

Hamline University

DigitalCommons@Hamline

School of Education and Leadership Student
Capstone Theses and Dissertations

School of Education and Leadership

Summer 2017

How Does Experience-Based Learning Impact Students' Decisions To Perform Sustainable Actions?

Andrew J. Pierson
Hamline University

Follow this and additional works at: https://digitalcommons.hamline.edu/hse_all



Part of the [Education Commons](#)

Recommended Citation

Pierson, Andrew J., "How Does Experience-Based Learning Impact Students' Decisions To Perform Sustainable Actions?" (2017). *School of Education and Leadership Student Capstone Theses and Dissertations*. 4310.

https://digitalcommons.hamline.edu/hse_all/4310

This Thesis is brought to you for free and open access by the School of Education and Leadership at DigitalCommons@Hamline. It has been accepted for inclusion in School of Education and Leadership Student Capstone Theses and Dissertations by an authorized administrator of DigitalCommons@Hamline. For more information, please contact digitalcommons@hamline.edu.

HOW DOES EXPERIENCE-BASED LEARNING IMPACT STUDENTS' DECISIONS
TO PERFORM SUSTAINABLE ACTIONS?

by

Andrew J. Pierson

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

Hamline University

St. Paul, Minnesota

August, 2017

Primary Advisor: Bill Lindquist

Secondary Advisor: Brenda Nelson

Peer Reviewer: Jarod Werner

TABLE OF CONTENTS

CHAPTER ONE: Introduction.....	6
Opening.....	6
Overview.....	6
My Teaching Experiences and Background.....	7
The Start of an Educator.....	8
The Beginning of my Teaching Career.....	8
What Teaching has Taught Me.....	8
My Rationale for Research.....	9
Why This Topic.....	9
Influences in my Life.....	10
A Reason for Knowledge.....	11
What Will I Find?.....	12
Summary.....	12
Preview of Chapter Two.....	13
CHAPTER TWO: Literature Review.....	14
Environmental Education.....	14
Appropriate Environmentally Sustainable Actions.....	15
Student Awareness of Environmental Sustainability.....	15
Students and Nature.....	17
Ecological Identity.....	18
Appropriate Exposure to Nature.....	19

Influences of Change.....	20
Psychology of Changing Behavior.....	20
Systems of Thinking.....	21
Making the Change.....	22
Effective Concept Implementation.....	24
Learning Theories.....	25
Experience Based Learning.....	26
Place-Based Education.....	27
Outdoor and Adventure Education.....	29
Putting Research to Practice.....	30
Summary.....	30
Preview of Chapter Three.....	33
CHAPTER THREE: Research Methods.....	34
Introduction.....	34
Setting and Participants.....	36
The School and District.....	36
Setting.....	36
Participants.....	36
Research Design.....	37
Experience-Based Learning.....	40
Research Paradigm.....	41
Qualitative Research.....	42
Data Collection Tools.....	42

Triangulation.....	42
Interviews and Questionnaires.....	43
Data Analysis.....	44
Participant Confidentiality.....	47
Conclusion.....	47
Preview of Chapter Four.....	48
CHAPTER FOUR: Results.....	49
Introduction.....	49
Indications of Appropriate Environmentally Sustainable Actions.....	50
Questionnaires.....	52
Waste and Recycled Measurements.....	58
Additional Activities.....	64
Influences that Change Behavior.....	67
Scenario Questions.....	68
Observations of Influence that Change Behavior.....	76
Effective Implementation Methods for Instilling Sustainable Behaviors.....	78
Vermicompost Prediction.....	79
Final Thoughts on Vermicompost.....	81
Conclusion.....	83
Preview to Chapter Five.....	85
CHAPTER FIVE: Conclusion.....	86
Introduction.....	86
Answering the Question.....	86

Revisiting the Literature Review.....	88
Implications, Limitations, and Use of Findings.....	91
What’s Next.....	93
Summary.....	94
Conclusion.....	96
REFERENCES.....	97
APPENDIX A School Research Consent Letter.....	105
APPENDIX B. Informed Consent Letter.....	109
APPENDIX C. Pre and Post Project Oral Questionnaire.....	113
APPENDIX D. Pre and Post Project Interview Questions.....	116
APPENDIX E. Scenario Questions.....	119

LIST OF TABLES AND FIGURES

Table 1: Pre-Project Knowledge Question Results.....	54
Table 2: Post-Project Knowledge Question Results.....	55
Table 3: Pre-Project Participation Question Results.....	55
Table 4: Post-Project Participation Question Results.....	56
Table 5: Scenario Question Rubric.....	69
Table 6: Scenario One Results.....	70
Table 7: Scenario Two Results.....	71
Table 8: Scenario Three Results.....	72
Table 9: Scenario Four Results.....	73
Table 10: Scenario Five Results.....	74

Figure 1: Pre-Project Questionnaire Graph.....	57
Figure 2: Post-Project Questionnaire Graph.....	57
Figure 3: Classroom Waste Graph.....	60
Figure 4: Classroom Recycling Graph.....	61
Figure 5: Food Waste Graph.....	62
Figure 6: Sustainable Pictures.....	65

CHAPTER ONE

Introduction

Opening

Conservationist Aldo Leopold once said, “I am glad I will not be young in a future without wilderness.” Being a father and elementary teacher, this quote by Leopold has personal meaning that cuts deep at my core values. With the future of human and environmental interaction in mind, the research question I will investigate in this study is as follows: How does experience-based learning impact students’ decisions to perform sustainable actions?

Overview

The introduction of this capstone will describe personal experiences and events that have influenced my desire to investigate this topic. I will give an overview of my rationale for choosing this topic and explain why and how it will fit into my professional career.

An anxiety I have about this study is being able to implement the many aspects and ideas of environmental sustainability into a third grade science curricula while still ensuring that all state standards are addressed. Reading and math continue to be the focal points of formal public education and testing, therefore, I will need to creatively integrate science time into areas of the day that are specifically designated for reading or math. A solution to my anxiety about covering all standards is the use of subject integration or embedding science standards into reading time or reading standards into science time. This past year our elementary school implemented two new curricula for science and non-fiction reading that have done a great job of overlapping subject areas. Project Lead the Way (Project Lead the Way, 2017) and Nell Duke (Duke, 2015) offer an

experience-based and information in action approach, which encourages students to research, interview, and use hands-on investigating to complete projects. It has been interesting to see the transformation as well as learning curve that have come along with these two curricula. It has appeared so far this year that students are excited about these new learning opportunities. Yet, these curricula have proven to be a challenge for some learners that struggle with more abstract and open ended concepts. The completion of my vermicompost experience-based research study will not only offer me a deeper understanding of how place-based learning experiences affect students, but it may also enhance or impact the format I use to teach *Nell Duke and Project Lead the Way*.

Our district has also adopted the use of targets and scales with a goal of increasing rigor for all students. Targets and scales is a system created by Marzano (2010). Targets and scales address learning goals and objectives that the classroom teacher introduces and explains to students before, during, and after a lesson or unit. These targets and scales are directly tied to state standards.

At the conclusion of this study, I hope to better understand what environmentally sustainable behaviors would be appropriate for third graders to practice. I would like to know how to teach and implement these behaviors in the classroom so that students may willingly practice them outside of school as well. Understanding the psychological factors that influence effective learning would also be a benefit to teaching sustainable behaviors. My goal is that my students be conscious of their actions, consequences of their actions, and positive impacts of their actions.

My Teaching Experiences and Background

The start of an educator. At age 16 I began my journey as an educational leader when I took a position as a baseball coach. Although this position was far from formal education, it taught me the responsibility that comes along with being a respected instructor. When one makes the decision to become a formal educator, they must also recognize the power that goes with this task each and every day. Being an educator enables me to influence and inform young people both intentionally and unintentionally. This power to change human lives and in turn, futures, is what has specifically influenced my decision to investigate sustainability behaviors in third graders.

The beginning of my teaching career. My first formal teaching position in 2009 was as a first grade teacher. Being that this was my first year teaching, I admit that the year was likely filled with more educational experiences for me than for my students. I was amazed by the unique personalities of each of the students in my classroom. It was eye-opening to observe the differences in student routines and actions. It quickly became evident how influential a child's background and upbringing was to their academic and social success in the classroom. While some students were equipped with the background knowledge and life experiences to excel in formal education, others floundered following simple one step directions. Seeing these extreme differences had me wondering what some parents were doing to expose their children to a world that would prepare them for future success. Was I witnessing individualism among students, socioeconomic contrasts, varying degrees of life experiences, or did some parenting methods just conform better to formal education?

What teaching has taught me. A year after my first grade teaching experience, I took a position as a third grade teacher. This is the position I currently hold. Six years and a few hundred students later, most daily events in the classroom are less astonishing as they were

during my first year teaching. Third grade students differ from those I taught in first grade in that their distinctive dispositions don't seem to be as evident. Maybe this is a product of them being exposed longer to the formal education system. Sometimes this refined display of behavior makes me believe that already at this young age, students have succumbed to many of the social norms that we expect from responsible citizens. Our society values conformity and finds comfort in consistency. This can be viewed as a great thing if our social norms reflect responsible actions, but what if these social norms lack a crucial component to human survival? How do we change an action to make it into an ecologically sustainable norm that will benefit future generations?

My Rationale for Research

Why this topic? A quick exploration into a list of the most pressing issues our world faces would include food security and clean drinking water, climate change, population growth, and energy availability (Hutt, 2016). All of these issues share a common theme in that humans have a direct influence on how these issues play out in the future. Humans have a much more advanced understanding of these issues now than they ever have before. What we seem to be lacking, however, is a system or society wide approach to addressing these issues in a way that doesn't portray the actor as an anomaly. I believe that as an educator, I've been oriented in a place where I can influence the human actions required to elicit environmentally sustainable behaviors. In order to better understand how I can efficiently influence my third grade students, I will use my capstone research project to answer the question, how does experience-based learning impact students' decisions to perform sustainable actions? This project will be an action research study using qualitative methods of inquiry. I will begin the project by presenting students with an overview of recycling and the impacts of recycling at a local and global scale.

The project will include measuring my classrooms daily food and classroom waste as well as the amount of paper we recycle each week. The vermicompost system will be used as a tool for instruction as well as an experience based project that gives students a hands-on opportunity to participate in recycling.

Influences in my life. My reason for choosing a topic that involves environmental sustainability stems from personal life experiences. I was extremely fortunate to have family and friends while growing up that valued the benefits of nature. Fishing, hunting, camping, gardening, or simply exploring a patch of forest were all hobbies that I enjoyed in the company of family and friends. I can recall an event when I was three years old that would become just one of many examples reflecting my interest in the outdoors.

I was fishing on a floating dock in central Minnesota. For some reason my parents had made a quick trip back to shore and left me on the dock alone, with a life jacket on of course. It's unclear if it was inclement weather or faulty craftsmanship of the rope system holding the dock together but in short, the dock disconnected from land and began floating into the lake. Mesmerized by the aquatic ecosystem around me, insects skirting about, fish in the water, and Snoopy pole in my hands, I was none the wiser of my dire situation. Truthfully, I doubt any plan to abandon my fishing time on the dock would have occurred even if I understood the peril of my situation. This story concluded with me reeling in a 23'' walleye just as my parents rescued me from the dock with a boat. This experience became the first of many that have defined who I am, what I want to be, and mostly what I want others to have the opportunity to experience.

A love for all things wild is a theme that has sustained in life and one that I plan to share with my children. I believe it is the experiences I've had outdoors that have shaped me into who

I am, given me a sense of place, and allowed me to perceive what I believe is success in my personal and professional life. The natural beauty in our world has always offered me consistency, relief, and a deep biological connection to my past, yet given me a vision for the future. A curiosity and interest in the outdoors have become a springboard for many of the decisions I've made in life and paths I've taken.

A passion for the outdoors is what drew me to Bemidji State University in northern Minnesota for my undergraduate degree. With hundreds of lakes, thousands of acres of public land, and a campus full of like-minded individuals, Bemidji State gave me a sense of independence that was supported by the ever present and comforting natural environment that I had relied upon while growing up. What began as a major in aquatic biology quickly turned into elementary education when I had an epiphany on the impact that great teachers and the natural environment had on me while growing up. What better way to change the world than to shape young minds alongside one of my greatest teachers; Mother Nature. It seemed only fitting to reach out to students using the assistance of the most diverse, engaging, and important curriculum that exists.

A reason for knowledge. My personal experiences in the outdoors and my professional life as an educator have made me appreciate the natural world and the human mind. I strongly believe that our presence on earth dictates the coexistence of these two things. Future generations will have to live with the decisions and choices, or lack of decisions and choices that humans have made and will continue to make. A disconnect from the natural places on our planet will most certainly influence the clarity and health of the human mind and spirit. My fear is that without an understanding and connection to the natural world, future generations will have

no reason to sustain or restore our world's natural places. With the destruction of natural places our planet simply cannot sustain the fundamental needs for human survival.

What will I find? As I conclude researching and documenting student practices of environmentally sustainable behavior, I expect the results to vindicate the use of experience-based projects in the classroom. My research will include participation in an experience-based learning vermicompost project, weighing and tracking food waste, classroom waste, and recycled paper, questionnaires, scenario responses and interviews that will help determine if experience-based learning had any influence on student behaviors.

I hope to use my findings as the foundation for the teaching approach I take in the future. I want to be able to definitively know that the time and method I use to teach my students is the most effective and efficient possible to educate students not only about environmental sustainability but also other formal education disciplines. Along with teaching methodology, I hope to better understand what environmentally sustainable practices are most appropriate for the age of students I teach as well as how to make these practices a routine for them.

Summary

My lifelong love for the outdoors has given me an appreciation for how intricately fragile our natural world is. I have a passion for working with children and am consistently amazed at their abilities and resilience. While working in a classroom setting, it's been evident to me that there is a disconnect between children and the natural environment. I believe this disconnect with our natural environment has ramifications in physical and mental health among humans. Along with concerns to human health, a lack of care for our natural world will lead to damages to natural resources. Irreversible damages to our natural world will eventually usher a bleak outcome for mankind. Humans need wild places in order to support healthy living and the

wild places need our conservation minded foresight to sustain in a world that is experiencing extraordinary human population growth and environmental degradation. I believe I can close the disconnect between children and nature by answering the question, How does experience-based learning impact students' decisions to perform sustainable actions?

The experience-based learning vermicompost system along with data collected from questionnaires, scenario responses, interviews, classroom waste, student food waste, and recycled paper will guide me to a clearer understanding of experience-based teaching methods effectiveness in reaching a diverse set of learning styles among students by giving me pre and post project data. The data will address the effectiveness of experience based learning by revealing if student opinions and actions changed regarding recycling and sustainability. Researching the most age-appropriate lessons and strategies concerning environmental sustainability will allow me to incorporate these ideas into my classroom and at a school-wide level such as through my work with our School Forest Committee. When students understand the importance of environmental sustainability, my hope is that they will take ownership of a variety of practices that reflect environmentally sustainable behavior at school and out of school. The benefits of investing the time, effort, and expertise into helping young people understand and appreciate our environment now will far outweigh any other actions I personally could have on the future of our world.

Preview of Chapter Two

In chapter two I will explore the psychology of human behaviors and learning styles. I will also review teaching methodology. Finally, I will analyze environmentally sustainable practices that are most age-appropriate for addressing elementary aged students.

CHAPTER TWO

Literature Review

This literature review will explore the question: how does experience-based learning impact students' decisions to perform sustainable actions? The review will start with an overview of appropriate environmentally sustainable actions for elementary aged students. Appropriate environmentally sustainable actions will be followed by an exploration of social, physical, and psychological influences of change in children. Finally, influences of change will transition into an examination of the most effective implementation methods, teaching styles, and learning environments for instilling environmentally sustainable behaviors in students.

Environmental Education

The Environmental Protection Agency identifies environmental education as an awareness and knowledge of environmental issues that leads the public to make informed decisions and take responsible actions for a healthier environment (EPA, 2016). Part of understanding how natural systems interact and relate is a key feature of environmental education. The intent of this research project is to analyze the effectiveness of a component of environmental education, experience-based learning, in changing student perspectives and actions. With conscious, healthy environmental actions, students may begin to develop a relationship to the natural world around them. The content of this capstone focuses on a variety of environmental education features with an emphasis on better understanding how

environmental education may or may not be an effective tool for positively changing the perspectives and actions of students.

Appropriate Environmentally Sustainable Actions

Environmental Sustainability refers to the rate at which renewable resources are harvested, the amount of pollution created with resources and the rate that non-renewable resource depletion can continue indefinitely (Daly, 1990). Research involving environmental sustainability in this section will focus on appropriate actions for elementary aged students that promote environmental sustainability. This section will explore current trends in student's interactions with nature along with their understanding of environmental sustainability and their need to find a sense of belonging to natural places. Ecological identity and the perspectives within ecological identity will be discussed. This section will conclude with an overview of what actions are best suited to become routines that students will develop into lifelong habits. Environmentally sustainable actions for elementary aged students will be implemented in a formal classroom setting during an experience-based project with the intent of analyzing if these actions will become habitual behaviors.

The United Nations declared 2004-2015 as the Decade of Education for Sustainable Education, thus emphasizing that educating youth will be instrumental in realizing global sustainability (Hagglund & Samuelsson, 2009). If knowledge is the driving force in achieving a sustainable future, educators must first have an understanding of what students already know about environmental sustainability.

Student Awareness of Environmental Sustainability

A 2010 needs assessment conducted by Concord Evaluation Group found that less than one quarter of children 6-9 years of age involved in the assessment believed that humans could

affect or change the environment while nearly half were unsure what role they played in being part of our environment (Paulsen & Carroll, 2010). This same assessment found that although nearly three-quarters of children asked said they cared about the environment, just one quarter understood that water was a renewable resource (Paulsen & Carroll, 2010). Children often demonstrate a positive attitude toward the environment and recycling, however, there is a lack of understanding and disconnect between sustainability and the rationale behind practicing sustainable behaviors (Paulsen & Carroll, 2010). Although the assessment conducted by Concord Evaluation Group would suggest that most children generally enjoy and appreciate interaction with the environment, other studies would suggest different.

Psychologists Stephen and Rachel Kaplan in a 2002 study report that students would rather participate in activities that are conducted in a built up setting (Kaplan & Kaplan, 2002). They assert that adolescents find time spent in nature to be boring and lonely while time spent in a built up setting, especially with friends, to be more fun. The Kaplan study goes on to suggest that children that are raised in an urban environment often times feel less comfortable with nature because of the fear of the unknown. These unknown factors often include a misperception of the dangers that animals present or being lost in nature. Children raised in a rural setting are less intimidated by nature because of the increased contact they've had with nature while growing up, therefore they find more enjoyment while participating in activities in a natural setting (Kaplan & Kaplan, 2002). If the Kaplan's findings are true, the current trend of urbanization around the world will certainly have an effect on how children perceive the environment and their role within it. Some specialists such as Kahn (2002) may say that children are unable to view the dire need for environmental stewardship due to the fact that their only perspective of our world is that of current pollution and waste. *Children and Nature* by Peter H.

Kahn, Jr. suggests that children today view the pollution and degradation they see as normal and therefore don't have a true grasp on how polluted our world truly is (Kahn, Jr., 2002). Urbanization may be to blame for children's false impression of normal that is leading some environmentalists to believe that we have a deficiency in our society.

Students and Nature

The term "Nature-Deficit Disorder" was coined by author Richard Louv in his 2005 book, *Last Child in the Woods: Saving our Children from Nature Deficit Disorder*. Louv considers "Nature-Deficit Disorder" to be a child's lack of exposure to nature partially due to today's generation of digitally engaged children. Louv claims that depression, childhood obesity, and attention disorders are also a direct effect of children not spending as much time outdoors (Louv, 2005). Poor urban planning, the loss of natural spaces, an increase in social media and electronics, less importance placed on the natural world by private and public education, and parental fears magnified by the media are all reasons for the increase in children realizing "Nature-Deficit Disorder" (Louv, 2005).

Two studies done in recent years appear to back up the claim that there is a disconnect now more than ever between children and the environment. A survey of over 800 United States mothers asked how much time they spent as a child playing outside and how much time their children spend playing outside. "70% of the mothers reported playing outdoors every day when they were young, compared with only 31% of their children" (Clements, 2004). When asked what the main obstacles were in having their children play outside, most mothers referred to a fear of their children getting injured while outside, the possibility of crime, and their child's increased time spent watching television or playing with electronics (Clements, 2004). A similar survey conducted by England Marketing found that of the 1,652 adults and children surveyed,

only 10% of children claimed to frequently play in natural places compared to 40% of adults who claimed to have frequently played in natural places when they were children (England Marketing, 2009). Is it possible that children neglect to spend time outdoors simply because they lack a sense of place or identify within the natural world?

Ecological Identity

To realize their role in being part of our environment, children must seek to find an ecological identity. Thomashow (1996), describes ecological identity as the many ways that people construe themselves in relationship to the earth in a sense of self, actions, values, and personality (Thomashow, 1996). A sense of ecological identity is what eventually determines what actions a person will take to either improve or degrade the earth. Childhood connections and memories of nature, spending time in nature itself, and perceptions of environmental disasters are notions that can influence a person's ecological identity but the largest factor in developing a person's ecological identity is education (Thomashow, 1996).

It is important for educators and those seeking their ecological identity to note that people often relate ecological identity to either being a preservationist or a conservationist. According to Thiele (1999), although both preservationists and conservationist believe in an overarching theme of keeping nature healthy and safe, their reasons for doing so differ. Preservationists focus on preserving the environment strictly for the sake of the environment and not for human uses (Thiele, 1999). Conservationists are more concerned about conserving our natural world in order for future generations of people to enjoy it (Thiele, 1999). Being mindful of each of these perspectives will affect the direction educators decide to proceed in regards to lesson and activity planning. Will teaching methods encourage students to engage in activities that personally benefit them or will activities promote preserving natural places for the flora and

fauna? Regardless of the direction educators choose to go, what's most essential is to emphasize to children that they are an important piece of a bigger ecological picture rather than a completely separate entity (Wolfe, 1978).

Appropriate Exposure to Nature

If a child is experiencing a nature deficiency and education truly is the remedy to encourage finding an ecological identity, then promoters for a sustainable future must consider the best avenues to ecologically proficient minds. Author Cynthia Thomashow explains in *Adolescents and Ecological Identity: Attending to Wild Nature* (2002), that shorter outings in nature over an extended period of time will lead children to obtaining a sense of ownership and belonging to the natural world (Thomashow, 2002). Connecting children to local natural setting and involving them in local environmental issues will create long lasting environmental behaviors and attitudes (Thomashow, 2002). While reflecting on the findings of one of her studies, Thomashow states:

Slowing down the pace of their lives and immersing themselves in the sounds and movements of birds, small mammals, and insects had a significant impact on the way these teens began to think about themselves. They started to comment on their relationship to the weather, other species, the run of the river, and the quietness of this place as if self was reflected in the sanctity of this land, and it furthered their passion to protect its integrity. In protecting this piece of land, they were protecting a piece of themselves. (p. 269)

In his book, *Sharing Nature with Children* (1998), author Joseph Cornell suggests that outdoor leaders must be sensitive to the group of children they are teaching. Beneficial

relationships are based on an intuitive level between the teacher and student rather than just on informational content (Cornell, 1998). Cornell created a methodology known as "flow learning" that involves guiding students through a step by step process that follows the stages of: Awakening Enthusiasm; Focusing Attention; Directing Experience; and Sharing Inspiration (Cornell, 1989, 46-47). Cornell asserts that educators must express their personal feelings about nature, be sensitive to the reactions of students, make sure nature experiences are joyful, and practice activities that promote experiencing first and talking about those experiences later (Cornell, 1998). Exposing students to natural places is paramount to begin the education process, but what influences a person to actually change their behaviors once they have realized they have a potential impact on the environment?

Influences of Change

Individuals are influenced each day by their past experiences, the individuals in their life, and the society around them. These influences and experiences aid people in making rational as well as instinctual, split second decisions. Realizing what influences human behavior is vital since human behavior can be to blame for nearly all environmental issues and success stories we experience today. The overarching theme of this section is to explore the psychological and behavioral contributions that influence actions. This section will investigate what dictates a person's conscious and unconscious decisions to practice environmentally sustainable behaviors. A better understanding of the influences that predict a student's actions will aid an educator in facilitating lessons that are more impressionable to students.

Psychology of Changing Behavior

Psychology is the study of human behavior and mind that includes conscious and unconscious experiences and thoughts (Manning, 2009). Researching psychology will help give

a clear view of why humans practice unsustainable behaviors even though they may have a knowledge of the deeper consequences of their actions. On the other end of the spectrum, psychology will help us understand why people also go out of their way to practice sustainable behaviors. In her work, *The Psychology of Sustainable Behavior*, Manning explains that in general, most people want to live in a way that treats our ecosystem with respect and care while increasing worry about the state of our ecosystem. However, even with these feelings, we are still engaged in unsustainable behaviors that continue to have negative effects on our environment (Manning, 2009). So, why is it that we understand the impacts of our actions, yet we continue these actions? Manning says that even though we are having rational thoughts, our minds don't always drive our behavior.

Systems of Thinking

Unconscious or automatic processes constitute most of the decisions for a rational mind (Manning, 2009). There is recent psychological evidence that thinking is the product of the cerebrum where two different systems of reasoning take place. The first system is a rule-based, which is conscious, rational and deliberate. The other is an associative system, which is unconscious, sensory-driven and impulsive (Sloman, 2002). Although these two systems work in parallel, they don't always agree with each other. The rule-based reasoning system is slower and makes decisions based on facts, evidence, and careful consideration. On the other hand, associative reasoning is made more quickly, often described as a gut-feeling (Manning, 2009). This system does not use conscious control but rather it uses emotion, familiarity, and mental images (Manning, 2009). Although many people feel that they are making deliberate decisions based on facts, often times the associative system is playing a major role in our decision making and sometimes completely overrides our rule-based reasoning (Manning,

2009). How does knowing how we think help influence sustainable actions? Making sustainable actions appealing to the associative systems is one way (Manning, 2009). Another way would be to make the rule-based system aware so that it can deliberately override the associative system. The best approach, however, would be to capture both systems of thinking and make sustainable behaviors appealing for rational thinking as well as gut-feelings (Manning, 2009).

Making the Change

Manipulating our associative and rule-based systems of thinking is the solution to developing environmentally sustainable actions. There are seven psychological strategies that experts have determined will help to guide sustainable actions.

The first strategy is to make sustainable behaviors the social default (Schultz, et al, 2007). Humans are biologically programmed to care about what other people think and to try and make their behavior fit into those around them (Schultz, et al., 2007). People act based on messages from others that are both implicit and explicit and use these messages to form accepted and expected behaviors in our society (Schultz, et al., 2007). If people see their friends and neighbors engaged in sustainable behaviors such as composting (explicit) or using less fresh water (implicit in some situations), they are much more likely to partake in these actions because they feel a need to fit in.

A second strategy used to change behavior is to emphasize personal relevance (Manning 2009). Humans are hardwired to pay special attention to anything that will personally benefit them because their survival depends on it. So, if people see a direct personal benefit to practicing environmentally sustainable actions, they are much more likely to participate. If people perceive sustainable actions as only benefiting others or even future generations, they are

less likely to deliberately participate. This idea of personal relevance has a direct correlation to the conservationist ecological identity perspective.

Another strategy to promote sustainable actions is to make hidden information visible (Adams, 1999). Even though scientists are very much alarmed by the current severity of environmental problems, human's senses give them little evidence that anything is wrong because environmental issues are happening so slowly that human senses are unable to detect them. If facts, statistics, and research is not clear and easy for people to understand, they will have little motivation to change their actions.

The next strategy is to foster mindfulness. Manning (2009) found in her research that people who are in a more mindful state of awareness are more likely to act sustainably. Giving people a startling fact or surprising statistic will get their attention and in turn set them into a more mindful awareness. People are more conscious of their behaviors if they are mindful of the potential consequences of their actions. Strategies to awaken awareness of the urgency for sustainable behaviors could be as simple as presenting facts to students that describe an obsolescent society, degradation of the environment, or loss of natural places over the last century.

A fifth strategy is to create opportunities of competence, skills, and knowledge (Ryan & Deci, 2000). They claim the self-determination theory. This theory asserts that humans are drawn to activities where they feel competent. Those activities that give them a sense of connection to other humans are most influential. Self-determination theory suggests that humans need competence, autonomy, and relatedness for well-being and healthy functioning. Activities that threaten these three basic needs tend to be avoided (Ryan & Deci, 2009). If people are given

the tool of knowledge, taught the skills of sustainability, and find success in their efforts, they will continue their behaviors.

The sixth strategy used to increase sustainable actions is to make change a byproduct of other events (Neal, Wood & Quinn, 2006). Essentially, humans are habit-prone. Once humans have formed a habit, it becomes a routine that is easily performed. Recent research suggests that it takes an average of 66 days for an act to become habit (Neal, Wood & Quinn, 2006). The downside is that once a habit is formed, it's extremely difficult to break. If people are able to make their habits environmentally sustainable, these actions will be done with relatively little effort.

The final strategy is to balance urgency with realistic hope (Manning, 2009). Manning explains that it is important that we understand the environmental risks that we are facing and that we see these risks as potentially affecting us personally. Conversely, if all we hear is negative, our psychological defense mechanisms are likely to shut down or downshift any possibility of action that might help address the problem. There needs to be a balance between understanding urgency and staying positive enough to use the urgency as motivation to change actions.

Understanding how conscious and unconscious thought processes, the people around us, and realizing how a few simple strategies change a person's actions, can be a significant step in directing our actions toward environmental sustainability. The next section will review effective methods to implement outdoor education concepts by taking advantage of the aforementioned influences that change a person's behaviors.

Effective Concept Implementation

Effective concept implementation in this section will explore teaching techniques, methods, and delivery that are most effective in transferring appropriate environmentally sustainable actions to elementary aged students. The success or failure of transferring pertinent information to students depends largely on an educator's ability to satisfy all of the unique learning styles within a classroom. This section will provide an overview of the variety of learning styles often encountered in a classroom as well as best practice when working with these learning styles.

Learning Theories

Learning theories are frameworks that explain how information is absorbed, processed, and retained. A variety of influences including environmental, cognitive, emotional, and past experiences all play a role in how learning occurs (Knud, 2004). This section will briefly explain the constructivist learning theory and cognitive learning theory. These theories should be taken into account by educators when planning for concept implementation.

Vygotsky's Social Development Theory is possibly the most well known and seasoned constructivism theory. Vygotsky's theory suggests that social interactions proceed development and that cognition is the product of socialization and social interactions (Wertsch, 1985). Children that participate in practical activity in a social environment are much more likely to learn from their experience and retain what they've learned. The constructivist learning theory as asserted by Vygotsky and Lundberg states that:

The most effective way for students to learn is to have them construct their own knowledge (Lundeberg, 1997). Lundeberg (1997) states, three key principles emerge from constructivist views: (a) People learn from new experiences based on prior knowledge and beliefs; (b) new knowledge is always situated in a context; and (c)

learning is socially mediated and acquired within learning communities. (p. 60)

Essentially, students learn best when they are presented with a problem that they are then required to work through and find a solution to. In constructivist theory, it is also important that students gain meaning from social interactions and collaboration (Helle et. al., 2006).

Cognitive learning theory suggests that rather than learning from what a person is currently working on, people learn by making sense of the relationship between old and new learning experiences (Myers, 2008). In this theory, students must engage in reflection and retain childhood curiosities in order to learn. Helle, Tynjala & Olkinuora (2006) state that cognitive learning encourages active reflection, construction of concrete artifacts, learner control of the process, the use of authentic learning contexts, creating multiple types of representation of knowledge, relevant yet complex problems, and a sense of student ownership and motivation. With cognitive and constructivist learning theories in mind, the following section explains experience based learning methods and what makes this type of learning effective.

Experience Based Learning

There are a variety of names and terms for learning that are similar to experience-based, student-centered teaching methods. These include inquiry-based learning, place-based learning, problem-based learning, case-based learning, discovery learning, and project-based learning (Prince & Felder, 2007). What all of these methods have in common is that they focus on students creating meaning through collaboration, creation, and high-level thinking skills rather than gaining knowledge from the teacher.

Experience based learning is defined as a teaching method that helps students gain knowledge and skills by working over a period of time to investigate and respond to an

authentic, engaging, and complex question, problem, or challenge (Fritzberg, 2003). Some view experience based learning as a pedagogical approach to more creative and divergent student thinking. In the 1930's, educator John Dewey supported a shift in teaching pedagogy from traditional to progressive approaches that promoted student engagement in meaningful experiences rather than simple memorization of facts and knowledge. Another educator, William Heard Kilpatrick followed in Dewey's footsteps (Beyer, 1997). Kilpatrick would be the first to describe what we now know as experience based learning. McCarthy (2008) found that with an increased focus on mathematics and reading, some schools are placing less focus on other skills and subjects. The thought is that if students aren't tested on it, then there's no time for it in the classroom. Other educators that don't subscribe to this high-stakes testing train of thought choose to infuse creativity, experience, and student-driven learning into their lessons and curriculum. "School districts across the USA are beginning to adopt curricula that follow a EBL approach with an emphasis on developing students' twenty-first century skills" (Rogers, Cross, Gresalfi, Trauth-Nare & Buck, 2011, p. 894). Although it is not a national movement yet, experience based learning is gaining popularity again in the education world as demonstrated by the numerous studies and articles on experience based learning and other innovative teaching techniques (Childress, 2012). Experience-based education is an example of learning that fits well into environmental education.

Place-Based Education

Place-based education involves learning within the local area or community of the learner. This type of learning provides students with opportunities to become active citizens and stewards of the environment where they live (Sloman, 2002). Place-based learning can be likened to citizen science in that it takes resources and sometimes environmental issues from the

surrounding community and brings them into the learning process in a way that makes learning exciting. Teachers of place-based education “design learning activities that could potentially engender a sense of appreciation or positive regard about students’ home communities and regions” (Thiele, 1999). These experiences are real-world, hands-on opportunities that tackle issues that directly affect the natural world around a student’s home. This personal connection to the learning experience makes for a genuine and authentic lesson which in turn can make the learner more aware of sustainable behaviors that they could be practicing. The benefits of place-based learning echo Manning’s second strategy that says personal relevance is vital in creating a change in action.

Examples of place-based education could include taking part in a community project, working in a school forest or garden, studying nature or natural history in a school forest, participating in community service, or getting involved in a citizen science project. Place-based learning can be local outdoor and adventure education experiences as well as reflective time outdoors that allows the learner to become more familiar with their local environment (Sloman, 2002)

Orr (2002) offers four reasons why place-based learning is important for children. First, it combines intellect with experience through direct action. Students are given opportunities to learn through hands-on experiences. Second, studying place is relevant to problems of overspecialization. Educators must expose students to concepts using a variety of disciplines versus specializing or focusing on one discipline. Third, the study of place offers many significant projects that help to improve policy and practice in communities. Place-based education involves activities that promote sustainable practices that take into account issues with food, energy, and waste. Finally, the study of place offers a review of acknowledging the

importance of the place one lives. Developing this sense of place and connection to where one lives will give students a wider perspective of world as an interconnected community (Bekoff, 2014). Bekoff suggests that a main reason for incorporating place-based learning is to acquaint young people to the parts of local environments with nonhuman assets. When children value those assets, they are more likely to care for and protect them.

Outdoor and Adventure Education

Another educational approach is to combine experience based learning with place-based education. This pedagogy is known as outdoor and adventure learning. Outdoor and adventure learning involves less academic activities such as canoeing, kayaking, hiking, rafting, mountain climbing, ropes courses, or camping. The theme of outdoor and adventure education is to emphasize how the natural world affects humans by giving hands-on lessons of stress challenge (Bogner, & Wiseman, 2004; Palmberg & Kuru, 2000; Schwartz et al., 2012). Allowing students to enjoy the outdoors with a more physical and strenuous approach can give students an intimate perspective of the natural environment around them.

A study by Bogner and Wiseman (2004) looked at how residential adventure programs for adolescents impacted knowledge of conservation and attitudes towards nature and the environment. This study found that students learning through outdoor education showed a higher level of environmental awareness (Bogner & Wiseman, 2004). The study asserts that outdoor education provides “a response to the urgent need within biology education to shift away from a materialistic and atomistic worldview, and its epistemological paradigm shift towards an ecological approach with its network thinking and its sense of identification with background

pattern” (2004, p. 43). For some students, this more intense approach to outdoor exposure is both appealing and impactful.

Putting Research to Practice

How does this literature review help answer the question, how does experience-based learning impact students’ decisions to perform sustainable actions? An understanding of what past experiences students have in the outdoors and how this exposure can be used to further their education is a great place to start. One of the seven psychological strategies explained earlier in this chapter describes the importance of emphasizing personal relevance when changing actions (Schultz, et al, 2007). A better understanding of what students personal experiences are will aid the educator in teaching material that is relevant to student’s lives. A deeper understanding of a student’s background and sense of place will allow educators to create robust lessons and activities that change actions. There are a variety of influences that determine how and why people make decisions that can range from past experiences to the pressures of society. By grasping how influences can shape a person’s perspective and eventually mold behavior, educators can begin to determine which methods of implementation will best suite their audience.

Research has proven that a more tactile approach to environmental education evokes a sense of biological connection to the natural places around us (Adams, 1999). Being outdoors in a natural setting, especially in or near the community where we live can be extremely impactful in making us more environmentally conscious. If we are aware of our surroundings and how our actions directly affect our natural environment, we are more likely to practice sustainable behaviors (Amel, Manning, Scott, 2006).

Summary

The literature review began with an overview of what environmental sustainability means to students. It's clear that now more than ever before, there is a disconnect between children and the environment (Kahn, 2002). This disconnect is due to urbanization, a loss of natural habitats, an increase in children using social media and electronics, parent fears of letting their children play outdoors, and less importance placed on the natural world by the society. In order for children to connect with the natural world, they must find their ecological identity (Amel, Manning, Scott, 2006). Essentially, they must understand that they have a place and role in the intricate systems within the natural world. Allowing children to slow down, observe, and appreciate the many systems within the environment, and sincerely reflect on how they fit into our world is necessary if they are to understand the importance of their actions (Thomashow, 2002).

Whether consciously or unconsciously, people are influenced at the junction of nearly every decision they make. Although we often assume that most of the decisions we make are rule-based, rational and deliberate systems of thinking, many times this is not the case. Our unconscious or associative system of thinking is sensory-driven and impulsive (Schultz, et al, 2007). Associative decision making accounts for the thousands of split second decisions we make daily. If a person is to display environmentally sustainable behavior, they must be aware that both of these systems of thinking exist and furthermore, be able to train both of these systems of thinking to work together towards the same common goal of environmental sustainability (Manning, 2009). Seven examples of psychological strategies; making an action the social default (Schultz, et al, 2007), emphasizing personal relevance (Amel, Manning, Scott, 2006), making hidden information visible (Adams, 1999), fostering mindfulness (Amel, Manning, Scott, 2006), creating opportunities for competence (Ryan and Deci, 2000), making

change a byproduct of other events (Neal, Wood and Quinn, 2006), and balancing urgency with realistic hope (Manning, 2009) are given that when used, extract behaviors that influence a person's ability to exhibit environmentally sound practices. Chapter Three will include examples of where these strategies will be used in an effort to evoke a change in student behaviors toward more responsible and sustainable environmental actions.

The final section of the literature review examined how to take the knowledge gained in appropriate environmentally sustainable actions and influences of change and put them into practice by using the most effective instructional methods. Research has shown that the most effective tools to inspire learning are those that are tactile, hands-on, and are relevant to the learner. The constructivist learning theory asserts that students learn best when they construct their own knowledge. The cognitive learning theory suggests that students learn by comparing what they know from past experiences with newly gained knowledge. What both learning theories have in common is that they require the learner to have the opportunity to learn with experiences that go beyond simple classroom lectures.

Experience based learning is similar to inquiry-based learning, problem-based learning, case-based learning, discovery learning, and project-based learning focuses on having students create meaning through collaboration, creation, and high-level thinking skills rather than gaining knowledge from the teacher. Some learners, however, need more. Outdoor and adventure education uses activities such as biking, camping, hiking, canoeing, or even ropes courses to immerse the learner into the natural world. This high activity, intense and typically less academic style of environmental education can give students a better appreciation for how the natural world pertains to their lives. In conclusion, there are numerous facets at work when evolving an environmentally conscious individual. Above all, however, students must first

simply be exposed to the natural world around them in order to begin to develop a sense of place.

Preview to Chapter Three

In chapter three I will explain the methodology of my research study. The purpose of my study is to examine how experience-based learning impacts students' decisions to perform sustainable actions. I will discuss the setting and research participants in the study. The data collection tools for the research study and analysis of data collected will also be outlined.

CHAPTER THREE

Research Methods

Introduction

This chapter will discuss the description of the participants in the study as well as the setting. It will explain the research paradigm, qualitative methods of inquiry that I will employ during the research, and the various data collection tools that will be used for this study. The rationale for using the research method and tools will be explained as well as an outline of how the data will be collected and analyzed. The chapter will conclude with a description of how participant privacy and protection will be accomplished.

The intent of this research is to study: How does experience-based learning impact students' decisions to perform sustainable actions? The literature review in chapter two explored appropriate environmentally sustainable actions, the various influences that change behaviors, and the most effective implementation methods and environments for instilling sustainable behaviors. To examine the effectiveness of these influences and teaching methods, I will utilize experience-based learning projects in vermicompost, measuring food waste, classroom waste, and recycled paper in a third grade classroom. Measuring food waste, classroom waste, and recycled paper in the classroom will be a way to assess if student behaviors are affected by the experience-based learning project. An increase or decrease in the amount of food waste, classroom waste, and recycled paper will indicate if students are consciously throwing away more or less food, waste, and recycling paper. Reasons for using this type of experience-based project and measuring these areas of student's everyday lives are anchored in the psychological

strategies mentioned in Chapter Two that describe making hidden information visible (Adams, 1999), emphasizing personal relevance (Amel, Manning, Scott, 2006), and making change a byproduct of other events (Neal, Wood and Quinn, 2006).

Experience-based learning projects provide learners with the opportunity to solve a problem or examine an issue that is directly related to an aspect of their life (Prince & Felder, 2007). The idea behind experience-based learning is that learners often feel deeper connectivity to the lesson and therefore retain what's presented in the lesson because it directly impacts their life in some way. In this experience-based learning project, students will take a hands-on approach to recycling daily waste that they would otherwise throw away.

Along with the vermicompost project and weighing of waste and recycling, students will also participate in activities and lessons that articulate what recycling, composting, vermicomposting, and sustainability are. Creating labeled signs that dictate which items are to be placed in which waste or recycling containers, responding to sustainability scenarios, drawing pictures of personal recycling or composting experiences, graphing food and classroom waste, graphing recycled paper, and predicting if the food deposited into the vermicompost system will increase, decrease, or stay the same, are additional activities that will accompany this study.

The most efficient and thorough way to analyze the effectiveness of this experience-based learning project will be through an action research study using qualitative methods of inquiry (Mills, 2011). Action research refers to the use of investigative and evaluative tools within the project that are used to evaluate evidence of learning. Qualitative research methods are used to research a target audience's range of behaviors and perceptions. Qualitative research is the most appropriate method of research because my research question focuses on student's actions and experiences. The methods of inquiry will be questionnaires, interviews, responding

to scenarios, and collecting daily and weekly data of the amount of food waste weight, classroom waste weight, and recycled paper weight.

Setting and Participants

The School and District The research study will take place at a school in a small rural Midwest community on the border of Canada. There are 457 students in the elementary, middle, and high school. Among these 457 students, 90% of students identify themselves as white, 3% as American Indian, 3% Black, 3% Asian, and 1% Hispanic. 55% of students are eligible for the free or reduced lunch program.

Setting The research study will be conducted in my classroom located in the elementary wing. A typical day of subjects for third grade students in this study include physical education, language arts/writing, science, social studies, reading, math, spelling, music, and reading skills. The study will take place in my classroom during non-fiction reading/science time at approximately 2:00 in the afternoon.

Participants The study will be conducted in my third grade regular education classroom, which consists of 16 students. There will be seven males and nine females participating in the study. These third graders are eight and nine years old. There are no students with Individual Education Plans in my classroom. One student in my classroom has a 504 plan which does not require modifications during science lessons. One student leaves my classroom for approximately one hour each day for extra reading help. The school is school-wide Title 1, so students in our classroom receive approximately two hours of extra classroom instruction from math and reading specialists. These 16 students are in the classroom with me during all academic subjects throughout the day with the exception of physical education and music. Each

of the 16 student participants will be receiving a consent form to be taken home, have signed by a guardian, and returned back to me.

Research Design

My research study will take place during our non-fiction reading/science time each day. The focus of the study will be to assess if an experience-based project with accompanying activities will have an impact on the students' decisions to make sustainable actions. Sustainable actions are those that support a long-term ecological balance. Examples of sustainable actions may include recycling, composting, and using less water or electricity.

Before starting the experience-based research project, I will present my students with lessons intended to increase their ecological literacy or understanding of natural systems. I plan to do these lessons and activities to intentionally foster student mindfulness of why this is an important issue (Manning, 2009). These lessons will define recycling, composting, vermicomposting, and sustainability and the implications of each in our daily lives. Students will be presented with examples of recycling, composting, and vermicomposting, as well as national and international statistics and facts of recycling and food waste. Earth Day, April 22, 2017 will be used as a day for students to reflect and share about any experiences they have had that include recycling, composting, or other sustainable actions. Our class will also use this Earth Day theme to discuss and calculate student's ecological footprint on the Earth. Calculating each student's ecological footprint will be important as it will emphasize personal relevance to the topic (Manning, 2009).

After an introduction to recycling, composting, vermicompost, and food waste, students will begin the experience-based vermicompost project. To begin the project, we will record and graph our class food waste for one week prior to setting up the compost system. This will allow

students to begin the routine of weighing food waste and become more cognizant of food waste. After one week of simply weighing, recording, and graphing our class food waste, we will set up the vermicompost system. The logic for waiting one week to begin the vermicomposting system is that students must first see a reason for composting (Adams, 2006). If we are creating excess food waste, we must do something with it.

The vermicompost system will consist of an enclosed compost bin which contains red wiggler worms and worm bedding. When students deposit food waste into the compost bin, the red wiggler worms feed on the organic material and create worm humus or manure. This humus can then be used as a fertilizer. My student's involvement with the vermicompost system will be taking their food waste each day after lunch, weighing the total class food waste, and recycling a portion of it into a compost system. Students will record and track food waste and recycled paper by graphing our daily and weekly totals for five weeks. Students will also make predictions on what will happen to the food waste that they've deposited into the compost bin.

A change in food and classroom waste as well as recycled paper by students will indicate a change in student actions and retention of sustainable action lessons during the study. A scenario will be presented to students once each week for five weeks that will offer them the opportunity to respond with a call to sustainable action and rationale to that action. Student responses to these scenarios will be analyzed with a rubric to identify if sustainable responses and rationale to their written action evolve over the study. The scenario questions are a way to create opportunities for competence (Ryan & Deci, 2000) throughout the study. Pre and post questionnaires and interviews are designed to give evidence of changes in actions as well as if students have retained lessons in recycling, composting, and sustainable decisions through the experience-based project.

Data will be gathered by weighing the amount of food waste provided by students each day during lunch, weighing classroom waste created each day, and weighing paper recycled at the end of each week by students. Each day at the end of our lunch period, all of the students in my class will be asked to deposit their food waste into a bucket that will be weighed on a portable scale. This weight will be recorded and brought back to our classroom to be graphed by all students. A portion of this weighed food waste will also be brought back to our classroom and deposited into our vermicompost bin while the remaining food waste will be thrown away in the cafeteria. Students will be on a rotating schedule for food waste contribution to the vermicompost system each week in an effort to allow all students the opportunity to participate. The compost system will be located in our classroom.

At the end of the study, our class will review our graphed data and discuss any trends in weight of food and waste thrown away by students. Making change a byproduct of other events (Neal, Wood, and Quinn, 2006) could be one notable change seen throughout the study. If students concentrate on creating less waste, they may become more mindful of sustainable actions that they either are or could be doing.

Recycled paper and classroom waste in our classroom will be weighed and graphed in the same way that food waste will be, however, recycled paper will only be weighed, recorded, and graphed one time each week. Students will also be given the opportunity to draw pictures of their interpretation and experiences with recycling and composting (Ryan & Deci, 2000). Weekly scenarios will aid students in focusing their knowledge of recycling and sustainability in writing.

We will conclude the food and classroom waste and recycled paper activity after five weeks by discussing possible trends and reasons for those trends that we may see as well as

possible implications for these trends. We will discuss how food waste, recycling, and compost relate to sustainable actions. Has our class been performing any sustainable actions, why or why not? How do our actions affect you and other living species on earth? Do you see any natural systems at work or affected by this project? These questions will guide our discussion and help to balance urgency with realistic hope for sustainable decision making in the future (Manning, 2009).

Pre and post project questionnaires and post project interviews will be given to students during this study. Pre and post project questionnaires will be given to students in both written and oral form. These questionnaires and interviews will also be a way for students to reflect on personal relevance to the topic of the study (Amel, Manning, Scott, 2006) and foster mindfulness. Data from these pre and post questionnaire and post interviews will be compiled and analyzed for changes in responses. Scenarios given once each week to students will evoke written responses that probe into student understanding and rationale of sustainable action. A rubric will be used to analyze and track the student understanding and justification of sustainable actions.

The outcome of the project will help answer the question, how does experience-based learning impact students' decisions to perform sustainable actions? Will this project help students gain a better understanding of how the waste they create each day can have an impact on our natural systems? Could behaviors based in sustainability change because of the vermicompost and sustainable action activities we've learned about?

Experience-Based Learning. It was clear while researching and developing my literature review, that experience-based learning is an extremely powerful way to engage students in learning (Sobel, 2005, p. 58). Experience-based learning focuses on using projects to engage

people not only about their surroundings but also about how their actions impact their surroundings. Experience-based learning lends itself well to elementary students in that it allows children to be very hands-on and take an active role in their learning. In this study, experience-based learning will come in the form of using student's daily food waste, classroom waste, and contributions to paper recycling. The ability to use measurable quantities in the form of food and classroom waste and recycled paper as well as student reflection data in the form of questionnaires and interviews will allow for a clear assessment of the effectiveness of experience-based learning in a third grade classroom (Mills, 2011).

Research Paradigm

The most efficient and thorough way to answer my research question will be to employ an action research study using qualitative methods of inquiry. Mills (2011) asserts that the decision about data collection methods depends upon the nature of the research question. My research question revolves around tracking students' behaviors and measuring their participation or lack of participation in recycling and composting which is why I've chosen to use qualitative research methods. The data that I will collect is the weight of food waste and classroom waste my students create each day as well as the weight of paper they recycle each week. Another type of data that I will collect are answers from questionnaires, scenario responses and interviews regarding recycling, composting, and sustainability. I will ensure that the questionnaires, scenario responses and interviews are a valid and reliable means of data by first field testing the questions on third grade students from outside my classroom. I want to make sure that the questions I'm asking on the questionnaires, scenario responses I'm receiving and answers I'm receiving from interviews will offer sufficient rationale to the trends I'm seeing in our recorded classroom waste and recycling data.

Hendricks (2013) explains that the purpose of action research is for educators to investigate and explore how they can improve their teaching methods. My literature review made it evident that experience-based learning is an effective approach to satisfy a variety of learning styles. I plan to use the data gathered from this research study to drive my future teaching methods and strategies in multiple subjects.

Qualitative Research. Using qualitative research will allow me to view learning themes within my classroom. Questionnaires and interviews will present a range of data that will define any evidence of learning. Mills (2011) maintains that qualitative research uses descriptive, narrative approaches in data collection to understand the way things are and what the research means from the perspectives of the participants in the study. Hendricks (2013) says that the main idea of qualitative research is to understand and interpret experiences as they occur in natural settings. Using qualitative research methods will allow me to use the data collection tools necessary to find out if experience-based learning truly is a valuable tool for learners and educators alike.

Data Collection Tools

Triangulation. Creswell (2009) explains that qualitative researchers don't rely on one single data source but rather they gather data using multiple collection methods such as interviews and documents. This idea of using multiple methods to collect data is known as triangulation. Hendricks (2013) tells us that when designing a research project, researchers should consider ensuring that results are valid and credible. Triangulation is a way to ensure that data collected is valid and credible because it uses multiple sources rather than just relying on one form of collection. My research study will include data in the form of questionnaires, scenario responses, interviews, and weighed waste and recycled paper, as well as allowing time

for students to express themselves in other ways such as picture drawing. I'm confident that by using these data collection methods, I will be able to comprehensively answer my research question. Using these data collection methods will allow me to see if there is decisive change in student behaviors in the amount of waste created and paper recycled as well as an indication of information retention about recycling, composting, and sustainable actions.

Interviews and Questionnaires Interviews, scenario responses and questionnaires will be three forms of data collection tools for my research at the beginning, during, and end of the study. I plan to give each student a questionnaire prior to beginning the study and then again at the end of the study. The questionnaire will be given in written form as well as orally. Similar to how students learn in various ways, students often times express themselves more effectively in different ways. Verbal communication with questionnaires will be a way to target those students that express themselves best verbally. Verbal communication is often times the most comfortable way for third grade students to communicate, especially if those students struggle with handwriting. Written questionnaires will be a way for those students that are visual learners to respond to questions regarding recycling, composting, and sustainability. Utilizing these tools will help me analyze the effectiveness of experience-based learning as well as foster mindfulness (Amel, Manning, Scott, 2006) for students and create opportunities for competence (Ryan & Deci, 2000).

Questions 1, 3, 5, and 8 of the questionnaire will be used to inform me of how well students retained information from the lessons, activities and experience-based learning project. Questions 2, 4, 6, and 7 will be intended to inform me of any changes in student actions and behavior. There will also be a "comments" opportunity under each question for students to voice any other thoughts.

I plan to interview each student in my class individually at the conclusion of the study. The interview questions will probe deeper for student's understanding about recycling, composting, and sustainable actions based on questionnaire answers. Questions 1, 3, 5, and 8 of the questionnaire focus on student retention of taught information. Questions 2, 4, 6, and 7 of the questionnaire are intended to display any change in student actions or behaviors. The interview will be designed to allow students to give rationale and explanations to their questionnaire answers. The interview will probe deeper into student understanding, perception, and participation in recycling, composting, and sustainable actions. Whereas the questionnaire provides students with possible answers to each questions or a scale of 1-5, the interview allows students to prove their knowledge by explaining recycling, composting, and sustainable actions by addressing their participation in them. Since the focus of this study is to find out if an experience-based project will change student actions in sustainability, it's important to emphasize recycling, composting, and sustainability in the interview and questionnaire. These answers will be recorded and compiled to be analyzed at the end of the study.

A third form of gathering student data will be with the use of scenario responses. One time each week, for five weeks, students will be given a scenario that allows them to give a written response to how they would react to a sustainable themed situation. Each week student responses will be analyzed with a rubric that focuses on a call to action, a response to the scenario that includes a sustainable action, and a rationale for the action they would use in the scenario. The rubric will help indicate any change in how students would approach and react to situations that are conducive to sustainable actions.

Data Analysis

Creswell (2009) asserts that qualitative researchers make interpretations of what they hear and learn. The triangulation of qualitative data will require me to make meaning of questionnaires, scenario responses, interviews, paper recycling weight, food waste weight, and classroom waste weight. Our class will begin analyzing data by compiling the food waste weight students produce during lunch, classroom waste produced each day, and paper recycling weight produced each week in my classroom. Our class will record and graph the data from our daily food and classroom waste. We will also record and graph the weekly weight of recycled paper from our classroom. A decrease or increase in the amount of waste weight will indicate a change in student behaviors in recycling and sustainable behaviors. Less waste weight would indicate that students are more conscious of how impactful their actions are. More waste weight would indicate little understanding or care of how their behaviors affect our environment. On the contrary, a higher recycled paper weight would indicate a conscious effort to reduce waste and increase sustainability. I will be interested in noting if students put forth a more conscious effort to recycle and throw more or less waste away due to social dynamics. One of the seven psychological strategies explored in Chapter Two discusses making an action the social default (Schultz, et al, 2007). If a majority of the students in the classroom are recycling paper versus throwing it in the garbage, will this have any influence on the actions of individual students?

Next, I will compile the questionnaire answers from the pre and post project phase. A number system will be used to compile and analyze the answers to questions 1, 3, 5, and 8 on the questionnaire. An "A" answer will be converted to be equivalent to one point, "B" is equal to two points, and "C" is equal to three points. Questions 2, 4, 6, and 7 require the student to answer on a scale of 1-5. The fewest possible points on the questionnaire for my class would be 128 points. The highest possible points would be 512 points. A higher number would indicate a

deeper understanding and higher level of participation in recycling, compost, and sustainable behaviors. A lower number would indicate less understanding and participation in recycling, composting, and sustainable behaviors. Any change in this number from the pre questionnaire to the post questionnaire would clarify if the experience-based learning project had any effect on student learning and behavior.

Post project interviews will be used as a way for students to rationalize their questionnaire answers. The post project interview will probe students understanding and participation in recycling, composting, and sustainable actions. The answers given during the interviews will be used in conjunction with the weight total data and questionnaire answers as a form of justification.

Weekly scenario questions will be a way to assess if student understanding and response to sustainable situations changes over the course of the study as well as allow students an opportunity for competence (Ryan & Deci, 2000). A rubric will be used to determine if student react to a scenario, if their reaction is to respond with a sustainable action, and if they justify or give rationale to their action. The rubric will be scored with a 1-3 point system. Individual rubric scores will range from 3-9. A score of three would indicate that there was no action taken for the scenario, an action taken was not sustainable, and there was no rationale for the action taken. A score of 9 would indicate that the student wrote that they would respond to the scenario, their action would be sustainable, and they gave clear and appropriate rationale for their sustainable action.

The theme that I will focus on analyzing is deliberate sustainable actions and conscious sustainable decisions by students. A rise or fall in recycled paper weight and food waste over eight weeks will determine if actions have changed in students. A change in questionnaire and

interview answers will determine if knowledge and action in sustainability have evolved. A change in rubric scores from scenario responses would indicate a shift in student perceptions and decisions to respond to sustainable situations.

Participant Confidentiality

Participant confidentiality is an important component to a research study. There will be multiple measures taken to ensure that participants' privacy will be protected during this study. First, I will gain research approval from Hamline's Human Subject Research Committee. Next, I will gain research approval from the school where the study will take place. Then, an informed consent letter will be sent home to the participants and families of all of the participants. The research project will not begin until I have gained approval from the district where the study will take place, families of the participants in the study, and Hamline's Human Subject Research Committee. Other measures taken during the course of the study include the use of anonymous questionnaires and individual interviews versus group interviews where some answers could be judged by other participants. Individual participants will be identified simply as numbers throughout the study in order to specify actions, observations, and changes of individuals, yet still keep anonymity.

Conclusion

In this chapter, I have outlined the framework of my experience-based research study that includes a vermicompost system, gathering and recording of students food and classroom waste as well as recycled paper each week, questionnaires, scenario responses, and interviews. I've described the location and setting of my research study as well as the participants taking part in the study. I provided details about what my research design will be. The role of experience-based learning and its benefits in this research study were outlined. I gave examples of where

the seven psychological strategies for change will be included in the study. A rationale for using qualitative research methods in this study was explained as well as a breakdown of what data collection methods will be used. Questionnaires, interviews, scenario responses and measuring waste and recycled materials comprise the parts of triangulation that balance out my data collection methods. Data analysis techniques were discussed near the end of this chapter. Finally, a brief summary of how participation confidentiality will be enforced in this study was highlighted.

Preview to Chapter Four

In Chapter Four, the results of my research study will be shared. I will provide a description of how the data was collected as well as a presentation of what those results are. I will interpret the results of the types of data that are collected and examine any trends or themes that emerge. Chapter Four will finish with a conclusion statement of the major findings in the research study as well as reflections on potential adjustments I will make on future projects.

CHAPTER FOUR

Results

Introduction

Chapter Four will present, analyze, and interpret the results of the research study. The question driving this study is, how does experience-based learning impact students' decisions to perform sustainable actions? The research study involved student participation in experience-based learning projects featuring vermicompost, measuring food waste, classroom waste, and recycled paper in a third grade classroom. Students also presented their thoughts and knowledge about sustainable action scenarios, interviews, and questionnaires throughout the study.

In this chapter, research study data will assist in exploring three key points of interest previously mentioned in Chapter One and Two. Key point number one will be a look at appropriate environmentally sustainable actions that occurred within the research study. Is there evidence that clearly indicates that vermicompost or consciously monitoring food waste and recycling was an effective approach to encouraging sustainable actions in students? Was vermicompost too complex for third grade students to understand, participate in, and learn from?

Key point number two that Chapter Four will discuss is the possible influences that changed student behaviors within the research study. Social influences, activity engagement, comfortability with the topic, and familiarity with the topic are just a few possible influences that could contribute to changes in behavior. The results of the research study will indicate if there were any influences that factored into changes in student behaviors.

The third and final key point that will be examined through the results of the research study is what the most effective implementation methods and environments for instilling sustainable behaviors was. There are a variety of ways to learn and there are a variety of ways to teach. Throughout the research study, is there evidence that supports experience-based learning as appropriate and effective? What, if any data suggests that students benefited more from experience-based learning?

Indications of Appropriate Environmentally Sustainable Actions

A 2010 study found that although nearly three-quarters of children asked said they cared about the environment, just one quarter understood that water was a renewable resource. Children often demonstrate a positive attitude toward the environment and recycling, however, there is a lack of understanding and disconnect between sustainability and the rationale behind practicing sustainable behaviors (Paulsen & Carroll, 2010).

A focus of this research study was to assist in understanding what type of sustainable actions would be appropriate for third grade students to perform. By third grade, many students have participated in recycling activities or general trash pick up activities to fulfil primary grade standards or to partake in Earth Day activities for example. What could students do at the third grade level, however, that would not only give them a sense of accomplishment but also a sense of connectivity, understanding and belonging to the natural world? Throughout the research study, students were engaged in an experience-based vermicompost project that allowed them to explore the composition process, save their food waste, and interact with worms. Is it possible that this experience-based vermicompost project was engaging enough to make students want to understand more about the environment or beyond that, change the way they live their lives to be more sustainable human beings? There is also the possibility that a vermicompost project

contains too many complex aspects to truly hook and keep the attention of a third grade student, let alone those students that want nothing to do with a slimy worm. In fact, research by psychologists Stephen and Rachel Kaplan (2002) reports that students would rather participate in activities that are conducted in a built up setting. A built up setting would be considered one which is not in a natural setting. They assert that children find time spent in and with nature to be boring and lonely while time spent in a built up setting to be more fun.

Participants of this research study were involved in four specific sustainable actions. These actions included first weighing classroom waste at the end of each day, second weighing recycled paper at the end of each week, third collecting and weighing compostable food waste at the end of each lunch period, and finally students composting a portion of the weighed food waste into a vermicompost container each day. Participants began weighing classroom waste on April 3rd, recycled paper on April 7th, food waste on April 18th, and the vermicompost deposits began on April 26th. Prior to depositing food into the vermicompost system, students were exposed to lessons that detailed and defined what compost means, the composting and decomposition process, how worms contribute to composting, and benefits of composting. Students also reviewed what recycling is and how it may relate to composting. Various short videos and the book, *What Does it Mean to be Green?* (Kahn, 2002) were activities that accompanied lessons about sustainability, our school forest, composting, and recycling.

As preparations for this research project began, it was evident that students were very curious about what was about to happen. A day before the project was introduced to the class, I was setting up the weigh scale, weighing our garbage and recycling cans, and getting the logistics of food waste collection figured out. It was 3:10 p.m. and students were supposed to be down the hall and on their way to the buses. With the excitement of a new project, however,

there were still five students standing in the classroom with amazed looks on their faces as their teacher weighed garbage cans on a scale. These five students were already unintentionally captivated by a project that had not even started. By the day the project was introduced, our classroom was buzzing with excitement as it was revealed that our class would be weighing and tracking classroom waste, recycling, and food waste. There were many questions about why we were doing this, how we would do this, and for how long we would be doing this. After an explanation to these questions, the next step in the project was to administer the pre study questionnaire to each student. Would the actions of weighing our classroom waste, recycling, food waste, and vermicompost deposits deepen student knowledge or would they just be segregated activities that produced limited long-term effects?

Questionnaires

The questionnaires in this study were used as a tool to measure student knowledge and participation in recycling, composting, and sustainable actions both at school and at home. Pre and post project questionnaires were administered in order to expose any changes that may have occurred in student knowledge and participation due to activities that students took part in during the study. If the vermicompost, waste and recycling actions in the project were appropriate for third grade students, then there should be an increase in student knowledge and participation visible in observations, scenario questions, and questionnaire answers.

Questionnaire answers were compiled from the pre and post project phase. A number system was used to compile and analyze the answers to questions 1, 3, 5, and 8 on the questionnaire. These four questions were considered “knowledge” questions. An “A” answer was converted to be equivalent to one point, “B” equal to two points, and “C” is equal to three points. Questions 2, 4, 6, and 7 require the student to answer on a scale of 1-5. These four

questions were considered “participation” questions. A higher number would indicate a deeper understanding and higher level of participation in recycling, composting, and sustainable behaviors. A lower number would indicate less understanding and participation in recycling, composting, and sustainable behaviors. Any change in this number from the pre questionnaire to the post questionnaire would clarify if the experience-based learning activities had any effect on student learning and behavior. Below are the pre and post questionnaire questions.

1. Recycling means:

A. To throw away

B. To save

C. To reuse

2. I recycle (circle a number)

Never

1

2

3

4

5

Everyday

3. Recycling is good for:

A. Me

B. Others

C. Everyone

4. Recycling is (circle a number):

Difficult

1

2

3

4

5

Easy

5. Composting is:

A. Throwing away

B. Saving something

C. A form of recycling

6. At home I compost:

Never

1

2

3

4

5

Everyday

7. I compost _____ food at one time. (circle a number)

A lot of

1

2

3

4

5

A little

8. Composting is a sustainable action:

A. No

B. Sort of

C. Yes

The results of the pre-project knowledge questionnaire revealed that regarding prior knowledge on the topics of recycling, composting, and sustainable actions, students were fairly knowledgeable. The lowest possible class score would be 64. The highest possible class score would be 192. The class score for the pre-project knowledge portion of the questionnaire was 170. Questions 1 and 3, referring to recycling, were the highest scoring questions. Question 8, referring to composting as a sustainable action, was the lowest scoring question. This indicates that student knowledge about recycling was more developed than student knowledge about composting and what a sustainable action is.

Table 1 Pre-Project Knowledge Question Results

	Answer A	Answer B	Answer C
Question 1	0	2	14
Question 3	0	2	14
Question 5	4	3	10
Question 8	2	6	8

Table 1 reveals the results of the post-project knowledge questionnaire. The results suggest that student knowledge on recycling, composting, and sustainable actions increased over the time of the research project. Again, the lowest possible class score on the questionnaire was a 64 and the highest possible class score was 192. The pre-project class score was 170 and the post-project class score was 180. This is a 5.8% increase in final scores. All three areas, recycling, composting, and sustainable actions increased in scores from the pre to post questionnaire, however, the largest increases in scores came in the areas of composting and sustainable action knowledge.

Table 2 Post-Project Knowledge Question Results

	Answer A	Answer B	Answer C
Question 1	0	0	16
Question 3	0	0	16
Question 5	1	3	12
Question 8	0	7	9

The pre-project participation portion of the questionnaire revealed that student participation in recycling and composting was moderate. The lowest possible class score was 64 and the highest possible class score was 320. The pre-project participation questionnaire class score was 207. Students indicated that they all participate in some form of recycling or composting at some point within the time frame of one year. More students participated in recycling activities than composting activities.

Table 3 Pre-Project Participation Question Results

	Answer 1	Answer 2	Answer 3	Answer 4	Answer 5
Question 2	0	1	10	3	0
Question 4	0	0	1	2	11
Question 6	2	4	5	3	1
Question 7	0	1	5	2	6

The post-project participation questionnaire revealed that student participation in recycling or composting increased from the pre-project participation questionnaire. With a lowest possible class score of 64 and highest possible class score of 320, the post-project participation class score was 234. This was an increase of 27 from the pre-project participation

questionnaire class score. This is a 13% increase in total class score from pre to post participation questionnaires. The largest increases in scores came in question 2, which refers to the amount of times students generally recycle. Interestingly, there was a decrease of 3 points for the class score in question 6. Question 6 refers to how often students compost at home. It is pertinent to note that although the largest increase in the scores came on questions regarding composting in the knowledge section of the post-project questionnaire, this questionnaire shows evidence that there was a decrease in student participation to compost outside of school. It appeared that some students at this point may not have considered all of the possible examples of composting such as garden/food scraps being fed to pets or animals.

Table 4 Post-Project Participation Question Results

	Answer 1	Answer 2	Answer 3	Answer 4	Answer 5
Question 2	0	7	6	1	2
Question 4	0	1	1	1	13
Question 6	4	5	4	2	1
Question 7	1	1	2	4	8

Below, Figure 1 and Figure 2 depict the pre and post questionnaire question mean scores. Note that questions 1, 3, 5, and 8 have differing values from question 2, 4, 6, and 7, thus the visual discrepancy in bar graph values.

Figure 1

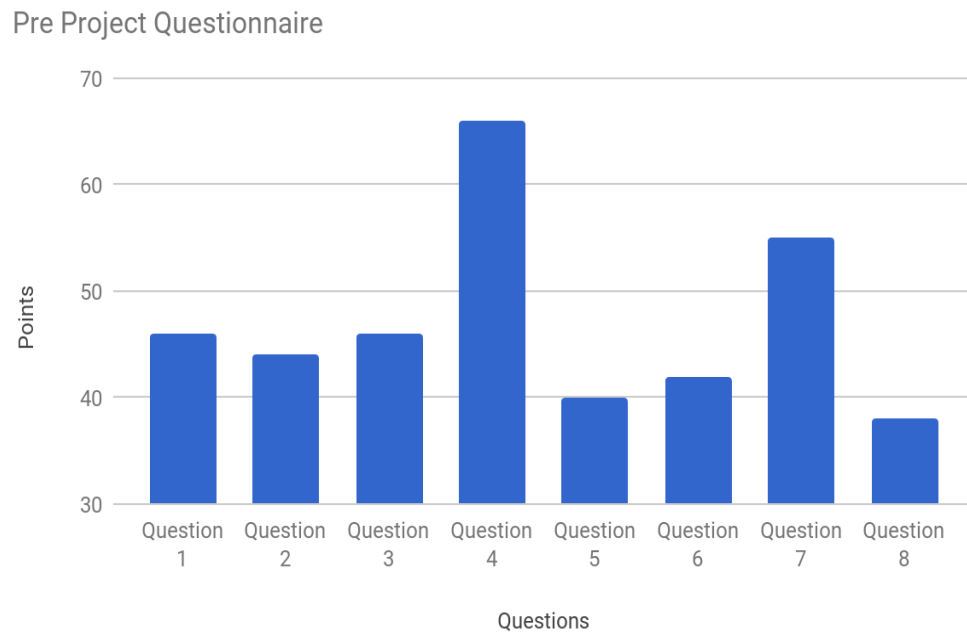
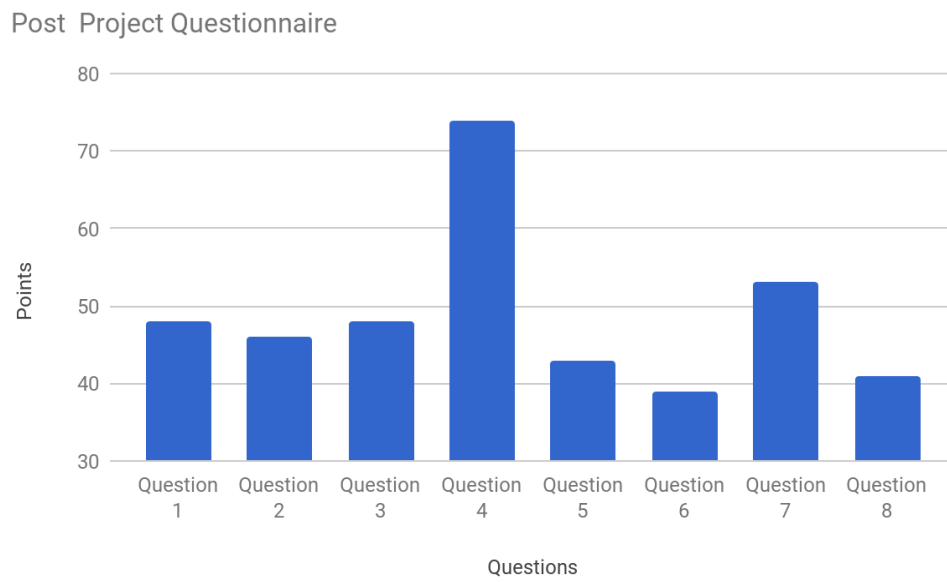


Figure 2



Final analysis of the pre and post project knowledge questionnaires conclude that the experience-based learning activities of vermicomposting, food and waste weight collection, and recycled weight collection were indeed appropriate environmentally sustainable actions in promoting an increase in environmentally sustainable knowledge. Supporting this is the 5.8% increase in the total class score from pre to post knowledge questionnaire answers. These experience based activities were also effective in promoting an increase in participation in recycling and composting in school. Supporting this is the 13% increase in total class scores from pre to post participation questionnaire scores. The questionnaires did reveal, however, that there was actually a decrease in the amount of composting that students participated in outside of school. This decrease in participation of composting outside of school may indicate that although the experience-based activities that occurred in this research project may promote an increase in knowledge about appropriate environmentally sustainable actions, six weeks of these activities may not translate to a change in behavior. Analyzing the results of the questionnaires certainly had me thinking about the Paulsen & Carroll (2010) study findings that indicated that children often demonstrate a positive attitude toward the environment and recycling, however, there is a lack of understanding and disconnect between sustainability and the rationale behind practicing sustainable behaviors (Paulsen & Carroll, 2010).

Waste and Recycled Measurements

Creswell (2009) asserts that in order for research and activities to be meaningful, it must be seen and heard. Weighing classroom waste, food waste, and recycled paper each day and week offered a way for students to engage in experience-based learning as well as expose data from the research that could be seen and heard daily. Did weighing and graphing our daily

classroom waste, food waste, and weekly recycled paper offer activities to students that were appropriate for a third grade student?

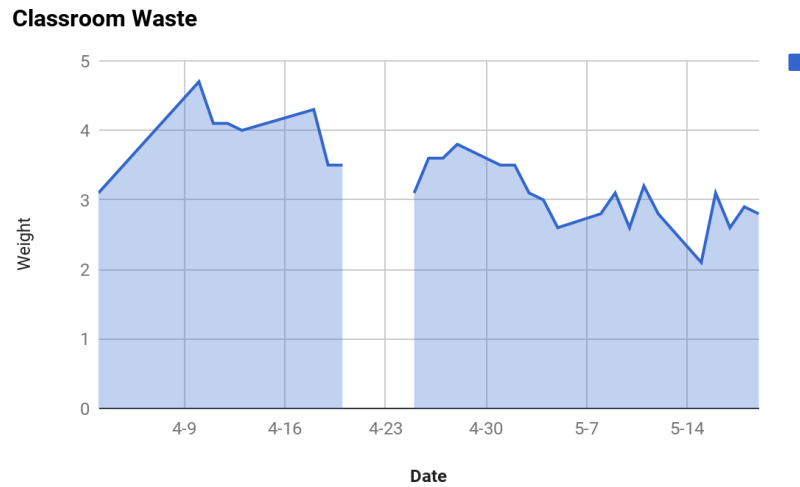
On April 3rd, our class began weighing classroom waste at the end of each day.

Weighing our classroom waste involved weighing our two classroom waste baskets and then subtracting the weight of the actual trash receptacles. This number was then graphed by students each day to eventually make a line graph of six weeks worth of data (See Figure 3).

An overall decrease in the weight of waste thrown away over the six week period may suggest that students consciously made an effort to throw less waste away or recycle more paper rather than throwing it in the garbage. It's important to note that there were a variety of variables that may have contributed to more or less waste weighed on any given day. These variables included days that students cleaned out their desks and lockers, especially during the final week of school, days that included art projects or science projects, or field trip days where there was very little time spent in the classroom. Another variable to consider would be the fact that students knew their waste and recycle management would be included in this study.

Analyzing the graph of classroom waste illustrates an immediate increase of waste over the initial week of the study followed by a general decrease in waste over the next four weeks. The last week of the study illustrates another jump in classroom waste that tapers off again during the final days of the study. Possibilities for the initial increase in classroom waste could include one of the aforementioned variables, a lack of understanding and conscious commitment to reducing classroom waste, or students capitalizing on the excitement of knowing that what they put in the garbage will be weighed at the end of the day. I suspect that the jump in classroom waste during the final week of the research study was due to students cleaning out their desks and lockers as the school year came to an end.

Figure 3

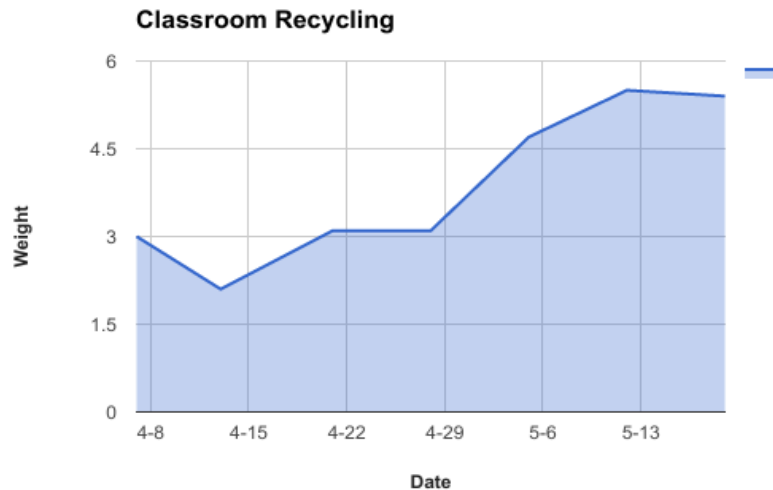


Going into the research study, I was open to the thought that there would be variables, especially social influences that may sway student performance and participation in the experience-based activities we would be working on. The focus, however, would be to look at the data over the six week period to determine if the activities we were doing would promote appropriate environmentally sustainable actions within the six week period and beyond both at school and outside of school. An entire look at the classroom waste graph would suggest that there was clearly a downward trend in the amount of classroom waste over the six week period. It appears likely that this trend was due to the fact that students were more conscious about what items and the amount of items they threw away during the research study.

Classroom recycling began on April 7th. The process in which our classroom recycling efforts occurred were similar to how our classroom waste was measured with the only difference being that our recycled paper was only weighed one time each week versus daily. The reason for this was that our classroom waste baskets are emptied daily and our recycled paper baskets are only picked up each Friday. A positive aspect of recycling being weighed just once each week,

however, is the possibility that there will be fewer outliers in the data. A day of desk cleaning or a day out of the classroom would be dissipated by four other days of conventional classroom recycling.

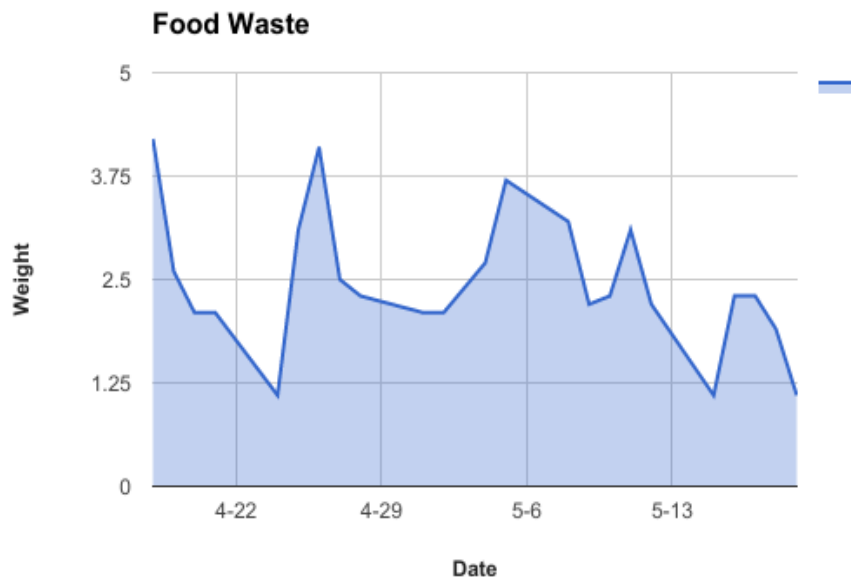
Figure 4



Analyzing the results of our classroom recycling illustrates that there was an immediate decrease in recycling during the first week in the study. It's interesting how this decrease in recycling correlates to the initial increase of classroom waste during the first week of the research study. Following the first week of the study, there was a general increase in the amount of recycling in the classroom. It is worth noting, however, that there was a slight decrease in the amount of recycling over the last week of the study. Even though the last couple of weeks of school often mean desk and locker clean out which would in turn create more waste or recycling, it's possible that this slight decrease in recycling was due to the many field trips and days out of the classroom during this time period. It's also possible that this slight decrease in recycling was due to students neglecting to consciously recycle paper and opting simply throw it in the trash rather than sort individual pieces of paper from trash when cleaning out desks or lockers.

Measuring student food waste offered quite possibly the most interesting observations yet perplexing data of the collections and measurements that took place during the research study. Students took a pure interest and ownership of food waste collection and measurement. There were numerous days when I forgot to bring the scale and food waste basket down to the lunchroom but the students not only reminded me but exuberantly volleyed a plethora of volunteering hands to go back to the classroom to gather the needed tools for measurement. Every student was happy to sort food waste from wrappers and non-compostable materials each day as they deposited their food to be weighed. In fact, many students from third grade and other grades even offered up their assistance in depositing their food waste. The disappointment from students came when they realized that not all of their food waste could be used for vermicompost.

Figure 5



Analysis of the food waste graph would indicate very little in the way of trends or patterns. I realized early on in the research study that although the food waste measurement portion of the study would be appealing to students, the data gathered from food waste measurements may be insignificant to the study as a whole. The main reason for this is that the food waste measurements varied so much depending upon what was on the lunch menu for that day. Some lunches, such as sub sandwiches created little or no compostable waste because items such as chips and vegetables came in non-compostable packaging. Generally, students enjoy sub sandwiches and the fixings that come along with them, thus leaving little to no waste. Other lunch items such as quesadillas or chicken fajitas for example, were not popular with third grade students and therefore created a significant amount of food waste. Another factor to consider is that students are required to take specific amounts of food such as vegetables, fruits, and entrees each day and have no control over the amounts they are given. These variables in student food preference, amount of food given, and cook's choice in meals had more impact on the amount of food waste than did the student's conscious efforts to create less food waste. Although the graphed data of classroom food waste does not clearly define an increase or decrease in food waste through the six week study, my personal observations of student engagement and participation in the food waste portion of the study indicated a conscious effort from a majority of students to lessen the amount of food they threw away each day. I can recall copious examples of students depositing their food waste into the food waste container with a giant smile on their face as they gloated about how little food they were throwing away that day.

Teachers of experience-based education “design learning activities that could potentially engender a sense of appreciation.” This personal connection to the learning experience makes for a genuine and authentic lesson which in turn can make the learner more aware of sustainable

behaviors (Sobel, 2005, p. 58). Waste and recycled weight measurements were a great way to get students involved in the research study. Students joyfully took ownership in collecting, weighing, graphing, and even analyzing the results of their actions. Through observations, it became clear that students were engaged with the experience-based activities of weighing classroom waste, food waste, and recycling paper. Although the food waste collection data graph did not clarify any significant increase or decrease in student food waste, classroom waste data as well as recycled paper data did identify a comprehensible effort by students to make environmentally sustainable choices in school. Ultimately, this research study worked to accomplish answering the question, how does experience-based learning impact students' decisions to perform sustainable actions? Measuring waste and recycled items in school was a way to engage students in experience-based activities that also offered tangible data that would help answer the research question. The data in this portion of the research study suggest that students did indeed increase their sustainable actions in school due to experience-based learning. However, would these sustainable actions also carry through to life outside of school?

Additional Activities

Throughout the research study, there were additional activities that accompanied food and classroom waste collection and recycling weight measurements, vermicompost, scenario questions, interviews, and questionnaires. These additional activities may aid in bringing light to any other thoughts, ideas, or experiences that students had during the span of the research study.

After reading the book, *What Does it Mean to be Green?* (DiOrio, 2010), students were instructed to draw a picture of what it may look like to *be green* in their life. I was intentionally vague when giving directions about drawing pictures in an effort to allow student thoughts and

feelings to reflect on the pictures versus instructor influences. A common theme with every picture drawn was that each included an outdoor scene of some kind. Some pictures portrayed student's picking up garbage outside, recycling outside at their home, landscapes of a clean or green earth, playing outside with friends, and park scenes. Most pictures included humans with smiles on their faces yet four pictures had no humans on them at all. All pictures were drawn in color and all but three pictures included the color green in them. Seven pictures included flora or fauna of some kind. Nine pictures included scenes of humans recycling, picking up garbage or using the words recycling, reusing, or compost. A general observation of these pictures was that students saw *being green*, recycling, reusing, composting, and the earth in a positive light. Scenes depicted positive participation in environmentally sustainable actions.

Figure 6



An impromptu activity that fit in well with this research project was an article and question from *Scholastic News*. *Scholastic News* is a weekly nonfiction periodical that our classroom receives each week. Each week *Scholastic News* features an article along with an

opinion or “Debate It” question. The April 17 edition of *Scholastic News* features an article about the recovery of sea otters along the California coast. The “Debate It” question in this edition was,

Should Plastic Bags Be Banned? The city of Newport, Rhode Island, is the latest place in the United States to ban stores from giving out single-use plastic shopping bags. Dozens of other U.S. cities have also banned the bags, as has the state of California. Supporters of these bans say that plastic bags are bad for the environment. But many opponents argue that banning bags is unnecessary. One reason is that they can be reused. What do you think? (Scholastic News, 2017 p.3)

Of the 16 students that voiced their opinion on the “Debate it” question, ten students said that plastic bags should not be banned. Six students debated that plastic bags should be banned. My initial expectation of this activity was that students would be distraught by the idea of plastic bags harming the environment and animals in our environment. I was quite certain that banning plastic bags would be the overwhelming argument that students would make. I was surprised to see that instead, a majority of students responded to the question by stating that they believed plastic bags should not be banned. It wasn’t until I began reading the rationale and responses to the question that I started to understand.

Four of the six students that argued for banning plastic bags responded with a rationale that included a concern for harm to animals, people, or the environment because of littered plastic bags. Two student’s responses included rationale that simply referred to the inconveniences or inadequacy of plastic bags for humans.

Four of the ten students that argued for not banning plastic bags responded with a rationale that included recycling or reusing plastic bags as the common theme. Responses

explained the many other uses for plastic bags and reasons for reusing them. The final four arguments for not banning plastic bags described the superior quality of plastic bags over paper bags.

Overall, student responses indicated that ten of sixteen students argued with a rationale that included an environmentally sustainable statement. Six students responded with a rationale that included an argument that benefited only humans and wasn't necessarily an argument for environmental sustainability.

Pre and post research study questionnaires, collecting, weighing, and documenting classroom waste, food waste, and recycling, vermicomposting, pictures, and a *Scholastic News* activity were all directed toward understanding what activities promote appropriate environmentally sustainable actions. Although not all data was conclusive, the overarching evidence suggested that yes, the activities discussed so far in Chapter Four were effective in promoting appropriate environmentally sustainable actions. The next section in Chapter Four will evaluate influences that changed behavior in the research study.

Influences that Change Behavior

Most people want to live in a way that treats our ecosystem with respect and care. However, even with these feelings, we are still engaged in unsustainable behaviors that continue to have negative effects on our environment (Manning, 2009). In this section of Chapter Four, activities and data will be examined in an effort to explain what psychological and behavioral influences change student behavior. Research suggests that humans understand the impacts of our actions, yet we continue these actions. Even though we are having rational thoughts, our minds don't always drive our behavior (Manning, 2009). Were there influences by peers, the

classroom environment, or the content of the lessons and activities that changed behavior during the research study?

Scenario Questions

Throughout the research study, there were five opportunities for students to respond to scenario questions. Scenario questions presented a situation in which students could describe how they would react to a possibly environmentally threatening scenario. These scenarios were a way to create opportunities for students to display their competence of the material (Ryan & Deci, 2000) within the study as well as expose any possible influences such as location or relationship to the people involved in the scenario. Scenario questions were each presented to the class, one question each week. All scenarios were presented in the same format. Each scenario was written on the whiteboard at the front of the room as well as presented orally to the class.

In this first scenario question, the scenario given was, “You’re walking with a friend to the movie theatre. Your friend throws a gum wrapper on the ground. What would you do? Why?” After students responded to the scenario, their responses were collected and scored on a rubric. Responses were scored according to their call to action, if the response presented a sustainable action, and if there was a rationale given to back up the call the action. Table 5 below is the rubric used to score scenario responses.

Table 5 Scenario Question Rubric

	1	2	3	4
Call to Action	Student indicates that they would not take action to scenario	Student indicates that they would take limited action to scenario	Student indicates that they would take an action to scenario	Student indicates that they would take multiple actions to scenario
Sustainable Action	Student presents a non-sustainable action to scenario	Student presents a partial sustainable action to scenario	Student clearly presents a sustainable action to scenario	Student clearly presents multiple sustainable actions to scenario
Rationale for Action	Student does not present a rationale to their action to scenario	Student presents partial rationale to why they would act sustainably to scenario	Student clearly presents an accurate rationale to why they would act sustainably to scenario	Student clearly presents accurate rationale to why they would act sustainably to each of the multiple actions to the scenario

Although this first scenario question would not necessarily indicate if there were influences that changed student behaviors, it would be a way to gauge student's prior knowledge of the general theme of the research study as well as give a starting point for analyzing future scenario questions. The responses to the scenario question would also indicate student engagement and willingness to participate in this aspect of the study. The results of the first scenario question left me optimistic that students understood that their actions have ramifications and that they understood the difference between an appropriate and inappropriate environmental action as well as a preview at possible influences to actions. I was also generally impressed with

the rationale that students gave for justifying their action to the scenario. Is it possible that in this first scenario question I was simply seeing the results of student conformity to an activity that students felt was important but had little true knowledge about? Would student justification or rationale to their action in the scenario increase as the study developed? Below are the results of scenario question one.

Table 6 Scenario One Results

	1	2	3	4	Class Mean Score
Call to Action	0	3	12	0	2.6
Sustainable Action	0	10	6	0	2.3
Rationale for Action	0	3	12	1	2.8
Total Class Mean					2.5

It was evident in scenario question one that all students would have a call to action if their friend were to throw a gum wrapper on the ground while they were walking with them. Although three students had a fairly vague call to action, all students responded with some sort of action. All students also indicated that their call to action would be an environmentally friendly one. However, 62% of students responded with a call to action that was vague. Most calls to action were simply to pick the wrapper up and throw it away or to tell their friend to pick it up. Just six students responded with multiple calls to action or calls to action that could have resulted in multiple environmentally friendly outcomes. The most impressive aspect of the results of scenario question one was the rationale that students gave for their call to action. 81% of students not only gave a rationale for their call to action but clearly and accurately elaborated on why they would take a sustainable action on the scenario. Overall I was optimistic about how

engaged students were with the scenario questions and how concerned students were about making sustainable decisions to the given scenario while they were with a friend.

Scenario two was as follows. You're driving with your mother. She rolls down the window and grabs a pop can to throw out. What would you do? Why? Below are the results of Scenario Two.

Table 7 Scenario Two Results

	1	2	3	4	Class Mean Score
Call to Action	0	4	12	0	2.4
Sustainable Action	0	9	7	0	2.1
Rationale for Action	3	9	4	0	1.8
Total Class Mean					2.1

The results of scenario two illustrated that all students presented a call to action. All students also presented a sustainable action, although 56% of sustainable actions presented were vague or unclear. The biggest difference in responses from scenario question one to two was the rationale that students gave for their call to action. Responses suggested that merely 25% of students gave a rationale to their call to action that was adequate or exceeded. Students were able to give a call to action that was relatively environmentally sustainable, yet were unable to explain or back up their call to action. One example quote from a student stated, "I would tell her not to throw it out because that's wrong." The theme of this quote was used multiple times by students. Although it clearly offers a call to action, the rationale for this action is vague. Students understood that throwing a pop can out of the window would have negative consequences but for some reason couldn't explain why they would tell their mother to

participate in a sustainable action rather than throwing a can out a car window. Analyzing this portion of the scenario question had me wondering if there was a social influence at play in this scenario question. It seemed to be easier for students to advise and rationalize with friends than it did with a mother concerning sustainable actions. Is it possible that students were demonstrating associative reasoning rather than rule-based reasoning when making and presenting their scenario responses? The rule-based reasoning system is slower and makes decisions based on facts, evidence, and careful consideration. On the other hand, associative reasoning is made more quickly, often described as a gut-feeling (Manning, 2009). Associative reasoning does not use conscious control but rather it uses emotion, familiarity, and mental images (Manning, 2009). Although students may have felt that they were making deliberate decisions based on facts, their associative system of thinking may have been playing a major role in their responses simply because they were advising and rationalizing with their mother rather than a friend.

Scenario three asked students, your classmate is cleaning out their desk. They have a huge pile of papers that they are carrying toward the garbage can. What would you do? Why? Below are the results of scenario three.

Table 8 Scenario Three Results

	1	2	3	4	Class Mean Score
Call to Action	0	2	14	0	2.8
Sustainable Action	0	8	8	0	2.5
Rationale for Action	1	11	4	0	2.1
Total Class Mean					2.4

Responses to scenario three presented results more closely related to scenario question one. Students were able to sufficiently offer a call to action that was generally an environmentally sustainable action. Although students struggled to rationalize their call to action as well as they did in scenario one, the rationalization to their call to action in scenario three was more clear and thorough than in scenario two. Again, this trend may suggest that advising a call to action and rationalizing with a friend or classmate rather than family member may have had an influence on student responses.

Scenario four presented the following scenario. You're camping with your family. A parent tells you to take the day's garbage and get rid of it in a nearby river. What would you do? Why? Below are the results of scenario four.

Table 9 Scenario Four Results

	1	2	3	4	Class Mean Score
Call to Action	0	4	12	0	2.5
Sustainable Action	3	7	6	0	2
Rationale for Action	0	10	5	1	2.2
Total Class Mean					2.2

All students adequately responded to scenario four with a call to action. Interestingly, sustainable action responses to scenario four were the weakest of any of the five scenarios. 19% of students responded that they would, indeed throw the garbage into the river because they wanted to fulfill their parent's request. Responses indicated that they would rather throw some trash in the river in order to not get into trouble with their parents. Student's rationale for action was sufficient or comparable to the other three scenarios regardless of that fact that not all of the

calls to action were environmentally sustainable. The class score in the sustainable action portion of the scenario responses to scenario four is further confirmation that the relationship of the person in the scenario to the student responding to the scenario does influence student responses and quite possibly student's decisions to make environmentally sustainable actions.

Students were asked to respond to the following scenario. You're walking through our school forest. As you're walking, you come upon an old tire. What would you do? Why?

Below are the results of scenario five.

Table 10 Scenario Five Results

	1	2	3	4	Class Mean Score
Call to Action	0	4	11	1	2.8
Sustainable Action	3	9	4	0	2.1
Rationale for Action	3	7	6	0	2.2
Total Class Mean					2.4

Again, all students were able to respond to the scenario with a call to action with one student exceeding in their call to action, giving multiple calls to action. Similar to scenario four, students in general scored low in their call to action being sustainable. 19% of students didn't feel that they alone would be able to lift, remove, or dispose of a tire. Two students responded that even though it's not good to litter and leave a tire in the forest, they wouldn't move the tire because it may be the home of an animal and they didn't want to disturb an animal's home. Rationalizing the call to action was similar to scenario three. Rationale for action in scenario five was interesting to read because as previously stated, many students were thorough and sure to explain why they may leave the tire in the forest instead of remove it and risk destroying an

animal's home. Although leaving a tire in the forest may not be thought of as an environmentally sustainable action, I scored the action as being sustainable on the rubric if students rationalized their call to action with a sustainable reason for leaving the tire. I considered creating habitat for wildlife as being a sustainable action, albeit with a rubber tire.

The five scenario questions throughout the research study offered me as the observer wonderful insight on participant thoughts, perspectives, and understanding of previously learned material. Using a rubric to score each scenario response by considering the student's call to action, if the call to action was environmentally sustainable, and if students could rationalize their call to action, allowed for a clear view of possible influences within the scenario as well as a glimpse of student's understanding of utilizing appropriate environmentally sustainable actions. Looking at the scenario data, it was evident that there are influences at play when students consider a sustainable call to action. Depending upon if the scenario involved family versus friends and classmates, student responses with sustainable action or rationale for a sustainable action varied. Students were more apt to confront and recommend a sustainable call to action with a classmate or friend than they were with a family member. These findings do support research that says associative reasoning, often described as a gut-feeling, does not use conscious control but rather it uses emotion and familiarity (Manning, 2009). It's possible that students unconsciously responded to scenario questions involving parents with more reserve, less thought toward environmentally sustainable actions, and more concern to the consequences of upsetting or disobeying a parent. These data may go on to suggest that students more readily participated in and changed their behaviors to be more environmentally sustainable in a school setting or around peers but weren't necessarily able to translate this to activities and behavior outside of school.

Observations of Influences that Change Behavior

A variety of influences including environmental, cognitive, emotional, and past experiences all play a role in how learning occurs (Knud, 2004). Throughout the research study, a number of instances were observed that I perceived to be influences on student behavior. Some of these influences will be described in the next section of Chapter Four. Here I will discuss the influences of peers and opportunity which were the most apparent impactful influences at school. When friends or classmates were excited about a project or passionate about a topic, the class as a whole became much more engaged. If one student announced that a worm had escaped from the vermicompost container, there would be six or eight students surrounding the vermicompost container within seconds. I was thrilled to see this type of interest and commitment throughout the study. As mentioned earlier in this chapter, students also helped remind each other as well as me whenever we forgot to accomplish our daily research study tasks. Unprompted, students discussed their reaction and responses to each scenario question after they had turned in their written responses. These discussions often resulted in debates on what call to action would be the most effective and environmentally appropriate. By the end of the study, it became very clear that the quality of student participation in an activity relied heavily on first just getting a handful of students excited about the activity.

The other major influence observed was opportunity. During the past few years our school has made a conscious effort to incorporate more environmental learning into our curriculums. More teachers are using our school forest and incorporating project based learning. Our enrichment program, Community Education program, and Summer Camp offer more outdoor-related opportunities as well. One such opportunity the past couple of years has been our Outdoor Club. This club is offered through Community Education and it organized and

orchestrated by teachers and community volunteers. These environmental-related opportunities for students have paid dividends on the enthusiasm that students showed throughout our research study. Ms. Leah Spee, our enrichment coordinator is quoted saying, “I am so excited to see the kids wanting to learn about the flora and fauna in their area.” Ms. Spee also approached me near the end of the year to express how impressed she was with the knowledge and participation of three particular students in my class when they gave her a phenology report earlier that week. Evidence in these observations of opportunity support the self-determination theory. The self-determination theory suggests that one strategy that formulates change is to create opportunities of competence, skills, and knowledge (Ryan & Deci, 2000). Ryan and Deci claim that humans are drawn to activities where they feel competent. Those activities that give them a sense of connection to other humans are most influential. When given opportunities in the classroom as well as after school hours, students excelled in understanding and participating in environmental-related activities.

Scenario questions and general observations in this research study were used to determine if there were any influences that changed behaviors. Analyzing the scenario questions revealed that students were influenced by who was involved in the scenario. Students were more likely to make a call to action that was environmentally sustainable as well as rationalize that call to action to a friend or peer but were hesitant to express this similar environmentally sustainable calls to action when confronting a parent. This is evidence that students may have been responding to the scenario questions with an unconscious associative system of thinking rather than rule-based. Further, questionnaire responses discussed earlier in the chapter appear to confirm that student’s willingness to perform environmentally sustainable actions was more likely to occur at school rather than at home. It’s possible that student relationships to the person

involved in the action or activity influences them, leading students to use of associative systems of thinking or rule-based.

General observations portrayed influences to be peers and opportunity. Students were influenced by how their peers reacted to an activity or action. A positive reaction created excitement and a willingness to participate in an activity. When students are given multiple opportunities to partake in environmental-related classes and lessons, they feel more comfortable and sufficient with the theme of the activity. With comfort and familiarity, students are confident and enjoy environmental-related activities. These observations in opportunity describe the self-determination theory (Ryan & Deci, 2000). The self-determination theory suggests that one strategy influencing change is to create opportunities of competence, skills, and knowledge. The next section in Chapter Four will examine the most effective implementation methods and environments for instilling sustainable behavior.

Effective Implementation Methods for Instilling Sustainable Behaviors

This final section of Chapter Four will examine the effectiveness of experience-based learning in the research study. Were experience-based activities such as waste and recycled product measurements and vermicompost successful in instilling appropriate environmentally sustainable actions in students? The research study included student interviews, students documenting their final thoughts on the vermicompost activity, and students documenting their compost hypothesis. These data pieces were used to analyze if the experience-based teaching methods in this research study had an impact on instilling sustainable behaviors in students.

Vygotsky's constructivist theory suggests that social interactions proceed development and that cognition is the product of socialization and social interactions (Wertsch, 1985).

Children that participate in practical activity in a social environment are much more likely to

learn from their experience and retain what they've learned. Cognitive learning theory suggests that rather than learning from what a person is currently working on, people learn by making sense of the relationship between old and new learning experiences (Myers, 2008). In this theory, students must engage in reflection and retain childhood curiosities in order to learn. When our class embarked on the vermicompost activity, the constructivist and cognitive theory demanded consideration. Throughout the research study, students were given the opportunity to work together with their peers, reflect on their thoughts, offer their individual input, and let their curiosity drive the activities we participated in. As an instructor and observer of this research study I was interested to learn if the format of this research study, experience based learning, would prove either of these learning theories correct or false.

The intent of the research study was to find out, how does experience-based learning impact students' decisions to perform sustainable actions? In essence, what actions and activities, influences, and implementation methods are most effective in impacting student's decisions to perform environmentally sustainable behaviors? The value of analyzing student's written and oral thoughts and understanding of vermicompost at the end of the study as well compost prediction at the start of the study may not be helpful in concluding if experience-based learning was successful in transferring to students performing sustainable actions outside of school, however, it will be helpful in determining if experience-based learning directly affected student's ability to perform sustainable actions and to gain and retain knowledge at school during the research study.

Vermicompost Prediction

One intriguing discussion that our class had concerning the vermicompost activity revolved around two questions. The first question was, what will happen to the food waste that

we deposit into the vermicompost container? The second question was, will the weight of the material in the compost container increase, decrease, or stay the same? These questions were presented to students on the same day that our vermicompost system arrived in the classroom. It appeared that the excitement of dirt, worms, and food waste in the classroom really was a catalyst for thoroughly discussing questions regarding vermicompost. It should be noted that there was much passion involved in these discussions. This passion resulted in students being eager to participate in the vermicompost activity in order to verify their prediction.

81% of students predicted that the waste food that we deposited into the vermicompost system would go into the belly or stomach of the red wiggler worms. 19% of students predicted that the food we deposited into the vermicompost system would simply turn into dirt. 43% of students predicted that the weight of the material in the compost container would decrease by the end of the study. 37% of students predicted that the weight of the material in the compost container would increase by the end of the study. 20% of students predicted that the weight of the material in the compost container would stay the same from the beginning to the end of the study. Reflecting on these data now, I have a couple of thoughts. First, I wish that I would have incorporated a component in this prediction exercise that would have asked students to rationalize their prediction. Having rationale to analyze would have aided in understanding student knowledge about vermicompost prior to starting the study. It also would have been helpful for students as it would have offered them an opportunity to learn by making sense of the relationship between old and new learning experiences as well as reflection (Myers, 2008). Analyzing the data that was gathered, however, concludes that there was a consensus on what would happen to the food deposited into the vermicompost container but there was a significant amount of variability in what students predicted would happen to the weight of the material in

the vermicompost container. It appeared that prior knowledge and previous lessons about decomposition and composting were retained and used in predicting about material in the vermicompost container. Predicting about an increase or decrease in weight of material in the vermicompost container was a subject that required students to utilize more critical thinking skills or possibly guessing. Would students gain and retain any knowledge while participating in the experience-based vermicompost activity? What would their final written thoughts on vermicompost reveal about their learning?

Final Thoughts on Vermicompost

Analyzing the final thoughts on the vermicompost activity, both written and verbal interview, was a bit difficult to assess. These final student thoughts are difficult to organize into neat numbers or percentages. Instead, one must analyze the overall perception of the class as well as individual accounts from students that may point toward evidence of learning or behavioral changes.

Verbal interviews offered the unique opportunity to sit down and talk one-on-one with students about their thoughts of the research study and vermicompost activity in particular. Student interviews expressed an overall consensus of excitement with students having the opportunity to try something new that they had never done in a classroom before. Students were surprised that they would be able to bring food from the lunchroom back to the classroom. They were also engaged with the idea of keeping a container full of worms in our classroom. Some students were hesitant with the smell of rotten food or smelly worms in the classroom but admitted that their expectations of a smelly activity never materialized. All students generally understood the concept of recycling and composting, yet a majority confessed that the projects and activities they participated in at school didn't impact how or what they recycled or

composted at home. 37% of students recycled or composted at home before the research study and they continued to do so after the study. 63% of students didn't recycle at home before the research study and still didn't after the study. It's important to note that neither the cities within our school district nor private waste collecting companies outside of city limits offer recycling services. Individuals may opt to bring recyclable products to the county landfill on their own if they wish, however, where they will be recycled. Students more often than not were unable to sufficiently describe what a sustainable action was. A small number of students were able to connect recycling or composting to sustainability but most students could not think of an individual sustainable action without being prompted.

Written thoughts offered students an opportunity to give their parting likes and dislikes of vermicompost and reflection to their previously given prediction on vermicompost. All but one student indicated that their favorite part of the activity was handling or having worms in the classroom. One student did not enjoy having worms in the classroom. 37% students voiced their dislike being the waste food that they needed to work with. These students either didn't like the smell of the food waste or having to touch other people's food waste. 63% of students did not have any dislikes with the vermicompost activity. When reflecting on their prediction of what would happen to the material deposited into the compost and what would happen to the weight of the compost, students were most engaged with reflections about the weight of the material in the compost container. In their prediction reflections, 87% of students correctly identified that the weight of the materials in the vermicompost container did in fact increase. 75% of students clearly referred back to their original prediction and either confirmed their prediction as being correct or admitted that the results of the study proved their original prediction wrong. Student's identification and confirmation of their original prediction was critical in understanding if they

gained and retained information throughout the experience-based learning activity. It would appear that at least 75% of students understood the concluding results of the vermicompost activity as well as were able to reflect on their own original prediction of the vermicompost. The student's written final thoughts concluded that the experience-based learning vermicompost activity was effective in impacting 75% of students.

Vermicompost prediction and final thoughts reflection written responses along with individual verbal interviews with students helped to better understand how experience-based learning impacted students in this study. Data in these written responses and verbal interviews indicated that experience-based learning was effective in reaching students in a classroom setting. Students were able to gain and retain information throughout the study and were engaged with participation of the experience-based activities. Sustainable activities that were performed with experience-based learning in school, however, were not transferred to life outside of school. Those students that recycled or composted outside of school prior to the study, continued to do so. Those students that did not recycle or compost outside of school prior to the study, still had not changed their behavior to start recycling or composting outside of school. Students were aware that the activities that they were participating in at school included recycling and composting, however, most were unable to definitively identify these activities as being labeled as sustainable.

Conclusion

Chapter Four presented and analyzed the results of the research study. Data presented in Chapter Four aided in explaining, how does experience-based learning impact students' decisions to perform sustainable actions? Students participated in experience-based activities that included weighing and documenting classroom waste, food waste, and recycling. Students

also participated in depositing their food waste into a vermicompost system. Questionnaires, written reflections and responses, prediction discussions, picture drawing, verbal interviews, and general observations were used to gather data that included student's thoughts, perspectives, and participation in the experience-based learning activities. Three key points of interest discussed in Chapters One, Three, and Four helped to focus the gathered data. These three points of interest were appropriate environmentally sustainable actions, influences that changed student behaviors, and effective implementation methods for instilling sustainable behaviors.

Data gathered and analyzed in Chapter Four suggested that student's environmentally sustainable actions in school were in fact impacted by the experience-based learning activities throughout the study. Students increased the amount of paper they recycled and decreased the amount of classroom waste that they threw away. Post study questionnaires and one-on-one interviews suggest that students generally comprehended the concepts of recycling and composting and the benefits they have on the environment, due to the experience-based learning vermicompost activity with accompanying activities. Scenario questions and general observations within the research study proved that the most impactful influences came from student's parents, peers, and opportunities. Parents had the most impact on students performing sustainable actions outside of school. Peers and the opportunity to take part in supplementary outdoor-related classes or activities influenced student's decisions to perform sustainable actions in school. An overall 9% increase in class pre to post questionnaire scores, a class increase in the amount of recycling, and a decrease in classroom and food waste point toward experience-based learning being effective in increasing student's decisions to perform sustainable actions in school. However, this did not translate to students performing more sustainable actions outside of school. Questionnaire participation questions and scenario responses suggest that parent's

actions and directions had a larger impact on student's actions outside of school than did experience-based learning lessons and activities in school.

Preview to Chapter Five

Chapter Five will be a narrative reflection of the capstone as a whole. It will explore the question driving the research study, revisit the Literature Review, and contemplate the implications, limitations, and findings of the research study. Chapter Five will be the concluding chapter of the capstone.

CHAPTER FIVE

Conclusion

Introduction

The concluding chapter will consider the impact of this Capstone as it relates to students, myself as a researcher and teacher, and on the teaching profession as a whole. A final consideration of the Capstone question, how does experience-based learning impact students' decisions to perform sustainable actions, will be discussed. The first section of Chapter Five will clarify if the capstone question was ultimately answered by the research study. A summary of what was learned as a researcher and observer throughout the Capstone process will also be discussed.

Next, pertinent parts of the Literature Review will be revisited. Some areas of the Literature Review were more helpful than others in helping to understand and analyze the data from the research study. In this section, there will be a deeper examination of what Literature Review material was most relevant to the research study.

Implications and limitations of the research study findings will be analyzed as well as thoughts on how the research data and information will be used in the future. This will include a final deliberation on the major findings of the study and how these findings may be used in the teaching profession.

Answering the Question

This Capstone project has revolved around the question, how does experience-based learning impact students' decisions to perform sustainable actions? Keeping this question in the

forefront has been crucial to keeping the Capstone focused throughout the entire process. In order to effectively answer this question, I worked to arrange the Literature Review and data from the research study into three areas. The first was to examine appropriate environmental actions for students to participate in. The second was to identify influences that changed student behaviors. The third was to determine the most effective implementation methods for instilling sustainable behaviors. Researching for the Literature Review and organizing the research study based on these three areas made it much easier to help answer the capstone question.

The Capstone process has taught me many useful lessons. First and foremost, the importance of beginning with a strong and assessable question. It was so important to ensure that the wording of the question was such that it allowed the reader and me as the researcher to clearly identify what to look for and analyze. A strong question gave me direction and easily kept me on the correct path for research and organizing the research study. A properly prepared question helped to drive the entire Capstone. I feel confident that my research study was effective in answering the question because the question itself offered appropriate direction for the type of research needed.

So, how does experience-based learning impact students' decisions to perform sustainable actions? Discoveries obtained through the research process suggest that experience-based learning was effective in empowering students to take ownership the learning process. Students developed a better understanding for recycling, composting, and sustainable actions in general. Data also revealed that the most powerful influence to student actions is their parents or family members. These key findings also, however, pointed toward the fact that the six week research study did not allow enough time to increase the sustainable actions that students displayed outside of school. It appears that a major influence, parents, have a stronger influence

on student's decisions to perform sustainable actions outside of school than did experience-based learning in school.

Relating back to the question, how does experience-based learning impact students' decisions to perform sustainable actions, and answers to this question based on the data collected, there was a finding that I did not expect. Being an educator that spends roughly 1,200 hours with students each year, it's easy to assume that what I say or teach and the form in which lessons are presented to students will have more influence than anything else in their daily life. The concluding data of this research study seemed to suggest otherwise. Family, most notably parents, are a larger influence on students than peers, myself or experience-based lessons. Going into the research I had just assumed that the answers to the research question would be found within the classroom, however, that was a wrong assumption. Regardless of this unexpected finding, I'm satisfied with the conclusion to the Capstone question that the data from the research study offered.

Moving forward, I plan to continue to utilize experience-based instruction in the future. Specifically, I plan to continue the vermicompost project and sustainable actions activities throughout the school year (at least 30 weeks) in years to come rather than just for a six week period. Furthermore, I plan to involve parents in the vermicompost project on a regular basis by sending home more information regarding the project and challenging parents and students to take part in recycling and composting at home. It will be interesting to see if the increased time in instruction translates to more sustainable actions being performed outside of school.

Revisiting the Literature Review

Referring back to the Literature Review throughout the research study was helpful to keeping the study on track and reminding me where to focus my attention as a researcher and

observer. The Literature Review as a whole was helpful in giving me a solid background in a variety of areas related to my research study. As the research study progressed, however, it became apparent that there were parts of the Literature Review that were obviously more relevant parts than others to the work I was doing. The following section of Chapter Five will discuss the most pertinent information to the research study that appear in the Literature Review.

Early in the Literature Review I researched examples, including those by Paulsen & Carroll (2010) and Manning (2009) that asserted that people generally want to do the right thing, make sustainable decisions, and perform environmentally sustainable actions. The problem is that there are often a variety of social and logistical variables or a lack of knowledge that prevents people from making sustainable decisions and actions. Throughout the research study, I certainly found this to be true. Never once throughout the study was there a participant that indicated a sense of disdain toward animals, plants, or the environment in general. Students wanted to make sustainable decisions and actions but they didn't always know exactly what they could do or there were influences that consciously or unconsciously influenced them. As an educator, this was somewhat comforting to me. I was optimistic knowing that the foundational idea of sustainable decisions and actions was appealing to students. Now it was just a matter of understanding and manipulating the variables and influences that would make sustainable decisions and actions possible.

Another Literature Review theme that surfaced often throughout the research study was that of Louv (2005), Clements (2004) and Ryan & Deci (2000). Louv (2005) describes the consequences of children's lack of exposure to the outdoors. Depression, childhood obesity, and attention disorders are a direct effect of children not spending as much time outdoors (Louv, 2005). Clements (2004) backs up this claim with a survey that asked over 800 United States

mothers, how much time they spent as a child playing outside and how much time their children spend playing outside. “70% of the mothers reported playing outdoors every day when they were young, compared with only 31% of their children” (Clements, 2004, p.58). When asked what the main obstacles were in having their children play outside, most mothers referred to a fear of their children getting injured while outside, the possibility of crime, and their child’s increased time spent watching television or playing with electronics.

As sad as these theories and statistics seem, I didn’t necessarily find them to be true in the district that this research study took place. Rather, a strategy for change claimed by Ryan & Deci, 2000, occurred. They claim that creating opportunities of competence, skills, and knowledge are major factors in influencing change. Humans need competence, autonomy, and relatedness for well-being and healthy functioning. Activities that threaten these three basic needs tend to be avoided. Many students that participated in this Research Study also are members or participants in other outdoor-related clubs or classes in and outside of school. Many of these students also enjoy outdoor-related activities regularly with family and friends. This familiarity and comfortability seemed to have had a strong influence on student’s willingness to participate and knowledge of the content in the research study. I believe that this familiarity and comfortability with outdoor-related activities due to family and peers participation in outdoor-related activities also plays into the theories of Knud (2004).

Knud (2004) asserts that past experiences are extremely influential agents of change and learning. While Vygotsky suggests that social interactions are important factors which lead to learning development. Both of these theories appeared evident as students were observed and data was analyzed throughout the Research Study. Student’s prior knowledge due to previous outdoor-related opportunities, especially those with family and friends, not only gave students a

stable fundamental knowledge of the content of the research study but it also made them comfortable with the content of the research study.

A final piece of information from the Literature Review that proved to be relevant to the Research Study was Manning's (2009) statement that unconscious or automatic processes constitute most of the decisions for a rational mind. It became most apparent while analyzing the scenario questions given to students during the research study, that unconscious thoughts about the consequences of what a parent's actions may be had more influence on student's actions and decisions outside of school than did anything else. Students were more concerned about what may happen if they didn't listen to their parents or mimic their actions than what may happen to the environment if they made a poor sustainable decision. This observation may also be related back to another influential strategy that suggests the importance of making a sustainable behaviors the social default (Schultz, et al, 2007). Humans are biologically programmed to care about what other people think and to try and make their behavior fit into those around them. If students see their friends and family engaged in sustainable behaviors, they are much more likely to partake in these actions because they feel a need to fit in.

Although there were many aspects of the Literature Review that could be perceived as being relevant to the Research Study, the above theories stood out to me in highlighting what I most observed and the data suggested. I believe my research study adds to the literature base by confirming the importance of parental support, the advantages of experience-based learning, and the power of opportunity.

Implications, Limitations, and Use of Findings

This Capstone aimed to find out, how does experience-based learning impact students' decisions to perform sustainable actions? I believe that the research done in a school setting

during a six week period truly did answer this question. Experience-based learning is an effective tool in helping students learn, retain, and display a concept. Students are engaged and willing to participate in experience-based learning because experience-based learning incorporates numerous facets that are catalysts for learning and change. The implications of this Research Study are that experience-based learning should be a valued element of any effective educator's repertoire. Experience-based learning allows students to find a comfortable niche in the content, see personal relevance, and enjoy engaging hands-on experiences. The Research Study did, however, emerge limitations.

One such limitation was the inability to further investigate what factors outside of school impacted student's decisions to perform sustainable actions and how these factors impacted student's decisions. When it became apparent that family, especially parents, and peers had likely one of the strongest influences on student's decisions to perform sustainable actions, I regretted not having a plan to incorporate a way to further explore this phenomenon. However, I do plan to incorporate more parent involvement in this project in years to come as my classroom continues visiting sustainable actions. As the research study is now, the only true data that I have relating to family and peer influence is from scenario questions, pre and post questionnaires, and verbal interviews. Although each of these pieces of data touches on family and peer impact, none of them dig very deep into this concept. I was able to find out appropriate environmental actions in school for students, that parents are possibly the biggest influences of change, and that experience-based learning is effective in reaching students, but it would have been nice to know more about just how much influence parents have or even what could be done by elementary teachers to reach out to parents. If parents are the most influential agents of change, maybe it's them that need to be targeted as much or more than students in school.

Understanding the importance of parent's role is certainly one take-away that I will utilize in the future. No matter what the content of my lessons at school are, or what methods I utilize to present them, it's quite possible that my influence will not be as dramatic as a peer or parents'. In the future, I will plan to use more experience-based learning opportunities with my students but more than that, I will plan to include more parent involvement and participation such as letters home describing our classroom activities and a challenge to students and parents to continue these activities of recycling and composting at home. Hopefully this will aid in concepts coming full circle and lessons being taught in more than just a classroom.

What Next

A final component of this Capstone will be to use data gathered and information learned and put it into practice. Moving forward, I plan to do this a couple of different ways. First, I would like to continue experience-based learning activities that incorporate sustainable actions such as vermicompost in my classroom for an extended period of time rather than just six weeks. With this, however, I would like to involve more classrooms within the elementary and also encourage more participation with stakeholders outside of school. Ideally, these sustainable actions that became evident by the end of the research study in school, would translate to sustainable actions at home. The data suggests that parent involvement will be paramount in accomplishing this task. Newsletters informing parents of our daily activities and projects, an open invitation to come into the classroom and participate, and a challenge to perform sustainable actions at home are all ways that I plan to involve participation outside of school.

In school, I would like to share with my colleagues what I've learned from my research study. I would hope that my findings will excite them and encourage them to try some of these sustainable actions in their own classroom. Of course, I would also offer any assistance I could

in getting them started, offering tips, ideas and advice on activities they could try, and even volunteer my class to assist with any ideas they may have. It's possible that the knowledge gained from my students this year will carry through into projects and activities they perform in fourth grade this coming year.

Follow up projects to this research may even include investigating food waste at school. As mentioned earlier in Chapter Four, one of the biggest variables in our food waste data was the fact that students are required to take a certain portion of specific foods whether they plan to eat them or not. Maybe by studying food waste in the future during each meal, our class could make recommendations on which menu items our school cooks could reconsider and which are the most popular. Realizing these facts would reduce food waste and increase nutrition for students.

Summary

Chapter Five began with an answer to the Capstone question, how does experience-based learning impact students' decisions to perform sustainable actions? The Research Study found that experience-based learning does positively impact students' decisions to perform sustainable actions in a school setting as it proved to increase their sustainable actions at lunch time and in the classroom from the start of the research study to the end. The research study suggested, however, that experience-based learning did not increase the sustainable actions that students displayed outside of school. It appeared that parents have a stronger influence on student's decisions to perform sustainable actions outside of school than did experience-based learning in school.

Next, Chapter Five examined various parts of the Literature Review that proved to be the most important to the research study. Observations, surveys, questionnaires, and interviews proved that students truly do care about the state of the environment and want to act in a way that

is environmentally sustainable (Paulsen & Carroll, 2010, Manning, 2009). Although today's fast paced society appears to be creating a disconnect between children and nature (Louv, 2005, Clements, 2004), the particular district in which this research study took place does not boldly reflect this. Instead, the ample opportunity to participate in outdoor-related activities in and out of school with peers and family have kindled a desire for students to familiarize themselves with the natural environment (Ryan & Deci, 2000). These past experiences in the outdoors were impactful in helping to familiarize students with the concept of sustainable decisions and actions (Knud, 2004). During the research study, social interactions with peers were critical in helping students engage and understand the concepts of recycling, composting, and sustainability. Interactions with peers in school were influential for students but it was the unconscious or automatic system of thinking that revolved around parent actions that created the strongest influence on students outside of school (Manning, 2009).

The final section of Chapter Five discussed the implications, limitations, and future use of the findings from this study. The research study suggests that experience-based learning is an effective method of teaching and learning. It is capable of reaching a diverse audience by tapping into individual past experiences, strengths, and learning styles. The research study did not, however, further address a major finding which includes the role that parents play in impacting student learning. It's possible that above experience-based learning or teachers themselves, parents are the most influential forces in student learning. With this knowledge, educators must be aware that how they incorporate parents into their classrooms and lessons or make them aware of subject content will greatly alter the outcome of student learning success.

Conclusion

Embarking on the journey of Capstone completion was a daunting thought. There are many adages that could be used to describe the Capstone process but I believe the best may be one that expresses an appreciation of the journey rather than only focusing on an end result. This master's program has allowed me to deeply explore topics that I never imagined would be applicable to my personal or professional life. I see the world differently, analyze all sides, and most importantly, concentrate on enjoying each step of the process rather than focusing on an end product. I chose this Capstone topic because of a genuine concern for the future of young people's intimacy with the outdoors. My passion for nature stems from experiences I've had that taught me the intricacies and layers or smaller pieces within the natural world that are all interconnected. The irony of this Capstone is that it has taught me more about enjoying each layer or piece of a larger concept. Completing this Capstone has been a prime example of exactly how each piece of research, chapter, activity, or observation, must fit together to make a comprehensible whole. The Capstone began with a simple question of, how does experience-based learning impact students' decisions to perform sustainable actions? Sure, the completion of the Capstone resulted in an answer to this question but it also revealed much more. This single question, a piece of the whole, evoked knowledge, patience, persistence, and understanding. The woven pieces of this Capstone puzzle will have lasting effects on both my students and I as we continue to piece our puzzle of life together, and hopefully better understand and appreciate the natural world around us.

REFERENCES

- Adams, J. (1999). Cars, cholera, cows, and contaminated land: Virtual risk and the management of uncertainty. In: R. Bate (Ed.) *What risk?* London: Butterworth Heineman.
- Anderson, V., Datta, R., Dyck, S., Kayira, J., & McVittie, J. (2016). Meanings and Implications of culture in sustainability education research. *Journal of Environmental Education*, 47(1), 1-18. doi:10.1080/00958964.2015.1056077.
- Beane, Mairead Kathleen, "Exploring the Implementation of Project-based Learning at an Alternative High School" (2016). School of Education Student Capstones and Dissertations. Paper 4084.
- Beck, Mary Patricia. (2010). Increased time spent in a natural setting related to an increase in pro-environmental behaviors and pro-environmental attitudes in adolescents. *School of Education Student Capstones and Dissertations*. Paper 1037. http://digitalcommons.hamline.edu/hse_all/1037.
- Bekoff, M. (2014). *Rewilding our hearts: Building pathways of compassion and coexistence*. Novato, CA. New World Library.
- Beyer, L. E., (September, 1997). William Heard Kilpatrick. Prospects: The Quarterly Review of Comparative Education. XXVII (3), 1-14. Retrieved from http://www.ibe.unesco.org/fileadmin/user_upload/archive/publications/ThinkersPdf/kilpatricke.PDF
- Brogan, D. S., McDonald, W. M., Lohani, V. K., Dymond, R. L., & Bradner, A. J. (2016). Development and Classroom Implementation of an Environmental Data Creation and Sharing Tool. *Advances In Engineering Education*, 5(2), 1-34.

- Bogner, Wiseman, Palmberg, Kuru, Schwartz (2012). Center for Place-Based Education and Community Engagement. What is Place Based Education? Retrieved from http://www.promiseofplace.org/what_is_pbe.
- Chambers, R. and Conway, G. (1992). Sustainable rural livelihoods: Practical concepts for the 21st century, IDS Discussion Paper 296, Brighton: IDS.
- Childress, S. (March, 2012). Rethinking school. *Harvard Business Review*, 90(3), 76-79. Retrieved from <http://hbr.org/2012/03/rethinkingschool/ar/1?awid=645259513061956204-3271>.
- Clements, R. (2004). An Investigation of the State of Outdoor Play. *Contemporary Issues in Early Childhood*, 5(1), 68-80.
- Cornell, Joseph. (1998). Sharing Nature with Children: the classic parents' and teachers' nature awareness guidebook.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Los Angeles: Sage.
- Daly, H. E. (1990). Toward some operational principles of sustainable development. *Ecological Economics*, 2:1-6.
- DiOrio, Rana. (March, 2010) What Does It Mean To Be Green? Little Pickle Stories.
- de Vreede, C., Warner, A., & Pitter, R. (2014). Facilitating youth to take sustainability actions: The potential of peer education. *Journal of Environmental Education*, 45(1), 37-56. doi:10.1080/00958964.2013.805710.
- Duke, Nell K. (2015). *Information in Action, Reading, Writing, and Researching with Informational Text*. Scholastic Incorporated.
- Eidelman, Lissa A.. (2010). Energizing outdoor environmental education criteria and

- curriculum for outdoor energy education. *School of Education Student Capstones and Dissertations*. Paper 1038. http://digitalcommons.hamline.edu/hse_all/1038.
- England Marketing. (2009). *Childhood and nature: a survey on changing relationships with nature access across generations*. The Barn, Fenside Road, Warboys, Cambridgeshire.
- Forbes, C. c., & Zint, M. (2011). Elementary teachers' beliefs about, perceived competencies for, and reported use of scientific inquiry to promote student learning about and for the environment. *Journal Of Environmental Education*, 42(1), 30-42.
- Fritzberg, G. (January 01, 2003). No Child Left Behind: Changes and challenges. *Journal of Education Boston University School of Education*, 184(3), 37-44. Galloway Thoele, Kathryn Allison, "Environmental Education in Pre-K Child Care Settings" (2015). *School of Education Student Capstones and Dissertations*. Paper 98.
- Goral, M. B. (2006). Education for a sustainable future. *Democracy & Education*, 16(3), 25-28.
- Hagglund, S., & Samuelsson, I. P. (2009). Early childhood education and learning for sustainable development and citizenship. *International Journal of Early Childhood*, 41(2), 49. Retrieved from <http://search.proquest.com/docview/194776488>.
- Hart, R. A., & Smith, G. (. (1997). *Children's participation : The theory and practice of involving young citizens in community development and environmental care*. Toronto: *Green Teacher*.
- Helle, L., Tynjala, P., & Olkinuora, E. (January 01, 2006). Project-based learning in

- postsecondary education - theory, practice and rubber sling shots. *Higher Education*, 51(2), 287-314.
- Hendricks, C. (2013). *Improving Schools Through Action Research: A reflective practice approach* (3rd ed.). Boston: Pearson Education, Inc.
- Kahn, P.H., Jr. (2002). Children's Affiliation with Nature. In P.H. Kahn, Jr. & S.R. Kellert (Eds.), *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations* (Chapter 4). Cambridge: MIT Press.
- Kaplan, S. & Kaplan, R. (2002). Adolescents and the Natural Environment: A Time Out? in P.H. Kahn, Jr. & S.R. Kellert (Eds.), *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations* (Chapter 9). Cambridge: MIT Press.
- Kaplan, S. (2000). Human nature and environmentally responsible behavior. *Journal of Social Issues*, 56(3), 491.
- Knafo, A., & Plomin, R. (2006). Prosocial behavior from early to middle childhood: genetic and environmental influences on stability and change. *Developmental Psychology*, 42(5), 771-786. doi:10.1037/0012-1649.42.5.77.
- Knud, L. (2004). *The three dimensions of learning*. Malabar, Fla: Krieger Pub. Co. ISBN 9781575242583.
- Louv, Richard. (2005). *Last Child in the Woods*. Chapel Hill: Algonquin Books of Chapel Hill.
- Lundeberg, M. A. (January 01, 1997). We think they're learning: Beliefs, practices, and reflections of two teachers using project-based learning. *Journal of Computing in Childhood Education*, 8(1), 59-81.
- Manning, Christine. (2009). *The psychology of sustainable behavior*. Minnesota

Pollution Control Agency.

Marzano, Robert J. (2010). *Formative assessment & standards-based grading*.

Bloomington, IN: Marzano Research Laboratory,

McCarthy, S. (January 01, 2008). The impact of No Child Left Behind on teachers' writing instruction. *Written Communication*, 25(4), 462-505.

Mills, G. E. (2011). *Action Research: A guide for the teacher researcher* (4th ed.). Upper Saddle River: Pearson Education, Inc.

Moonstone, Beth Anne. (2016). Nature experiences and ecoliteracy: The effect of place based education experiences, adventure and outdoor education experiences and undirected nature experiences on ecoliteracy. *School of Education Student Capstones and Dissertations*. Paper 4147. http://digitalcommons.hamline.edu/hse_all/4147.

Myers, D. (2008). *Exploring Psychology*. New York, New York: Worth. p. 163.

Neal, D. T., Wood, W., & Quinn, J. M. (2006). Habits: A repeat performance. *Current Directions in Psychological Science*, 15, 198-202.

Nicole D'Alessandro. (2014). How to teach kids about sustainability. Retrieved from <http://www.ecowatch.com/how-to-teach-kids-about-sustainability-1881888830.html>.

Orr, D. W. (2002). *The nature of design: Ecology, culture, and human intention*. New York: Oxford University Press.

Pangborn, Katie Lynn. (2016). How does composting at school change the way middle School students perceive their ability to positively impact the earth? *School of Education Student Capstones and Dissertations*. Paper 4158. http://digitalcommons.hamline.edu/hse_all/4158.

- Project Lead the Way. (2017). Project Lead the Way Incorporated.
- Paulsen, C. & Carroll, S. (2010). Young kids and environmental sustainability: A needs assessment. In support of NSF Pathways Grant #1010959. Concord, MA: Concord Evaluation Group.
- Plevyak, L. H., Bendixen-Noe, M., & Henderson, J. (2001). Level of teacher preparation and implementation of EE: mandated and non-mandated EE teacher preparation states. *Journal Of Environmental Education*, 32(2), 28-36.
- Prince, M., & Felder, R. (January 01, 2007). The many faces of inductive teaching and learning. *Journal of College Science Teaching*, 36(5), 14-20.
- Rogers, M. A. P., Cross, D. I., Gresalfi, M. S., Trauth-Nare, A. E., & Buck, G. A. (January 01, 2011). First year implementation of a project-based learning approach: The need for addressing teachers' orientations in the era of reform. *International Journal of Science and Mathematics Education*, 9(4), 893-917.
- Ryan, R.M. and Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*. 55(1), 68-78.
- Rutt, Cameron. (April 17, 2017). Debate It: Should Plastic Bags Be Banned? *Scholastic News Weekly Reader*, volume 73 (edition 20), p. 3.
- Schultz, P.W., Nolan, J.M., Cialdini, R.B., Goldstein, N.J., Giskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science*, 18 (5), 429–434.
- Sloman, S. A. (2002). Two Systems of Reasoning. In: T. Gilovich, D. Griffin, & D.

- Kahneman (Eds.). *Heuristics and biases: the psychology of intuitive judgment*. Pp. 379-396. New York: Cambridge University Press.
- Swaim, J., Maloni, M., Napshin, S., & Henley, A. (2014). Influences on student intention and behavior toward environmental sustainability. *Journal of Business Ethics*, 124(3), 465-484. doi:10.1007/s10551-013-1883-z.
- Thiele, L. P. (1999). *Environmentalism for a New Millennium: The Challenge of Coevolution*. New York, NY: Oxford University Press.
- Thomashow, M. (1996). *Ecological identity becoming a reflective environmentalist*. Cambridge, Mass.: MIT Press.
- Thomashow, C. (2002). Adolescents and Ecological Identity: Attending to Wild Nature. in P.H. Kahn, Jr. & S.R. Kellert (Eds.), *Children and Nature: Psychological, 95 Sociocultural, and Evolutionary Investigations (Chapter 10)*. Cambridge: MIT Press.
- Vickers, V. & Matthews, C. (2002). Children and Place: A Natural Connection. *Science Activities*, 39 (1), 16 – 24.
- Weber, N. R. 1., Strobel, J., Dyehouse, M. A. 3., Harris, C., David, R., Fang, J., & Hua, I. (2014). First-year students' environmental awareness and understanding of environmental sustainability through a life cycle assessment module. *Journal of Engineering Education*, 103(1), 154-181. doi:10.1002/jee.20032.
- Weiland, I. i., & Morrison, J. (2013). The integration of environmental education into two elementary preservice science methods courses: A content-based and a method based approach. *Journal Of Science Teacher Education*, 24(6), 1023-1047.
- Wertsch, J. V. (1985). *Vygotsky and the social formation of mind*. Cambridge, MA:

Harvard University Press (p. 5-6).

Winther, A. A., Volk, T. L., & Shrock, S. A. (2002). Teacher decision making in the 1st year of implementing an issues-based environmental education program: a qualitative study. *Journal Of Environmental Education*,33(3), 27-33.

Wolfe, L. M. (1978). *Son of the Wilderness: The Life of John Muir*. Madison: University of Wisconsin Press.

APPENDIX A

School Research Consent Letter

February 27, 2017

Dear Jeff Nelson:

I am completing a master's degree in education at Hamline University. The culminating aspect of my degree is to conduct a research project. The purpose of this letter is to ask permission to conduct research in my classroom with my students. The research will take place during our science, social studies, and writing time. The final product of the research will be archived in Digital Commons at Hamline's Bush Library. The findings may also be published or used in scholarly ways in the future.

The purpose of my research project is to study students' experiences with project-based learning and more specifically, environmental sustainability through waste, recycling, and composting. As a whole group we will participate in a waste and recycling tracking activity as well as a compost activity for 6 weeks. This will take place daily and will focus on students understanding and participation of environmental sustainability and behavioral changes. My main goal is to determine whether or not using this project-based learning method has a positive effect on changing students' perception and participation of environmentally sustainable actions. No additional activities outside of class or the regular school day will be required for participation.

In order to collect data, students will be asked to complete questionnaires, participate in interviews, and write about their experiences. Any student that agrees to participate in my research will have his or her identity protected. No real names or identifying characteristics will

be used. Students' grades will not be affected by participation in the activities and students are free to withdraw from the project at any time without negative consequences.

I will also receive permission to do this research from the Hamline School of Education. I will also request parental consent from each parent/guardian of the students. This will be done through a letter sent home explaining the research project.

Please return the attached form to indicate permission for me to conduct my research. If you have any questions or concerns, please let me know. Thanks for your cooperation!

Sincerely,

Andy Pierson

The purpose of this letter is to confirm that I have received and read your request and that I give permission for you to conduct research in your classroom with your third grade students.

Signature

Date

Printed Name

APPENDIX B

Informed Consent Letter

April 3, 2017

Dear Parent or Guardian:

I have your child in my third grade classroom. I am completing a master's degree in education at Hamline University. The culminating aspect of my degree is to conduct a research project. The purpose of this letter is to ask permission for your child to participate in my research. The final product of the research will be archived in Digital Commons at Hamline's Bush Library. The findings may also be published or used in scholarly ways in the future.

The purpose of my research project is to study the effectiveness of experience-based learning. As a whole group we will participate in a compost activity for 6 weeks. We will also be monitoring, measuring, and tracking our class waste and recycling each week. This will take place daily during science, social studies, or writing class and will focus on students understanding and participation of environmental sustainability and behavioral changes . My main goal is to determine whether or not using this experience-based learning method has a positive effect on changing students' perception and participation of environmentally sustainable actions. No additional activities outside of class or the regular school day will be required for participation.

In order to collect data, students will be asked to complete questionnaires, respond to scenarios, and participate in interviews. If your child participates in my research, his or her identity will be protected. No real names or identifying characteristics will be used. Your child's grade will not

be affected by participation in the activities and he or she is free to withdraw from this project at any time without negative consequences.

I have received permission to do this research from the principal, Mr. Nelson, and from the Graduate School of Education at Hamline University.

If you are willing to have your son/daughter participate in this study, please return the attached form. If you have any questions or concerns, please contact me. Thank you for your cooperation!

andy_p@lakeofthewoodsschool.org

218-634-2510 ext. 1730 (school)

507-276-4094 (cell)

<https://www.hamline.edu/committees/institutional-review-board/>

Sincerely,

Andy Pierson

The purpose of this letter is to confirm that I have received and read your request and that I give permission for my child _____ to participate in the research project you are conducting as part of your graduate degree program through Hamline University.

I understand that the purpose of the research is to study the effects of experience-based learning in educating students about environmental sustainability

.

Signed,

(Parent/Guardian)

(Date)

APPENDIX C

Pre and Post Project Oral Questionnaire

Project Oral Questionnaire:

1. Recycling means:

A. To throw away

B. To save

C. To reuse

2. I recycle

Never

1

2

3

4

5

Everyday

3. Recycling is good for:

A. Me

B. Others

C. Everyone

4. Recycling is:

Difficult

1

2

3

4

5

Easy

5. Composting is:

A. Throwing away

B. Saving something

C. A form of recycling

6. At home I compost:

Never

1

2

3

4

5

Everyday

7. I compost _____ food at one time.

A lot of

1

2

3

4

5

A little

8. Composting is a sustainable action:

A. No

B. Sort of

C. Yes

9. Other Comments:

APPENDIX D

Pre and Post Project Interview Questions

Pre and Post Interview Questions:

1. Please explain what you know about recycling (refer to questions 1 or 3 of Questionnaire for further probing).
 - When and where did you learn about recycling?
 - Give examples of recycling
 - What items have you recycled before?
 - If you've recycled, what have you all recycled?
 - What do you think the items you recycled were turned into?
2. Please explain what you know about composting (refer to question 5 of Questionnaire for further probing) .
 - Are recycling and composting similar or different? Why?
 - Why do you or don't you compost?
 - When and where did you first learn about composting?
 - What sort of items or materials should be composted and why?
 - Are there any uses for compost?
3. Do you participate in recycling or composting in school or out of school? Please explain (refer to questions 2, 4, 6, or 7 of Questionnaire for further probing).
 - When was the first time you ever recycled or composted something?
 - Is composting or recycling fun, difficult, smelly, or refreshing and why?
 - How often do you recycle or compost?
 - Are there certain times of the year when it's easier or harder to recycle or compost?

-Have you ever used an item, material, or anything else that was created from recycled or composted items?

4. Please explain if and how composting or recycling relates to sustainable actions (refer to question 8 of Questionnaire for further probing).

-What are sustainable actions?

-Why would or wouldn't recycling and composting be considered a sustainable action?

-Are sustainable actions a good thing or a bad thing? Why? Who or what are they good or bad for?

-Can you give an example of a sustainable act? What is that act helping to sustain?

APPENDIX E

Scenario Questions

Scenario Questions (one question given per week)

1. You're walking with a friend to the movie theatre. Your friend throws a gum wrapper on the ground. What would you do? Why?
2. You're driving with your mother. She rolls down the window and grabs a pop can to throw out. What would you do? Why?
3. Your classmate is cleaning out their desk. They have a huge pile of papers that they are carrying toward the garbage can. What would you do? Why?
4. You're camping with your family. A parent tells you to take the day's garbage and get rid of it in a nearby river. What would you do? Why?
5. You're walking through our school forest. As you're walking, you come upon an old tire. What would you do? Why?

