the project-based instructional method has benefits that impact the students and community in several ways. First, understanding an environmental issue in their community helps develop their sense of place within the community. Working to solve or improve environmental issues in the community builds relationships and connections between the student's school and the rest of the community. Dzurick et al. (2015) stated that the goal of urban education was to create a community's environmental identity and cultivate healthy environments. While their study was focused on urban communities, I believe that the concept can apply to any community. Helping students become involved in creating a healthy community improves the well-being of everyone in the community.

Development of the student's critical thinking and problem-solving skills is another benefit of the unit. To solve environmental issues in today's world, we need to be creating thinkers that have strong problem-solving skills. The Education for a Sustainable Future Benchmarks for Individual and Social Learning describes the types of learners needed to solve the environmental issues we are facing (Cloud, 2017, p. 10-15). As teachers, we need to be increasing students' opportunities to engage in this type of learning. The unit created helps to provide students with practice in critical thinking.

While there are benefits to the implementation of the unit of study, there are also some limitations associated with the implementation of this unit. Firstly, there are the financial limitations. Several activities in the unit will require purchasing materials each year that the unit is taught as well as any costs associated with transportation for an off-site visit during the biodiversity study activity in lesson two. In addition, there is also a more significant cost of seeds, gardening supplies, and long-term maintenance should a teacher choose to plant a pollinator garden on the school grounds.

Another limitation that needs to be considered is the content knowledge of the teacher implementing the unit. While I had adequate knowledge of the topics I wanted to use, I still learned new things in my research when creating the unit. As a teacher who is not as knowledgeable in the topic of native plants, insects, or even the scientific aspects of light and color, teaching these concepts could be overwhelming.

Future Research

The areas of research included in my literature review were chosen to build an in-depth understanding of environmental literacy and stewardship, to investigate factors that influence these areas, and to understand the most effective instructional strategies to build both aspects of one's environmental identity. The literature review was not exhaustive, however. One area that I would like to research further is the impact that race, gender, culture, and socio-economic status play on one's environmental identity. While I touched on some aspects of this in the literature review, time did not allow for in-depth research into the impacts of these factors on environmental literacy and stewardship. Outdoor spaces have historically been viewed as white spaces, and many people of color do not feel comfortable engaging in outdoor activities, although there is a current

movement to change that perception (Mills, 2016; Rott, 2016). Gaining a better understanding of how these factors impact a student's view of the environment as well as what things are being done to increase environmental literacy and stewardship with groups of people that don't see themselves as members of 'outdoor spaces' would be beneficial to designing instruction that creates meaning for a diverse group of students.

Another area I would like to do additional research on pertains directly to the content in the unit plan. As stated before, teaching concepts that are unfamiliar to the teacher can be stressful and even make the teacher resistant to trying the unit. I would like to include brief overviews of each concept with key ideas that students need to understand to help teachers who are unfamiliar with the subjects. Some of this knowledge I know, but to prevent spreading misunderstandings, I would like to research more on each topic to ensure that I have accurate information as well as details that I may not be aware of currently.

Communication

If increasing environmental education in the general education classroom is my goal, then I will need to share my unit of study with fellow instructors. There are several ways that I plan to accomplish this. First, I will share this with my grade-level teammates. Because they teach the same content as I teach, and have me as a content resource, this will be simple for them to implement. I also plan to share the unit with my district science coordinator. This will be a great resource as she will be able to provide insight on any tweaks or additions that need to be made to get district approval before sharing out with all other 4th-grade teachers in the district. Additionally, once all the kinks are worked out I plan to submit the unit to the MEEA in hopes that it will be published as a resource for

educators throughout the state. This process will allow me to fix anything that doesn't work well or make changes as needed once I've used the lessons with students before sharing them with the public.

Contribution to the Field

When selecting my topic for the capstone project, I reflected on my frustrations with being able to find resources for environmental education that could be used in a traditional classroom setting. There are options out there from national programs such as Project WET, Project WILD, and Project Learning Tree, as well as local programs like Discover Nature Schools by the Missouri Department of Conservation (Association of Fish and Wildlife Services, 2022; Missouri Department of Conservation, 2024; Project WET Foundation, 2024; Sustainable Forestry Initiative, 2019). However, some of these programs are cost-based or require training to implement. Another barrier to using these resources is how well they address the standards. The programs listed are amazing resources, but cannot often be used directly because of curriculum requirements, causing teachers to pull individual activities that work with their instructional needs. Many teachers, like me, want to include environmental education in their classrooms but do not know where to start (Stevenson, et al., 2014). The literature review and project creation can be used as a guideline for blending effective instructional strategies to create environmental education-integrated instruction for the typical classroom.

Conclusion

The final chapter of this capstone project was a reflection on the learning and work completed during my capstone process. I began by discussing the major learnings surrounding instructional strategies as they pertained to environmental education as well

as the process of curriculum design. I also revisited the key ideas from the literature review that helped guide my project creation. After completing the literature review, to increase student impact, I knew that I needed to keep learning locally based and interactive. Additionally, my research helped me structure a project-based unit that addressed required science standards and connected those standards to environmental issues. Next, I considered the additional research that could be completed to further my understanding of the issues related to my research question: *What are the most effective teaching strategies for integrating environmental education into 4th-grade curriculum across different subject areas, and how do these approaches impact students' environmental literacy and engagement with environmental issues?*. A deeper understanding of the effects of race, culture, and socio-economic status would help me plan more effective instruction for my students. Finally, I discussed my plans to share my work with my peers as well as how this project contributes to the field of environmental education and teaching as a more general field. Going forward, I plan to use this process to develop additional units for my classroom to grow my environmental education curriculum, and subsequently, the environmental literacy of my students.

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