TEACHING ENVIRONMENTAL EDUCATION TO ELEMENTARY AGED HOME SCHOOL STUDENTS AT NATURE CENTERS: AN ANALYSIS OF BEST PRACTICES

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TEACHING ENVIRONMENTAL EDUCATION TO ELEMENTARY AGED HOME SCHOOL STUDENTS AT NATURE CENTERS:
AN ANALYSIS OF BEST PRACTICES

by
Ronald P. Wodtke

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

Hamline University
Saint Paul, Minnesota
November 2016

Primary Advisor: Susan Manikowski
Secondary Advisor: Karen Shragg
Peer Reviewer: Amy Markle
To Kate: my amazing, loving and supportive wife. We are two travelers, off to see the world and there is such a lot left to see.
“The problem is not in finding the solution, but in formulating the question.”

—Eliyahu M. Goldratt
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# TABLE OF CONTENTS

CHAPTER ONE: Introduction

- Study Parameters: 11
- Beginnings: 14
- Research Rationale: 17
- Summary: 19

CHAPTER TWO: Literature Review

- Introduction: 22
- Environmental Education Requirement: 23
- Environmental Education Defined: 23
- Federal Environmental Education Requirement: 24
- The Every Student Succeeds Act: 25
- Midwest State Environmental Education Requirement: 26
- Psychology of Child Development: 27
- Overview: 27
  - Dr. Jean Piaget: 27
  - Dr. Erik Erikson: 30
  - Dr. Arnold Gesell: 32
- Developmental Stages of Children by Age: 33
  - Age two to seven years old: 35
  - Age five to age eleven: 37
  - Age eleven to age fifteen: 39
Educational Methodology: 42
A Teacher’s Role: 42
Essentials of a Good Teacher: 43
  Essential skill #1: Be well versed in your subject matter: 44
  Essential skill #2: Have passion for your subject and enjoy teaching: 45
  Essential skill #3: You must like your students: 46

Common Elementary School Teaching Styles: 46
Scaffolding Strategy in Elementary Education: 49
Dr. Benjamin Bloom’s Taxonomy: 50
The Need for Outdoor Education 52
  Every Student Succeeds Act. 52
  The Awe of Nature. 53
  The Benefits of Being Outdoors. 54
The Need for Environmental Education. 57
  Environmental Education is required under Federal Law. 58
  Current Environmental Issues. 58
  Remarks by U.S. President Obama. 61
Midwest State Law concerning Home Schools. 62
Research on Homeschooling. 64
  Home School Demographics. 64
  Historical Stages of American Homeschooling. 65
  Homeschooling Forms. 65
  Homeschooling Instructional Methods. 66
CHAPTER FIVE: Conclusions

Introduction 111
Research Rationale 112
Literature Review 113
Educational Psychology 113
New Connections to the Literature 115
Environmental Education is required under Federal Law 116
Relevance of the Research Conducted 117
Study Implications and Policy Influence 119
Substantiation of this Study 120
Study Recommendations and Communication 120

APPENDICIES

Appendix A: Piaget's Stages of Cognitive Development Chart 122
Appendix B: Erikson's Stages of Cognitive Development Chart 125
Appendix C: Gesell’s Spiral 131
Appendix D: Bloom’s Taxonomy 133
Appendix E: Bloom’s Taxonomy Revised 135
Appendix F: 25 Easy Nature Play Ideas for Early Childhood Centers 137
Appendix G: The Nature Conservancy 140
Appendix H: Educational Statistics Summary 145
Appendix I: Overview of Research Methods in Education 150
Appendix J: Questions on a Nature Centers Homeschool Program 153
Appendix K: A Comparative Analysis Nature Center Characteristics 156
Appendix L: Summary of Whiskey 1 Nature Center’s Homeschool Offerings 158
Appendix M: Summary of Alpha 1 Nature Center’s Homeschool Offerings 160
Appendix N: Summary of Hotel 1 Nature Center’s Homeschool Offerings 162
Appendix O: Hotel 1’s Class Descriptions for Home School Offerings 164
Appendix P: Summary of Hotel 2’s Current Homeschool Offerings 166
Appendix Q: Summary of Hotel 3 Five Year Homeschool Offerings Plan 168
Appendix R: Selected Questions Responses on Homeschool Program 170
Appendix S: Consolidated Summary of Best Practices 173
Appendix T: Letter of Informed Consent Requesting Permission of Adults to Take Part in Research 181
Appendix U: Appendix U: Human Subjects Committee Full Research Approval 184
Bibliography 186
CHAPTER ONE

Introduction

Research Question: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?”

Study Parameters

For the past five years I have been directly involved with teaching environmental education to elementary, and to a limited extent, middle school aged home school students at nature centers located in a large metropolitan area in the upper Midwest.

For the purpose of this study, I will be discussing the nature centers that offer home school programs, and are located in the seven counties that comprise the majority of an Upper Midwest metropolitan area. These seven counties encompass an area of three thousand square miles, fifty-two parks, twenty-one nature centers, and 340 miles of interconnected trails (Metropolitan Council, n.d.). The seven county areas are home to 2.85 million people, with the state median family income of $56,874 ($23,198 per capita) for the same time period (U.S. Census 2010). I view a nature center as offering such amenities as: an area in which plants and animals exist in their natural state; where educational programs are offered to public and private groups; where live animals and artifacts can be on exhibit for educational purposes; where other than educational functions are available; and where recreational activities may include hiking, cross country skiing, snowshoeing, running, canoeing, summer and winter camps, etcetera.

In regard to education, a nature center should offer both natural science and environmental education programs. Natural science is the study of specific disciplines
related to the natural world such as: geology, meteorology, biology, physics, chemistry, astronomy, paleontology, oceanography, taxonomy, and etcetera. Environmental science would include the natural sciences as well as the social sciences like economics, history, government, and psychology. Environmental science is therefore a multi-disciplined endeavor; where the natural world intersects with the needs and wants of mankind.

Another perspective of environmental science is in studying the effects that mankind has on the natural world and what are the consequences for all the stakeholders, both in the long and short term. Environmental education is therefore the exposure to issues involving our environment, and effects of improper/mismanagement of natural resources is critical for an informed citizenry. It is my opinion that such exposure cannot start too soon in the educational process.

Through self-reflection, course content evaluation and parent evaluations; I have realized that a need exists to develop a systematic approach to curriculum development which best meets the needs of the home school student population. Kindergartens through grade twelve public educators are guided in their instruction content by the standards established by the state Department of Education. Course content is also established by local school districts and to a lesser degree, department committees. Public and private schools also have a greater amount of resources available such as peer and principal input; on-site technology, media and library availability; laboratory/science equipment; field trip transportation and funding; and more monetary means. Additionally, the funding for these services is paid for by a larger revenue base than that of home schooling parents.
Home school educators, for the most part, do not have these resources available and as such must rely on sources outside of their homes. Therefore, the teaching of environmental and natural science education is a niche that can be greatly enhanced by nature centers for home school students.

My research into this topic will examine the necessity of environmental education as a multifaceted discipline endeavor which encompasses all other traditional subject matter. As such, the study of environmental topics prepares students for their role as an informed citizen in regard to political, economic, science and various social sciences aspects concerning economic development and governmental policies. This type of instruction is best started at a young age in order to develop citizen scientists capable of evaluating complex issues. Additionally, I intend to validate this statement by showing that this instruction can best be learned at a nature center where students are directly exposed to the interaction of these competing resources.

It is also my belief that home school parents have more latitude in the study of these issues since they can teach their children throughout the entire year and also have the flexibility to explore various organizations and centers to further a child’s education. This analysis will be accomplished by interviewing home school parents and students (once permission has been obtained), association directors and conducting surveys. Further data collection will be done through interviewing licensed elementary education teachers and nature centers educators; and examining educational research applicable to this topic. The aforementioned surveys and interviews will examine not only course content, but also instructional methods and the physical location where the instruction takes place.
Beginnings

The journey to this point in time has taken me many years and many miles. I cannot pinpoint the exact starting point, but there are instances that stand-out in the process. I grew up in North Minneapolis, Minnesota during the post-World War II/Korean War era. This was a time during the impetus of the Space Race, the introduction of the oral polio vaccine, the Civil War hundredth year commemoration, and advancements in science and great technological strides. It was a time that I remember viewing Bell Laboratories films in elementary school, visiting the planetarium at the Minneapolis Public Library, and reading the science books published by Time-Life Corporation.

Progression through the 1960’s reflected an ever increasing tempo of the Cold War, where, as elementary aged students we did fire drills, severe weather drills, and dills in the event of a nuclear attack. This was also a time of the Civil Rights movement riots, Vietnam War expansion, the decline of the Bald Eagle due to DDT poisoning, the Manson Family perpetrated murders, and the assassinations of President Kennedy, Malcolm X, Dr. Martin Luther King, Jr, and Senator Robert F. Kennedy. However, despite the turbulent times, I knew there was always solace in being outside. Whether that time was spent exploring the area where Shingle Creek joins the Mississippi River, playing outside during the changing seasons, exploring Minnesota lakes in a row boat with my brothers on family vacations, or laying on the cool grass and gazing at the sky on warm summer nights and wondering “Why?” and “How?” That feeling of wonder and amazement has never left me. In fact, it has grown more over the years because I realize just how much I still need to learn.
These musing my seem trivial, but are very much a part of the person I have become. The need to explore, wonder, and learn are part of all people and that desire to learn helps us to create and contribute. Contributions require action and dedication. Two of my earlier actions in an effort to contribute included writing to several universities to get information on courses needed to become an astronomer; and also sending a letter to Dr. Werner Von Braun at NASA with a suggestion to use solar batteries for space flight. I received in response a form letter from NASA thanking me for my suggestion. I still have that letter!

During my sophomore year in high school I took a required biology class and thoroughly enjoyed it. It was at this point that I thought about entering the field of ecology and becoming a teacher. This decision was further enhanced when I canoed in the pristine wilderness of the Boundary Waters Canoe Area in northern Minnesota and southern Canada at the end of my junior year in high school. One of our guides recommended Aldo Leopold’s book, *A Sand County Almanac*, which I subsequently read and thoroughly enjoyed. Upon graduation from high school, I joined the U.S. Army and studied for a year at the United States Military Academy at West Point, New York. I transferred to the University of Minnesota and graduated with a degree in Secondary Social Studies education. (I have held a current teaching license since my graduation.)

Upon graduation, I joined the U.S. Marine Corps and after thirty years of service, I retired.

My time in the Marine Corps took me to most of the United States and around the world once, part by air and part by sea. During these travels, I was able to experience first-hand many extraordinary environs of the world. A few of the highlights of this
career phase and post retirement activities include: traveling and/or living in over thirty-five countries on five continents and numerous U.S. states; participating in summer and winter training events in the mountain regions of northern California and New York; participation in three expeditions above the Arctic Circle in North Norway; acting as a crew member on a catamaran sailing the British Virgin Islands in the Caribbean Sea; extensive field experience in a desert environment (U.S., Iraq, Kuwait, and Egypt); field experience in a jungle environment (Okinawa, Japan and Australia); and sailing the Atlantic Ocean, Pacific Ocean, Indian Ocean, Baltic Sea, Caribbean Sea and the Philippine Sea.

In addition to the above highlighted training and deployments, I served as the Education/Human Affairs Officer for a missile battalion (Yuma, AZ) of approximately eight hundred personnel. During this tour of duty I received a Master’s degree in Human Resources Management from Pepperdine University (Malibu, CA) by taking off-site campus courses.

These experiences have greatly helped me in my career as an educator. Upon retirement from the USMC, I began my public education teaching career. My first year was spent doing substitute teaching in various Minneapolis and St. Paul City school districts. This was followed by several years teaching at a charter high school located in Minneapolis. The charter high school that I taught at had four different campuses and each campus was designed to accommodate the special needs of a particular student population. Over my tenure, I taught at two different campuses. The first campus had a student population that was comprised of approximately ninety-five percent east African refugees. The student population of the second campus was mostly for high school
students making up credits needed to obtain their high school diploma before reaching the age of twenty-two. This campus was also located in a “gang neutral” location.

When the U.S. Veterans Administration instituted educational benefits for Post-9/11 veterans, I left public teaching and returned to school full time to begin my Master’s program at Hamline University, and also completed an Associate of Science degree in Environmental Economics from North Hennepin Community College (Brooklyn Park, MN). While at Hamline, I applied for and was accepted for a year-long internship at Wood Lake Nature Center (Richfield, MN). During my internship, I co-taught home school classes as well as other programs. Following completion of my internship, I was hired at Wood Lake Nature Center as a Seasonal Naturalist and the Home School Coordinator. In this position, a large portion of my responsibilities included developing curriculum and teaching classes for six different home school cooperatives each month for a nine month period.

**Research Rationale**

This compilation of experience and education has led me to undertake the thesis and research question of: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?” This question can only be adequately answered when the opinions, feelings, beliefs, and experiences of stakeholders are explored. It is my opinion that the stakeholders involved in examining the above stated question includes, but is not limited to, nature center educators, parents, students, families and educational policy makers. It is important to evaluate the research that has been done previously in order to insure that best practices are being used. An old adage states: that
you cannot know where you going, until you know where you have been. I personally believe that this is always a good starting point, not only for evaluative purposes, but also for curriculum and instructional development as well. In our current age of advanced information technology, data, lesson plans, images, movies, documents and the like are readily available in a matter of minutes. However, this information is not always in keeping with best practices for your specific student population. I have found that libraries are still an essential part of any research because not all information is on the internet. In fact, some books that are out of print may only be available at a library. These texts are an invaluable tool for research because their references also include additional resources, investigation and analyses. Furthermore, when it comes to natural science and environmental education, nothing can replace the hands-on experiences gained by being outdoors and/or in wilderness areas. In my younger years I played a lot of baseball; and in that light I have often made the remark, that you can read all the books you want to about learning how to hit, but to really learn that skill, you need to stand in the batter’s box and have someone throw pitches at you. The same is true for natural science and environmental learning, experience is the best teacher.

The desire to know about how things occur and interact in nature is a cornerstone to understanding the natural sciences. These elements can be learned through reading, experiments and exploration. Learning about environmental science, a multi-faceted study, which includes the natural sciences, economics, geography, political science, sociology and the like is more difficult. Now young students are not able to fully grasp the intricacies of these topics. However, they can understand more simplified ways of learning these subjects by examining the effects of animals or particular environments no
longer being available because of human influences such as pollution, development, fire or poor habitat management.

**Summary**

My desire to research, explore and analyze home school environmental education is rooted in my life-long outdoor experiences and interests, and my professional endeavors in education. Additionally, it goes to my professional ethos as a teacher to seek self-improvement and employ the best methods for educating students. More importantly, it is my belief that through education and an early exposure to outdoor experiences, natural science and environmental science, students will be better able to make informed decisions on such issues as: population growth, oil spills, using the oceans as a waste dumping ground, deforestation, fracking, natural resources protection, climate change and the like. Of course this is a life-long process; however, it is never too early to start. Some of my most memorable experiences as a youth growing up are those that were connected to outdoor activities and a desire to learn more about our natural world. A central premise of these experiences was that being outdoors and learning was fun.

In chapter two I will document the research literature that was used in my analysis and the findings of this examination. Some of the areas I will examine include studies conducted in the fields of child psychology, education, natural and environmental science, by researchers which include, but are not limited to, Jean Piaget, Erik Erikson, Benjamin Bloom, Maria Montessori, Carl Rogers, Abraham Maslow, David Orr, and Donald Ecroyd. Further examination will include current readings and studies in the fields of environmental science, education, and the impact of outdoor activities as they apply to child development in a home school environment with classes being conducted
at nature centers. In all cases, I will link these findings to the particular research and the impact each has on the stakeholders involved.

My thesis question will be examined by researching the opinions, feelings, beliefs, and experiences of the stakeholders involved with home educators. These stakeholders include, nature center educators, parents, students, families and educational policy makers. Nature center educators are involved because these are the professionals that are doing the instruction. By surveying this facet I can learn what methods these professionals are using in order to arrive at the best practices for the community of environmental educators. Once analyzed, I can then share these findings with other members of this community and thereby increase the overall effectiveness of instruction.

The parents are of course are major stakeholders because they are the ones that are doing the majority of the teaching of their children. Since they have at heart the best interests of their children, their input is critical. Additionally, since they spend the majority of time with their ‘students’ they can have valuable input on what role and instruction material could be useful.

Home school associations is another group I will examine since they can provide information on what their particular association feels is important for their group. These associations can also provide me with links to other informational areas as well. Establishing a rapport with these associations will be able to access a larger base of experience in a more expeditious manner.

Educational policy makers at independent school districts and state levels should also be able to provide information, analysis and findings from an even broader base than the home school associations since, by State Law, home educators have certain
requirements they must comply with. In conjunction with these groups, I will survey licensed elementary education teachers in order to elicit what best practices they employ for effectively teaching this student body.

The pursuit of this study: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?”; is important not only for me to become a better educator, but also to advance developmental methodologies and curriculum to achieve excellence in the field of environmental education.
CHAPTER TWO

Literature Review

Research Question: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?”

Introduction

In this chapter, I will present the literature pertinent to the study of environmental education. This literature review will cover the topics and themes related to the need for environmental education; the research done in the field of educational psychology as it applies to elementary school aged children; issues concerning environmental education; current analyses of environmental education; state educational requirements as they apply to public schools and home school programs; teacher preparation, and best practices for instructing the requirements of natural science and environmental education.

Each of the facets is a piece of a puzzle, that when joined, the picture becomes one and is therefore more easily understood. The connection is more circular then linear, but the end result is the same. I will not be covering in detail the circumstances which predicated a particular action, rather I will concern myself with the major issues from which the resultant event occurred.

I will group similar themes together with the various findings of published authorities, and subsequently compare and contrast these findings. The major sections for consideration in Chapter Two are: Environmental Education Requirement where both federal and state laws will be examined, Psychology of Child Development in order to understand the maturation process of children; Educational Methodology where the
various educational psychology parameters are implemented and explored; Outdoor Education where the benefits from the physical, psychological and spiritual perspective are studied; Environmental Issues where some of our current concerns are presented and Home School Philosophy where forms and educational perspectives are evaluated. The major sections follow a linear progression, or building block approach, in understanding my research methodology. In Chapter Three I will add my personal observations, comments, and analysis to the presented findings. Each instance will be supported by published research or analysis.

**Environmental Education Requirement**

**Environmental Education Defined.** In regard to education, natural science is the study of specific disciplines related to the natural world. Environmental education, however, is a more encompassing discipline in that it includes the natural sciences as well as the social sciences. Environmental science is therefore a multi-disciplined endeavor; where the natural world intersects with the needs and wants of mankind. Environmental education is the exposure to issues involving our environment, and the effects of improper/mismanagement of natural resources is critical for an informed citizenry.

To address emerging issues, the state needs an environmentally literate citizenry.

People who are environmentally literate:

- understand the complexity of natural and social systems and their interrelationships.
- demonstrate the knowledge, skills, attitudes, motivation, and commitment to work individually and collectively toward sustaining a healthy natural and social environment.
have the capacity to perceive and interpret the health of environmental and social systems and take appropriate action to maintain, restore, or improve the health of those systems (Kennedy, 2008, p. 3).

“Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution” (Stapp, 2005, p. 34); (Author underlined).

**Federal environmental education requirement.** The successful implementation of any program is more likely to happen when it not only has the approval of a legitimate organization, but also is established in law. Environmental education is such a program. On November 16, 1990, President George Herbert Walker Bush, signed into law the National Environmental Education Act (104 Stat. 3325, 1990).

Section 2 of this Public Law noted several Congressional findings such as: threats to human health and environmental quality are increasingly complex; evidence of international environmental problems, such as global warming, ocean pollution, and declines in species diversity is expanding and documented; that these environmental problems represent a significant a threat to the quality of life, economic vitality and the natural balance of urban and rural areas; an understanding of the natural and man-made environments, and the environmental problems manifested in these areas is critical in order to formulate effective action plans to correct these complex problems. Additionally, action plan implementations are predicated on the availability of well-educated, trained, and dedicated professionals. Furthermore, the current efforts of the national government to educate, inform, and solve these environmental problems are inadequate.
More importantly, United States policy concerning environmental education, as outlined in Public Law 101-619, states that educational programs at all levels must be established and postsecondary students must be encouraged to pursue careers related to the environment (Congress, 1990).

An Upper Midwest state Department of Education released a press statement in April of this year, announcing that the U.S. Department of Education recognized several state schools for their environmental leadership. The press release, in paragraph two, included the following statement by an Upper Midwest state Commissioner of Education:

“I want to congratulate all of these schools, districts and post-secondary institutions for their incredible efforts in environmental education…These students are learning valuable skills that will make them leaders in the conservation and preservation of our natural environment…” (Collins, J., 2015).

**Every Student Succeeds Act.** In December 2015 this Act was passed by the U.S. Congress. This bill included a key provision that will enhance environmental education programs in the United States. This provision was sponsored by Senator Jack Reed and Congressman John Sarbanes, and is also known as the No Child Left Inside Act (NCLI). A major component of NCLI Act is to permit school districts to integrate environmental education into their normal class programs, as well as their after-school activities, in order to foster a versatile education. It will enable students to learn about the environment in classroom and hands-on activities outdoors. In this article, Senator Reed stated that:

“This new law will free up critical resources for environmental education to inspire the next generation of scientists and conservationists. It’s a smart investment in our children and their future” (Reed, 2015, para. 6).
President Obama signed this Act into law on 10 December 2015. However, the ramification of this law as it applies to Upper Midwest States in general, and home schools in particular, still need to be determined.

**Midwest state environmental education requirement.** A Midwest state Department of Education had an established an Environmental and Outdoor Education Advisory Committee, which was comprised of representatives from numerous organizations across the state. This committee was formed to assist this state’s Department of Education with the integration of environmental and outdoor education instruction into the academic standards for students in grades 7-12 by providing guidance and advice on projects which support this goal (Minnesota Environmental and Outdoor Education Advisory Committee, 2011).

Since homeschools are classified as a private school by the Department of Education, home school curriculum does not fall under the authority of the State. However, the Department of Education has established guidance as to homeschool curriculum and achievement testing requirements. A few of these requirements are: an Upper Midwest State’s compulsory instruction law requires all children age 7-17 to attend a public or private school; homeschools are a type of private school; homeschooled students must take recognized normed achievement tests; homeschool student musts receive instruction in reading and writing, literature and fine arts, mathematics and science, social studies including history, geography and government, and health and physical education; and since homeschools are classified as private schools, the MDE does not assist in curriculum selection (Homeschool Information for Parents).
In a recent e-mail exchange with a state naturalist who served on this committee, she stated that: “you note that the Dept of Education established an advisory committee, I sat on this committee for several years. The politics of the State agency changed (which funded and housed committee), and it was terminated several years ago.”

**Psychology of Child Development**

**Overview**

In this section I will present the research of several noted educational and child psychologists. A working knowledge of the developmental stages of children, both physically and psychologically, is imperative in order to develop an effective method of instruction. Without such an understanding, an instructor cannot hope to aid in the effective development of young minds, adequately challenge these students, or keep them from being bored by material that is too elementary. Students develop at different rates, and each individual is unique, however, the research presented will validate that a relative norm exists given a child’s intelligence, mental maturation, and physical development. Furthermore, the research presented will be analyzed by comparing and contrasting this research categorized by the child’s developmental stage in relation to their relative chronological age. These methodologies will synthesis various theories of child psychology and serve as a guideline for instructors to more effectively develop curriculum for specific aged students.

**Dr. Jean Piaget.** The Swiss psychologist Jean Piaget studied the intellectual development of children; and his observational studies over many decades led him to theorize that by exposing children to new and unfamiliar experiences, children will begin to develop their cognitive development more fully. This developmental process is
evolutionary over a period of many years. However, according to Piaget theory, the development is fairly consistent given a child’s chronological age and as such, can be of immense value for a teacher.

In his 1979 book, *Comparing Theories of Child Development*, R. Murray Thomas analyses and evaluates numerous researchers’ theories on this phenomenon. In order to more fully understand the interrelationship of these theories, an educator must examine those theories which will be of use to their teaching, given the age of their students.

As a point of reference, Thomas presents a review of the four commonsense ideas about knowledge and its acquisition. First, knowledge is the amassing of information acquired through instruction or direct experience. Second, a person’s knowledge is an accurate representation of what they have learned or experienced. Third, our repository of knowledge is increased by our daily experiences. Fourth, that an item of knowledge can be recalled in its original and unaltered state (Thomas, 1979).

In his comparative analysis of Piaget’s beliefs on the validity of common sense ideas about knowledge, Thomas (1979) concludes that Piaget does not agree that knowledge is a repository of acquired information or a function of possessing such information (p. 293). Rather, Piaget felt that knowledge was a process, and to acquire this knowledge requires an individual to act on that stimulus, be that action mental or physical. Furthermore, that a child perception is not based on objective reality, but predicated on the child’s condition of perceptual mechanism. Thomas does point out that two areas in which Piaget agrees with the commonsense approach includes that past actions-memories can be stored and retrieved, and that memory quantity does increase with experience and maturation (Thomas, 1979).
For Piaget, the foundation of thinking and subsequent environmental adaption and interaction were schemas. Schemas involve mental or physical actions in response to environmental stimuli. In Piaget’s logic, knowledge could not be acquired if no action was taken. The three schemas noted by Piaget were: behavioral (physical actions represented mentally); symbolic (objects/events represented by language in a mental state); and operational (a thought process employed for problem solving) (O’Donnell, 2009).

Piagetian theory emphasizes that knowledge is a process, and for knowledge acquisition to occur individual action to environmental stimuli must take place. Piaget used the word adaptation to describe this environmental adjustment. Adjustment is established through accommodation and assimilation. In the process of accommodation, an individual will modify an existing lower level schema to a higher level schema as a result of new information. Accommodation occurs when subject generalization is expanded to account for specifics. A case in point would be when a student will be able to recognize a rose and violet as specific flower types as compared to simply being flowers. In accommodation a schema (concept) can either be modified or a new schema (concept) will be manifested (O’Donnell, 2009).

When students incorporate different thought processes through exposure to new external stimuli the process of assimilation is being used. In other words, assimilation is the mental internalization based on new information. This new information (knowledge) can be evidenced either in quantitative growth or in understanding more complex issues (O’Donnell, 2009).
Thomas (1979) noted that “Piaget has proposed four underlying causal factors: (1) heredity (internal maturation), (2) physical experience with the world objects, (3) social transmission (education), and (4) equilibrium” (p. 300). Equilibrium is a state in which your present way of thinking is in cognitive balance with your experience. Conversely, disequilibrium, or cognitive dissonance/conflict, results when your experience is not in consort with your established or perceived thought processes. This particular state can be beneficial because learning can occur.

Piaget’s extensive research can enhance a teacher’s ability to develop instructional curriculum for elementary aged homeschool students when his principles are used. In O’Donnell’s et al. book, she presents a tabular format [Table 3.1, page 85] of Piaget’s hypothesized stages of cognitive development given the approximate chronological age of children from zero to eleven plus years is shown. A similar document from the psychology charts web-site (Appendix A).

“Since the child does not distinguish the psychical from the physical world, since in the early stages of his development he does not even recognise any definite limits between his self and the external world, it is to be expected that he will regard as living and conscious a large number of objects which are for us inert. This is the phenomenon we propose to study and we shall describe it by the current word “animism’”’ (Piaget, 1929).

**Dr. Erik Erikson.** A slightly different perspective in regard to the development of personality and education was presented by Erik Erikson. Erikson, as a Neo-Freudian psychologist, accepted many of the central tenants of Freudian theory, but incorporated his own theories based upon his collaborative research and experience. The epigenetic
principle suggests that each person must successfully progress through eight distinctive psychological stages. Each stage presents a challenge or crisis which must be resolved in order for the individual to develop the requisite psychological quality central to the particular stage. The epigenetic principle is the basis for Erikson’s theory of psychosocial development (Cherry, 2005).

Erikson’s investigative research presented an understanding of the ways in which the drives dominant in successive psychoanalytically defined epigenetic life stages are forged by the interaction with an individual’s culture and societal demands (The Gale Group, 2010).

A result of Erikson’s research was the addition of his own tenets to the accepted principles of Freud. The three tenets he incorporated, as noted by Thomas, were: “(1) the nature of a healthy personality and of ego identity, (2) the epigenetic principle, and (3) stages of psychosocial growth and identity crisis (Thomas, 1979, p. 264).”

Erikson’s ego identity tenet is a two dimensional process involving both the inner and outer self. Furthermore, maturation attainment is a process in which ego identity is realized. Thomas noted:

The first or inner-focused aspect is the person’s recognition of his own unified “self-sameness and continuity in time” [Erikson, 1959, p.23]. It is knowing and accepting oneself. The second or outer-focused is the individuals recognition of and identification with the ideals and essential pattern of his culture, it includes sharing “some kind of essential character with others [Erikson, 1968, p.104]. (Thomas, 1979, pp. 264-265).
Ego identity is an individual’s conscious cohesive bonding between our inner and outer selves. This is a life-long process which incorporates our daily life experiences. Each new developmental stage presents challenges or conflicts that either enhances or degrades a person’s development of identity. An additional aspect of this process is predicated on our ability to become proficient in a particular area of our life and at each developmental stage. Achieving competence and successfully and effectively resolving psychological conflicts facilitates the generation of a motivating behavior which in turn leads to mastery; while ineffectual performance and unresolved conflicts can lead to feelings of inadequacy (Cherry, 2005).

Erikson proposed that all humans, as they mature, must pass through a series of genetically determined, identifiable psychological stages. These stages are universal to humans. However, an individual’s social environment will influence the essence of the dilemma particular to the developmental stage (Thomas, 1979).

In O’Donnell’s et al. book, she presents a tabular format [Table 4.1, page 126] of Erikson’s Lifespan Development Framework. A similar document from the psychology charts web-site (Appendix B).

**Dr. Arnold Gesell:** Dr. Arnold Gesell’s research was similar to that of Dr. Erikson’s in that children progress through predictable developmental stages. Dr. Gesell developed a new technique of using a motion picture and a one-way mirror to record reactions children had to specific stimuli within a controlled environment. His observations and research of children in these environments led to his conclusions that children progress through predictable developmental stages. An individual child’s progression through these stages is uniform, but will occur at each child’s own unique
pace. The particular pace is influenced concurrently by external and internal factors; peers, culture, parental influence, health and genetics, personality, mental and physical development, respectively. A child’s development alternates between periods of equilibrium, in which a tranquil state of learning is done, and disequilibrium, which is an agitated and rapid period of learning and growth. It is important to note that during this time Dr. Gesell was the only theorist to conclude that child development occurs more in stage progression than by age, and that each child will progress through six distinct stages at six-month intervals, with interval duration positively correlated by age (Jurling).

The theory developed by Dr. Gesell is known as a maturational-developmental theory. Gesell theorized that growth can be viewed as a cyclical spiral. These developmental cycles are divided into six distinctly defined stages which are repeated throughout a person’s lifetime. Dr. Gesell named the progressive stages of each cycle as follows: Smooth, Break-Up, Sorting Out, Inwardizing, Expansion, and Neurotic “Fitting Together”. Additionally, Dr. Gesell’s research for growth and development, established the normative trends for the following areas: Motor, Adaptive (Cognitive), Language, and Personal-Social behavior (Gesell Institute).

A copy of Gesell’s Cyclical Spiral from the Gesell Institute of Child Development web-site is found in Appendix C.

**Developmental Stages of Children by Age**

In order to more fully understand the interrelationship of the theories of Piaget, Gesell, and Erikson, an educator must examine these theories which will be of use in their teaching, given the age of their students. Students develop at different rates, and
each individual is unique, however, the research presented will validate that a relative norm exists given a child’s intelligence, mental maturation, and physical development. As a general rule, students in the United States are classified as being in the elementary level when in grades kindergarten (age 5 years) though grade five (age 11) (Commission). (College., 2015).

Thomas’ analysis of Piaget’s child developmental periods can be divided into four separate levels, with a varying number of stages for each level, and that these levels are age approximate. Thomas stated: “although age designations are attached to each of the four periods in the following discussion, they should be regarded as only approximations, as rough averages” (1979, page 303).

My research question centers on elementary aged home school students. Nonetheless, a comprehensive understanding of child development prior to this age range is important because in a mixed class environment, mental maturation and physical development is not uniform, and an instructor will encounter varying degrees of development in their class. Therefore, effective teaching requires a working knowledge of these progressive psychological phases. (See Appendices’ A: C)

My comparative analysis of age and psychological developmental stages, as presented by Piaget and Erikson, will emphasis the distinct age breakdown of age five to age eleven. However, I will include ages prior to and following the elementary age range because in a home school environment, siblings at times attend scheduled sessions. Although, these two noted psychologists did not specifically define this particular age differentiation, however, they both noted differences at these developmental points.
The juxtaposition of Piaget and Erikson’s theories will be evaluated in light of the research done by R. Murray Thomas and Kendra Cherry. R. Murray Thomas’ undertook an analysis of Jean Piaget’s Genetic Epistemology developmental levels. (Thomas, 1979) Kendra Cherry presented Erikson’s Stages of Psychosocial Development in an article on the About Health website (Cherry, 2005).

Those levels which are elementary age appropriate for home school students will be examined to a greater degree. I will give a summary of the developmental levels and stages, after their presentation. This action is appropriate, in order to have a more complete understanding of Piaget’s observations and analysis. Furthermore, this summary aids in conceptualizing a child’s mental maturation process.

Ms. Cherry noted in her article: “Erikson believed that successful development was all about striking a balance between the two opposing sides. When this happens, children acquire hope, which Erikson described as an openness to experience tempered by some wariness that danger may be present” (2005, pp. 2-3).

**Age two to seven years old.** Piaget categorized this developmental period as.

Level 2: The Preoperational Thought Period [About age 2 to age 7]. Thomas summarized as follows: “Operations in Piaget’s system, are ways of manipulating objects in relation to each other” (1979, page 308). Thomas elaborated further (page 309): “Piaget attributed to language in the development of intelligence during this period. Language, he said, performs three roles: (1) It enables the child to communicate with other people, thus opening the opportunity for socialization of action; (2) it enables the child to internalize words in the form of thoughts and a system of signs; and most important, (3) it
internalizes action so the child does not have to depend on manipulating things physically to solve problems” (Thomas, 1979).

The second inclusive definitive stage noted by Erikson for this developmental period is Psychosocial Stage 3 - Initiative versus Guilt. At this point in time a child begins to direct social interactions and in so doing, asserts their influence and control over their environment. When children are successful with these endeavors, they manifest positive attributes such as feeling capable and will subsequently develop a sense of leadership. Conversely, when a child fails to acquire these skill sets, they exhibit feelings of self-doubt and guilt, and can display a lack of initiative. Achieving a balance between individual initiative and the skills to work with others leads to the ego quality of purpose.

Laing points out (as cited in In Gesell, Ilg, Bates Ames, 1977, p. 47) that a child will progress through the below listed Stages at the noted chronological age as follows: 52-56 weeks: Sorting Out; 15 months: Inwardizing; 18 months: Expansion; 21 months: Neurotic “Fitting Together”; 24 months: Smooth; 2 ½ years: Break-Up; 3 years: Sorting Out; 3 ½ years: Inwardizing; 4 years: Expansion; 4 ½ years: Neurotic “Fitting Together”; and 5 years: Smooth (Gesell, 1977).

Dr. Montessori theorized that a child will develop in three separate and distinct stages which coincide with chronological age. Since each stage is unique, a teaching strategy must implemented that specifically addresses the individual learner, and their current developmental stage. The following is a brief overview of the first stage formulated by Dr. Montessori through observation:

Stage one [birth to age six]. A principal aspect of this stage involves the acquisition of language skills. Additionally, a child’s ego begins to develop and
differentiation between others and self is manifested. These developmental milestones are concurrent with being exposed to the world for the first time (Montessori Method of Teaching).

**Age five to age eleven.** Piaget categorized this developmental period as Level 2: The Preoperational Thought Period [About age 2 to age 7]; Second Stage: Intuitive Thought-Conserved or Invariant [About age 5 to about age 7]. At this developmental stage a child begins to associate that more than one action will affect a desired outcome. However, if additional actions are introduced to the situation, the child becomes confused. Perceptions of events will take precedence over logic.

Piaget also categorized this developmental period as Level 3: The Concrete Operations Period [About age 7 to age 11]. Thomas’ clarification of Level 3 (page 313): “The term ‘concrete’ does not mean the child must see or touch the actual objects as he works through a problem. Rather, “concrete’ means that the problems involve identifiable objects that are either directly perceived or imagined. In the later formal operations period the child is able to move ahead to deal with problems that do not concern particular objects”

“Piaget said that for an action of the child to qualify as an operation, it has to be internalizable, reversible, and coordinated into overall systems. Furthermore, operations are not unique to an individual child but are common to all people of the same intelligence level” [Thomas, page 313-314; originally from Piaget, “Logic and Psychology”, 1953, page8; and Piaget and Inhelder, “The Psychology of the Child”, 1969, pages 96-97.].
Erikson categorized this developmental period as belonging to Psychosocial Stage 4 - Industry versus Inferiority. In this developmental Stage, a sense of pride develops in children based on their new abilities and their achievements. When children are complimented by the authority figures in their lives, an awareness of their feelings of competence is exhibited. Conversely, those children who receive little or no encouragement will foster feelings of doubt in their abilities. Successfully finding a balance at this stage of psychosocial development leads to in a child’s own abilities. Gesell researchers have found that at five and ten years of age, the child’s behavioral state appears to be in good equilibrium. The child is comfortable both with himself and his environment. However, as the child nears age five and a half to six years he begins to exhibit behavior marked as disequilibrium, and he subsequently manifests behavior which can be described as troubled. This cycle is repeated again at age eleven when the child demonstrates his disequilibrium with his inner self and his outside world. At age six and a half the child’s life seems to be in good balance, and the child is again comfortable both with himself and his environment. Six months later, at age seven, the child is again at a more uniform psychological state and is better equipped to deal with the anxiety of the inwardizing growth period. At age eight the child is very outgoing. However, at age nine the child is less outgoing than he was six months earlier and his behavioral equilibrium is not as balanced. Then term child specialists apply to this conduct is “neurotic”. From age seven to ten years the notable behavioral changes now appear at about a yearly interval. At these later ages the exhibited effects are likely to express an exclusive withdrawal, impatience, and a negative outlook on life (Laing, 2015).
Laing points out (as cited in In Gesell, Ilg, Bates Ames, 1977, p. 47) that a child will progress through the below listed Stages at the noted chronological age as follows: 5 years: Smooth; 5½ -6 years: Break-Up; 6½ years: Sorting Out; 7 years: Inwardizing; 8 years: Expansion; 9 years: Neurotic “Fitting Together”; 10 years: Smooth; and 11 years: Break-Up. (Gesell, 1977).

The following is a brief overview of the second stage formulated by Dr. Montessori through observation:

Stage two [age six to age twelve]. Developmental milestones of this stage include emotional and social interaction with others, and the mental ability to think in abstract reasoning and independent thought. Dr. Montessori identified adolescence as stage three in the developmental process (Montessori Method of Teaching).

**Age eleven to age fifteen.** Piaget categorized this developmental period as Level 4: The Formal Operations Period. Thomas explained (page 316): “She can now imagine the conditions of a problem-past, present, or future-and develop hypotheses about what might logically occur under different combinations of factors.” Thomas continued (page 317): “According to Piaget, the most obvious distinction between adolescent and adult thought is the greater lingering egocentricity displayed by adolescents.” (Thomas, 1979).

Erikson categorized this developmental period as belonging to the Psychosocial Stage 5 - Identity versus Confusion. At this adolescent development period, a child will discover their independence and begin to expand their self-identity. Through positive reinforcement and personal exploration, the child strengthens his self-identity, independence and control of his life. Those children who do not receive this encouragement will feel insecure about themselves and apprehensive about their future.
The resultant effect of successfully completing this stage leads to faithfulness in their ability to appropriately function in society (Cherry, 2005).

Gesell researchers have found that at eleven years of age the child demonstrates his disequilibrium with his inner self and his outside world. At age twelve the child’s life seems to be in good balance, and the child is again comfortable both with himself and his environment. At age thirteen, the child is again at a more uniform psychological state and is better equipped to deal with the anxiety of the inwardizing growth period. At age fourteen the child is very outgoing. However, at age fourteen the child is apt to get trapped in his numerous and sometimes incompatible social commitments. At age fifteen the adolescent is less outgoing than he was at the stage he just achieved, and his behavioral equilibrium is not as balanced. Then term child specialists apply to this conduct is “neurotic”. At age sixteen the adolescent will again progress through the cyclical stages and once again embrace equilibrium and stability. The researchers suggest that this cyclical pattern may progress throughout a person’s life, although in stages and intervals that are not clearly defined (Laing, 2015).

Laing points out (as cited in In Gesell, Ilg, Bates Ames, 1977, p. 47) that a child will progress through the below listed Stages at the noted chronological age as follows: 11 years: Break-Up; 12 years: Sorting Out; 13 years: Inwardizing; 14 years: Expansion; 15 years: Neurotic “Fitting Together”; and 16 years: Smooth. (Gesell, 1977).

The following is a brief overview of the third stage formulated by Dr. Montessori through observation:

Stage three [adolescence]. Students of this age experience a significant amount of personal, physical and emotional growth. The Montessori program for adolescent
students builds on their previous education and experience which used similar educational methods. Student demonstrated traits and philosophies such as: learning in and of itself is a reward, independence and self-discipline are manifested, and that students are comfortable with a collaborative learning environment where varying abilities and opinions are respected are underlying expectations. Students are now ready for adult learning techniques including reading, discussion and application. The use of manipulative materials is negligible (Adolescent From Community to Society, 2016).

Adolescent education for Montessori students is unique in that incorporates the below listed principles.

- The program continues with the groundwork established in elementary instruction.

- Curriculum design is responsive to the sensitivities of adolescent developmental needs by incorporating student responsibility through community work activities and student directed meetings. These projects are conducted with increased adult tutelage that always emphasizes performing your best at the assigned task.

- Students continue the concept of self-educating through interaction with mixed age classes in group experiences without formal grades being used. Progress is evaluated based on the student’s demonstrated best efforts through conversations with their instructors and written remarks on assignments. In all cases, the student is encouraged to follow their personal interests without interruption.

The curriculum offers lessons by being directly involved in community improvement projects rather than learning about the experiences of other people in a classroom setting. This provides the student with real world understanding. Additionally,
if the students are financially compensated for their efforts, their self-worth is validated and they in turn will better understand the role of economics in society (Adolescent From Community to Society, 2016).

Dr. Maria Montessori, in her book: *From Childhood to Adolescence* (p. 63) noted: "The chief symptom of adolescence is a state of expectation, a tendency towards creative work and a need for the strengthening of self-confidence." (Internationale).

**Educational Methodology**

**The Teacher’s Role.** My analysis of the educational methodologies will explore several learning theories and their application to teaching environmental education to home school students. It is important to note that learning is a life-long process for all individuals, and therefore goes far beyond the confines of our stereotypical impression of an educational system. Our learning is first the responsibility of our parents/guardians. Later, most students will be educated in a formal school environment. Separate or concurrent learning is then experienced when a person enters a college environment, governmental agency or private business. In these situations an individual has to learn the specific protocols and language of that environment, the culture of the organization and the like. During all these passages, an individual’s learning may still be influenced not only by their parents, but also religious organizations, peers, societal and cultural influences, and the like.

In all learning environments, students arrive with their bags packed with individual feelings, a thirst for knowledge, excitement, physical, psychological and mental developmental issues, resentment, and all the other quirks that make them who they are as individuals. The challenge for the teacher is to use these packed bags in the
most positive way possible in order to teach their students those lessons which are important.

Prior to examining some of the educational/learning methodologies we will first investigate the individual charged with instructing these young minds; the teacher. A teacher is a person who not only enjoys learning, but enjoys guiding students to learn as well. O’Donnell, Reeve, and Smith defined (page 33) teaching as: “The interpersonal effort to help learners acquire knowledge, develop skill, and realize their potential.” (O'Donnell, 2009) Classroom teaching was the subject of research conducted by Dunkin and Biddle in 1974 (as cited in O'Donnell, Reeve, and Smith). One of the outcomes of their research was the development of a Model for Studying Classroom Teaching in which they categorized this dynamic environment as being composed of the following four variables: 1) Presage Variables; 2) Process Variables; 3) Context Variables; and 4) Product Variables. The researchers defined the parameters of these variables as noted. Presage Variables are components that the teacher brings to the classroom which could include their learning experiences, teaching experience, personality, and classroom management style. Context Variables are comprised of the make-up that the students bring to the classroom which may include their personality, cultural background, the nature of the school and community. Process Variables describe the nature of the individual classroom dynamics and the interrelationship between the students and the teacher. 4) Product Variables are the student outcomes resulting from the combination of the other three variables (O'Donnell, 2009).

**Essentials of a Good Teacher.** Being a teacher is a unique profession which requires a vast array of skills, and those skills need to be readily accessible at any given moment.
That being stated, the essentials which will guide an individual in becoming a good teacher are few. The first essential is that a teacher must be well versed in their subject matter. This is an on-going process and will continue through-out an educator’s career. The second essential is that a teacher must not only enjoy the subject they are teaching, but must have a passion for learning as much as they can about it. In this context, a teacher can still adequately instruct their students, even when they are exhausted, and conversely, they will be enthusiastic when they are well rested. The third essential is that a teacher must like their students. If an educator does not enjoy being around young people, then they are in the wrong profession. These essential points, when combined, become a force which will elevate not only the performance of the instructor, but the pupils as well (Highet, 1989).

**Essential skill #1: Be well versed in your subject matter.** The cornerstone to successful teaching is an in-depth knowledge of the subject you are instructing. Furthermore, to understand your field, continual study of that field is imperative. A teacher can adapt their classroom processes, but it is inherently difficult to teach with authority if you do not have a complete understanding of your subject matter. This deep knowledge base gives you flexibility when you are given a “teachable moment” opportunity. This essential to good teaching is a universal issue. An article appeared in The Telegraph, a publication out of the United Kingdom, about some of the issues facing new teachers. Mrs. McCabe, who was one member of a panel of experts that reviewed the National Curriculum in England several years ago, noted the importance of subject matter knowledge. In this article, a Department for Education spokesman said: “Bernice
McCabe is absolutely right that we need to ensure we have teachers with a deep subject knowledge.” (Paton, 2011).

Newton and Newton in 2001 (as cited in O'Donnell, Reeve, and Smith) addressed the on-going scholarly debate as to the value of content knowledge (subject matter) versus pedagogical knowledge (teaching methods). O'Donnell, et al, continues in this analysis by citing Lee Shulman (1987) concept of pedagogical content knowledge. Shulman postulated that pedagogical content knowledge is the synthesizing of the distinct facets of content and pedagogy in such a way that the teacher gains an understanding of how to best present the subject matter given the composition of their students (O'Donnell, 2009).

Dr. Adela Solís cited the research conclusions of Gess-Newsome and Lederman (2001) that proponents of pedagogical content knowledge have aided in highlighting the value, importance and practice that subject matter knowledge is for educators, in contrast to the more universal approach in the education of teachers that has been in place since the 1970’s (Solís, 2009).

**Essential skill #2: Have passion for your subject and enjoy teaching it.** In regard to education, natural science is the study of specific disciplines related to the natural world. Environmental education, however, is a more encompassing discipline in that it includes the natural sciences as well as the social sciences. Environmental science is therefore a multi-disciplined endeavor; where the natural world intersects with the needs and wants of mankind. To be a teacher of environmental science, an instructor must also be student. You must thirst and hunger for more knowledge and skills in order to become a more accomplished teacher. A mathematics teacher must work diligently
with her students and herself to develop their mathematical skills. Likewise, the teacher must be excited about connecting those skills to their application in the “real-world”. In so doing, students will learn how to collect data and then evaluate the data by using technology. Furthermore, they can then present their findings to students as well as community members (Elliot, 2007).

**Essential skill #3: You must like your students.** Although the following quote is not a peer reviewed source, it illustrates the essential teacher skill.

Dave Pelzer was the child of an alcoholic, neglecting, and sadistic mother. In fact, his mother refused to call him by his name, but called him “It”, instead. For Dave, his “saviors” were his teachers. One teacher insisted that the principal intervene on Dave’s behalf, and a meeting was subsequently scheduled with the principal and Dave’s mother. The teacher that intervened was never seen at the school again.

Several years later, when Dave had a breakdown in school, because he could no longer see his “saviors”, his teachers, in his dreams; several teachers and staff intervened on his behalf, and he was placed in protective custody.

Dave wrote the following (found on page 163) from the book, *A 4th Course of Chicken Soup for the Soul*:

> With my eyes clamped shut, I heard one of my teachers gently whisper, “No matter the outcome, no matter what happens to us, this is something we had to do. As teachers…if we can have an effect on one child’s life…This is the true meaning of our profession.” (Pelzer, 1997).

**Common Elementary School Teaching Styles.** Teaching is an art form based on scientific research, and the physiological and psychological development of the student.
A such, a teacher must be cognizant of the individual learning styles of their students as well as the appropriate instructional methodology for the subject matter being taught. In this sub-section I will review some common the teaching styles used by elementary educators as noted in documents produced by Concordia University of Portland, Oregon. These teaching styles include: Hands-off, Demonstration, Collaboration, Traditional Lecture, and Hands-on.

Use of the hands-off style is best used with students in their later years of elementary schooling. In this style a teacher provides the student with only minimal direction. The student is then expected to work independently to accomplish the stated task, and in so doing, will develop a sense of independence, improve or acquire critical analytical skills, and take ownership of their accomplishments. Additionally, the teacher is still available to help guide the student should they desire and need the help or encouragement.

Demonstration is another style of teaching which incorporates the student’s mental and physical abilities and critical thinking skills. The particular demonstrative medium to be used must include the available resources and how to best visually demonstrate the desired process outcome. Demonstrative medium could include resources such as computer generated pictorials, laboratory experiments, building models, and videos or music. An advantage of this teaching technique is that students will respond to this method in a positive manner regardless of their learning style.

Collaboration is a teaching style used to develop problem solving, trust, communication skills, responsibility, team-building, and interactive learning in students. This style is best used when a project has first been explained and objectives and
timelines established. Upon completion of the collaborative activity a group discussion is appropriate to allow students to express and their thoughts and feelings about the collaborative process.

Traditional lecture is a teaching style used when facts on a particular subject need to be presented, and/or, in preparation for an examination. Students will frequently take notes on the information provided when this method is employed. This method helps the student to organize the major areas of the subject and outlines pertinent facts that need to be emphasized. Although this method is not optimal for the visual learner, it nonetheless teaches them a much needed skill set.

The use of a hands-on learning style is best used for elementary students where conceptual learning can be difficult, such as in mathematics, science, art or when manual exercises are required. The use of manipulatives tools or puzzles aid in fostering the learning for these particular subjects (Most Common Teaching Styles Used with Elementary School Students, 2012).

Dr. Maria Montessori, in her book: *From Childhood to Adolescence* (p. 63) noted: "The chief symptom of adolescence is a state of expectation, a tendency towards creative work and a need for the strengthening of self-confidence."

Dr. Montessori emphasized the below listed educational tenets for teaching children, particularly those in early childhood.

1) Respect for the child. This is the cornerstone principle of the Montessori Method. It is the teacher’s role to guide the student, assist them in doing things, and to learn for themselves by presenting choices and encouragement.
2) Absorbent mind. Children are naturally curious and in so doing educate themselves by being guided in a nurturing environment.

3) Sensitive periods. This facet refers to developmental stages when a child is more sensitive to learning specific skills. It is the role of the teacher to be vigilant in their observations and acute to the child’s sensitive period to assist fully in the student’s skill mastery.

4) Prepared environment. A teacher’s role is to prepare the learning environment so children can experience learning stimuli on their own. The learning environment is arranged in an orderly format that emphasizes active learning through exploration, freedom and movement.

5) Autoeducation. This is the term Dr. Montessori used to describe self-education when children are allowed to participate in an active and prepared learning environment (Morrison, 2014).

“The first thing to be done, therefore, is to discover the true nature of a child and then assist him in his normal development.” [Maria Montessori, The Secret of Childhood, translated by M. Joseph Costelloe, S.J.] (Maria Montessori Biography).

**Scaffolding Strategy in Elementary Education.** Scaffolding is a strategy which can be very effective for teaching student’s complex cognitive requirements and application, by taking these subjects and reducing them to smaller more simple mini-lessons. In so doing, a building block approach to learning can be used and will facilitate mastery of these mini-subjects and subsequent understanding of the subject as a whole. Scaffolding also includes combining and varying the following various teaching styles: use of verbal techniques such as turn-and-talk, and think-pair-share, will contribute to a
student becoming comfortable and accountable with sharing their thoughts and ideas on both informal and formal levels.

Another subset of scaffolding includes the pre-teaching approach in which the instructor incorporates technique as class discussions to generate enthusiasm for the upcoming topic; overview of the subject which allows the students to more fully conceptualize the vocabulary and concepts of the new unit; and encouraging students the opportunity to express their feelings, questions, opinions, and experiences about the new subject. Incorporation of these techniques should lead to greater understanding of the subject for the students, and also gives the instructor a better sense of the students existing knowledge and thoughts on the new subject. Pre-teaching in conjunction with the use of questioning, reflection and verbal expressions, contributes to the student becoming comfortable with the new material, making connections between the main points, and developing a more sophisticated cognitive approach to the subject (Teacher Techniques: Scaffolding Elementary Education, 2013).

**Dr. Benjamin Bloom’s taxonomy.** During his tenure at the University of Chicago (1943-1959) Dr. Benjamin Bloom held the position of University Examiner In this capacity; he developed tests to determine if undergraduates had sufficiently mastered their subject matter in order to graduate. In 1948 discussions with a group of colleagues with the American Psychological Association began on the subject of educational goals. This collaborative effort resulted in the system of classification known as “Bloom’s Taxonomy” (Eisner, 2000).

Dr. Bloom and his colleagues developed taxonomy of educational objectives to be used in the development of curriculum and assessments. This research was drawn from
the work that Dr. Ralph W. Tyler had previously done. Dr. Tyler’s work, *Basic Principles of Curriculum and Instruction,* published in 1949 became a cornerstone of educational curriculum development and assessment. In this work, the teacher becomes a scientific observer to determine whether students are achieving the desired results of the curriculum being presented. Based on their observations, the teacher makes adjustments to the learning process to ensure student success. (Author’s note: this behavior is in line with the research conducted by Dr. Montessori.) Tyler’s work outlined the following four basic tenets: 1) Define appropriate learning objectives; 2) Develop a useful learning environment; 3) Learning plans are developed so that the cumulative learning effect is maximized; and 4) Assess the curriculum and adjust it to increase its effectiveness. This methodology is formulated by the teacher based on their assessment of the student’s needs (Kreider).

In Bloom’s Taxonomy, higher order thinking skills are the end result, and attainment of these objectives requires sub-order developmental skills to ensure success. With the identification of specific end results, curriculum can be developed and implemented. Additionally, assessment is an important component of curriculum and must be used in order to effectively evaluate the learning process. The eLearning Guild presented a graphic of the original taxonomy developed by Bloom’s research in a publication titled *Perspectives-Bloom’s Taxonomy: What’s Old Is New Again.* Appendix D.

Over time, improvements have been made to this taxonomy. Most notably was the work done by two colleagues of Dr. Bloom, Anderson and Krathwohl. Anderson and Krathwohl work revised the order of Bloom’s pyramid and changed the original noun
based stages to verb based, which aligns more closely with classroom mechanics (O'Donnell, 2009).

Patricia Armstrong, Assistant Director, Center for Teaching at Vanderbilt University, presented an image of the revised version of Bloom’s Taxonomy developed by Anderson and Krathwohl in 2001. Appendix E.

Bloom’s Taxonomy outlined the following steps: 1) Knowledge: where information is learned; 2) Comprehension: the information is understood; 3) Application: the information is used; 4) Analysis: component parts of the information is determined; 5) Synthesis: the information is combined in varying ways; and 6) Evaluation: the information is assessed. Again, this taxonomy is used to develop learning objectives and curriculum, and must include an assessment component in order to refine and improve the learning process (Using Bloom’s Taxonomy as an Instructional Tool, 1996).

The Need for Outdoor Education

Every Student Succeeds Act. In December 2015 this Act was passed by the U.S. Congress and signed into law by President Obama on 10 December 2015. A key provision that will enhance environmental education programs in the United States was sponsored by Senator Jack Reed and Congressman John Sarbanes, and is also known as the No Child Left Inside Act (NCLI). A major component of NCLI Act is to enable students to learn about the environment in classroom and hands-on activities outdoors (Reed, 2015).
The Awe of Nature. Humans are connected to the natural world and experiencing nature’s power, diversity and grandeur has been shown to have positive effects on them. This section will examine some of these effects and in so doing, emphasizes the need for all people to take a “nature break” daily.

When people encounter unexpected and dramatic stimuli, such as storms, canoeing in river rapids, or a traumatic personal event, the psychological state of awe can be manifested. This manifestation results in a reassessment of a person’s cognitive social models which subsequently results in actions that are more ethical and generous. Awe, additionally, redirects the concerns a person has toward others and away from themselves. Research has shown that this state of awe is elicited by nature in approximately 75% of the time. Jake Abrahamson, in a recent Sierra magazine article (page 38) included the following quote by Dr. Dacher Keltner and Dr. Jonathan Haidt which appeared in the 2003 Cognition and Emotion journal: “Fleeting and rare, experiences of awe can change the course of a life in profound and permanent ways.” (Abrahamson, 2014).

The effect that nature has on our psychological well-being has been studied for over twenty-five years. Dr. Rachel and Dr. Stephen Kaplan developed the Attention Restoration Theory (ART), which examines the restorative properties that natural surrounding have on revitalizing the depletion of cognitive properties of people. The everyday demands of life require that people have focused attention. However, our cognitive functions, like our physical body, require rest and restoration. As fatigue sets-in, our brains capacity to focus on specific and direct stimuli is degraded. Attention Restoration Theory proposes that mental fatigue can be revitalized through exposure to
less stressful stimuli, and a more reflective mental posture, that our natural environment can provide. The Kaplan’s classified this type of less stressful stimuli as soft fascination or our secondary attentional system (Krisch, 2014).

Dr. Kaplan stated that in order to provide this restorative effect, the natural environmental properties, as follows, must exist. Soft fascination: where nature effortlessly seizes our attention; Being away: A condition where the natural world provides an escape from our normal routines; Extent: This is a feeling of environmental immersion; and Compatibility: This is the state when an individual not only wants the environmental exposure, but can appreciate it as well.

Soft fascination is the most important property, while the other properties intensify or preserve the fascination. At present, support for the theory with empirical data is uncertain (Garside, 2016).

**The Benefits of Being Outdoors.** Research data presented in a recent National Geographic article (*This Is Your Brain On Nature* ; pages 56-57) noted the following results of exposure to nature: a) creativity can be improved up to 50%; and b) that forest hikes can decrease up to 16% one of our one of our stress hormones (Williams, 2016).

Research conducted both in the United States and Korea has shown that exposure to a pleasant outdoor environment or images of natural scenes, resulted in the possibility of attention allocation in more positive emotions and/or an increase in the areas of the brain associated with altruism and empathy, respectively. Additionally, research conducted by Dr. Stephan Kaplan and his colleagues revealed improved short-term memory proficiency when executives took a fifty minute walk in an arboretum compared to a walk along a city street (Williams, *This Is Your Brain On Nature*, 2016).
Exploration of myopia causation has also shown a direct correlation to time spent outside and a decrease in cases of myopia. These studies have been conducted in China, Taiwan and the United States. Daniel Stone, in a recent National Geographic magazine article (page 20) included the following quote about nearsightedness by researcher Ian Morgan, “arise from a lifestyle of not just too much study but of too little time outdoors.” (Stone, 2016).

The English Outdoor Council of the United Kingdom noted the following aspects of outdoor education: 1) Active learning is bolstered by providing a fun, safe, and challenging experience; 2) This experience advantageously impacts all areas of youth development; 3) Outdoor activities promote the advancement of self-esteem and self-confidence in youth by providing an worthwhile alternative achievement path; 4) Direct outdoor experience builds a positive attitude which greatly contributes to team-building and the desire to learn across all curriculum areas; 5) Develops alternative avenues of leisure which contributes to a diverse and satisfying lifestyle; and 6) Outdoor learning fosters an understanding and appreciation of our natural world which contributes to thinking on a global level which subsequently results in adaptability and responsibility to all communities (English Outdoor Council).

Ms. Susan Sachs Lipman wrote an article which summarized a report by the National Wildlife Federation, *Back to School: Back Outside*. This report demonstrated that time spent outside in conjunction with education correlates to far-reaching academic benefits as noted: Increased performance in core academic subjects; reduced Attention Deficit Hyperactivity Disorder; contributed to the demonstrated academic performance of under-resourced students in a significant and positive manner; scores on college entrance
exams and standardized test increased; an improvement in school behavior; and contributed to an increase in students desire to learn (Lipman, 2010).

An additional benefit of outdoor play is economic. Nature play requires little in the way of expensive equipment, complicated structures, or large amounts of space. It can be as simple as providing a space to dig, a pail and a shovel. With just a few items children and students can use their imaginations to transform a small space into a laboratory of magical discoveries and problem-solving adventures. Children and adults are disconnected with nature and the outdoors. Green Hearts Institute for Nature in Childhood stated in their 2010 publication that: “American kids (Ages 3-12) now spend 27 percent of their time with electronic media, versus only one percent outdoors.” (Childhood, 2010). Appendix F

My own personal recollection is that my brothers, friends, and I spent most of our time outdoors, engaging in age appropriate activities which included: snow shoveling, snowball fights, riding bicycles, playing sports, floating Popsicle sticks in water down our alley, and exploring along the Mississippi River. All activities required little if any, expense, but greatly helped in our physical, emotional, spiritual, and mental development.

In 2015 The Nature Conservancy conducted a survey of 602 kids between the ages of 13 and 18 about environmental issues, outdoor activity, and their attitudes toward nature. Some of the highlights of this survey included: the majority spend time using electronic devices daily; about 10 percent spend time outside daily; 91 percent noted that they would increase outdoor time through peer pressure encouragement; 90 percent reported that time in nature helped to relieve stress; 80 percent stated that being outdoors was uncomfortable; 66 percent noted they had personally enjoyed time in nature and consequently appreciated it
more; 62 percent said they lacked transportation to natural areas; and 61 percent said there were not natural areas near their homes (Deputy, 2016). Appendix G.

**The Need for Environmental Education.** As I previously noted, in regard to education, natural science is the study of specific disciplines related to the natural world. Environmental education, however, is a more encompassing discipline in that it includes the natural sciences as well as the social sciences. Environmental science is therefore a multi-disciplined endeavor; where the natural world intersects with the needs and wants of mankind. Environmental education is the exposure to issues involving our environment, and the effects of both proper and improper/mismanagement of natural resources is critical for an informed citizenry.

David Orr’s book, *Earth in Mind*, is an analysis of our current state regarding the roles and issues pertaining to the environment from several different perspectives. Dr. Orr not only addresses the issues, but more importantly, offers well formulated suggestions as to how to correct the problems. In Chapter Ten (entitled: *Politics*), Dr. Orr stated that our perception of environmental issues contributes to our subsequent actions in dealings with each particular problem and solution in that these issues are being defined wrongly as one of science, not one of politics. In this chapter (page 70), Dr. Orr proposed the rhetorical question: “Why then do we find it so difficult to do what is merely obvious and necessary?” In his analysis of this question, Dr. Orr proposed these answers. 1) We have defined the problem wrongly as one of science, not one of politics. Accordingly, we have focused on the symptoms and not the causes of biotic improvement. 2) The conservation of biological diversity is difficult because the generally anemic state of democracy here and elsewhere does not favor the conservation of much of anything. 3) The large gap
between strong public support for the environment and the environment as a potent national political issue is partly explained, I think, by the failure of scientists to communicate adequately to society (Orr, 2004).

**Environmental Education is required under Federal Law.** Federal Law requires environmental education as I previously noted. However, this is such an important concept, the Federal laws bear reiterating.

In December 2015 the Every Student Succeeds Act was passed by the U.S. Congress and signed into law by President Obama on 10 December 2015. This law included a major component which permits U.S. school districts to integrate environmental education into their normal class programs, as well as their after-school activities, in order to foster a versatile education (Reed, 2015).

Additionally, On November 16, 1990, President George Herbert Walker Bush, signed into law the National Environmental Education Act (Pub.L. 101-619). Section 2 of this Public Law noted several Congressional findings such as: threats to human health and environmental quality are increasingly complex; evidence of international environmental problems, such as global warming, ocean pollution, and declines in species diversity is expanding and documented; that these environmental problems represent a significant a threat to the quality of life, economic vitality and the natural balance of urban and rural areas (Congress, 1990).

**Current Environmental Issues.** Environmental issues have been a concern for humans for several centuries. A few notable pioneers and advocates of conservation in the United States would include President Teddy Roosevelt, John Muir, Dr. Rachel Carson, Aldo Leopold, Mike Link, and Congressman John F. Lacey. These individuals
and the organizations they have been associated with have helped to advance the conservation and environmental movement in our country. However, as electronic information technology advances, the world gets smaller, and our knowledge and comprehension of environmental issues as being a global concern becomes apparent.

The following major themes of environmental science were outlined in the textbook: *Environmental Science: Earth as a Living Planet*, page 3: Growth of human population; Urban expansion; A global perspective for solving environmental challenges; Human and nature coexistence; Sustainability; and Science and values where scientific solution implementation requires value analysis (Botkin, 2009).

National Resources Defense Council (NRDC) was founded in 1970 with the mission to work to safeguard the earth—its people, its plants and animals, and the natural systems on which all life depends. It is an immensely effect environmental action group with over two million members and online activists combined with the expertise of nearly 500 lawyers, scientists and other professionals. The NRDC web page states: “The New York Times calls us "One of the nation's most powerful environmental groups." The National Journal says we're "A credible and forceful advocate for stringent environmental protection."” (National Resources Defense Council, 2016).

The National Resources Defense Council noted that their priority issues for 2016 included these environmental challenges. Global warming—which is the most important human and environmental crisis of our time. We must strive to create a clean energy future by simultaneously investing in renewable energy sources and reducing and eventually eliminating our dependence on fossil fuels. These actions will in time increase our economic position, and reduce our air pollution and global warming issues as we
move to a more sustainable existence. Restoring our world's oceans is critical because our oceans are close to an ecological collapse; which is due in part to climate change and pollution. We must make a concerted global effort to protect and manage these resources. Protection of our wilderness areas and endangered wildlife is also necessary because these resources are interrelated and co-dependent; by protecting our wilderness areas we will simultaneously establish sanctuaries for wildlife. Furthermore, we must prevent pollution and protecting health by reducing or eliminating the toxic chemicals found in our food, the products we use, our air and water. These actions will assure an abundant and safe fresh water supply, and assist in developing sustainable communities (National Resources Defense Council, 2016).

The Sierra Club was founded in 1892 by legendary conservationist John Muir. The organization has been influential in assisting in the passages of the Clean Air Act, Clean Water Act, and Endangered Species Act. Additionally, it has been instrumental in protecting millions of acres of wilderness (The Sierra Club, 2016).

The magazine of the Sierra Club is published on a by-monthly basis and contains an update of current environmental challenges and issues. In a recent publication the Sierra Club noted the following news items: British Petroleum agrees to pay $18.7 billion for claims as a result of their Deepwater Horizon oil spill in the Gulf of Mexico. A study by the U.S. Environmental Protection Agency confirmed that drinking water can be polluted by fracking. One-third of the Amazon Rainforest located in Ecuador is planned to be auction to Chinese oil companies. The Netherlands must reduce their five year planned carbon-emissions of 17% to 25%, was ordered by a Dutch court (The Sierra Club, 2015).
The October 2015 issue of Readers Digest contained an article which is an outstanding environmental education case study. The article entitled, *As Our Military Sinks*, presents some of the issues the U.S. Navy faces as a result of global climate change for the base located in Norfolk, VA. As a case in point, the land is “sinking” as a result of rising sea levels. The sea levels at Norfolk are rising at a rate twice as fast as the global average. This situation encompasses many stakeholders, including the individual home owners, business outlets and owners, schools, and the like. The situation cannot help but to result in catastrophic economic loss. Additionally, at a national and international level, we are dealing with an immense security issue and response issue to not only a global crisis, but humanitarian efforts as well. Add to this scenario, the political arena when Congressional leaders and Virginia state legislators still question the science of climate change. As this unfolds, the funds needed to deal with this situation may not be made available because the legislators who control the allocation of money may not do so, given their political stance. It is also wise to remember that this is just one of our coastal defense bases (Goodell, 2015).

The United States has more than forty 40 naval bases along both our coasts; including Naval Station Norfolk which is the world's largest naval installation. Norfolk covers an area of approximately 3,400 acres and currently accommodates about 149,000 personnel. Additionally, Naval Station Norfolk ensures operational readiness of the US Atlantic Fleet by providing installation and personnel services, and various facilities for approximately 134 aircraft and 75 ships (Naval-Technology.com, 2013).

**Remarks by U.S. President Obama.** In both his 2015 and 2016 State of the Union addresses, President Obama made the remarks concerning climate change and the need to
continue to act in an environmentally appropriate manner. The President acknowledged that numerous scientists have confirmed that as rising temperatures continue we will continue to see oceans rising, more intense heat waves, dangerous floods and droughts. Furthermore, that these activities can be attributed to human activities and can result in hunger and conflict across the globe. Therefore, we must act forcefully to change our current activities in order to stem these immense disruptions which are not only detrimental to people, but our national security as well. The President went on to say that to date his administration, has done more than ever to combat climate change, from the methods we use to produce and use energy. In conjunction with these efforts, by reserving more public lands and waters than any administration in history we add to the systemic health of our environment. “And that’s why I will not let this Congress endanger the health of our children by turning back the clock on our efforts. I am determined to make sure that American leadership drives international action.” (Obama, Text of President Obama’s 2015 State of the Union address, 2015).

In his 2016 State of the Union address, President Obama made the following comments concerning climate change: “When we lead nearly 200 nations to the most ambitious agreement in history to fight climate change, yes, that helps vulnerable countries, but it also protects our kids.” (Obama, Remarks of President Barack Obama – State of the Union Address As Delivered, 2016).

A Midwest State’s Law concerning Home Schools

An Upper Midwest state’s Department of Education classifies homeschools as a private school. Consequently, home school curriculum does not fall under the authority of the State. However, this Department of Education has established guidance as to
homeschool curriculum and achievement testing requirements. A few of these requirements are: compulsory instruction law requires all children age 7-17 to attend a public or private school; homeschooled students must take recognized normed achievement tests; and homeschool student musts receive instruction in specific subjects (Homeschool Information for Parents).

As outlined in the above paragraph, home schools are required by this state’s law to report to their local school district superintendent various activities and milestones. The following items are reportable: 1) The intent to begin or continue homeschooling must be report annually by 1 October; 2) Immunization information or a notarized statement about their child’s immunization status. These documents must be submitted when the child begins homeschooling and again when they begin their seventh-grade year; 3) Homeschool children age 7-17, must take a standardized test yearly, but the results are not reportable (Minnesota Laws & Forms, 2015). Amplification of some other home school specifics (not all inclusive) is: home schools recognized by state directed agencies may have reduced reporting requirements. Teacher certification is optional. School year length is not regulated. Home schools must submit the Compulsory Instruction Report (U.S. Department of Education, 2012). The Home-Based Educators Accrediting Association (HBEAA) is the only authorized association for accrediting homeschools for the subject state. Homeschools issue their own transcripts and diplomas; and the state’s Department of Education does not certify or validate these (Minnesota Department of Education, 2015).
Research on Homeschooling

Home School Demographics. To more fully understand homeschool dynamics, it is useful to examine empirical data. In my literature review, I learned that home school research has been conducted since the 1970’s. Since, population survey estimates of students being home schooled was limited in the 1970’ and 1980’s; a reasonable extrapolation of the data and consequently of accurate results is difficult. (See Appendix H for detailed statistics.) However, researchers tend to agree that approximately one million students were being homeschooled in 1998 (Murphy, 2012).

The findings shown below will highlight characteristics of a variety of criteria, and will include the primary research study that presented the analysis.

Political perspectives: The research by Mayberry et al (1995) showed that 77% were categorized as being conservative to extremely conservative, with the balance being categorized as liberal to highly liberal. Homeschool parents tend to be moderately to highly active in community affairs (Parker, 1992; Ray, 2004a; J. Taylor, 1986a.); including political activities and voting (Parker, 1992).

Geographic location: Homeschool and public school students are distributed similarly across the nation. (National Home Education Survey, 2006 by Princiotta & Bielick), but are underrepresented in the Northeast. (Belfield, 2004a; Princiotta & Bielick; 2006). Students are consistently more from small-town and rural areas (Luebke, 1999; J. Taylor, 1986a; Wenders & Clements, 2007); and will normally populate more affluent counties in the U.S. and are more likely to be from single-family homes (Gustavsen, 1981; J. Taylor, 1986a).
Family Size: Research conducted by Rudner (1999) and Ray (2010) showed approximately parallel results when the number of children per family was evaluated. Families having one to two children were 79.6% and 37.9% for families nationwide and homeschooling, respectively (Rudner, 1999). Additionally, Families having three or more children were 44.0% and 62.1% for families nationwide and homeschooling, respectively (Bielick et al; 2001; Bielick; 2006) (Murphy, 2012).

**Historical Stages of American Homeschooling.** According to numerous researchers presented by Dr. Joseph Murphy (pages 30-32), homeschooling can be traced back to the founding of our nation. Scholars categorize the homeschool history of having the following three distinct stages: 1) The period prior to compulsory public education in which homeschooling was widely practiced for primary aged children. 2) Institutionalized schooling when required based on political, social, economic and cultural criteria and administered by state governments. 3) Our present period of modern homeschooling which some scholars note is a continuum of the long history of homeschooling and other scholars view it as a mosaic of educational opportunities in response to state mandated compulsory education (Murphy, 2012). In fact, from the perspective of native Americans, their children have been home schooled for centuries.

**Homeschooling Forms.** The research conducted by McKeon (2007, pp.15-16) noted the following forms of homeschooling: Traditional: This form is the most common type and consists of an already developed traditional curriculum. Unschooling: This style focuses on the needs and interests of the individual learner. Eclectic: This is a composite of the other forms of homeschooling. Classical: This model is tailored to the learner’s cognitive developmental stages and emphasizes a concept known as trivium. In this
specific teaching methods are used that equate to the established school diversification of elementary, middle school, and high school (Murphy, 2012).

In the research conducted by Levinson (cited in Taylor-Hough, 2010) he noted the following forms: Unschooling, Classical education; The Charlotte Mason method; Correspondence and umbrella schools; Traditional; Cooperative schooling; and Computer-based education. With the exception of the below noted forms, the other educational formats are similar to those identified by McKeon. The Charlotte Mason method emphasizes a student’s life-long desire to learn. The Correspondence and umbrella schools are learning focused on the use of textbooks, worksheets, quizzes, and the like. Cooperative schooling is conducted by parents having a similar learning style and uses a shared teaching method of subject expertise. Computer-based education is purchased software curriculum with a range of methodologies to choose from (Murphy, 2012).

**Homeschooling Instructional Methods.** The instructional methodologies used by homeschoolers have been the subject of research going back to the earlier 1980’s. A consistent thread revealed in these studies is that mothers conduct the majority of the teaching. This observation was validated by the research done by Gladin (1987) and Ray (1999a) as noted in their findings of 90% and 88%, respectively. In regard to parents being certified to teach; Rakestraw, 1988 reported that the vast majority of parents had never held state teacher certifications. Additional studies conducted by Ray (2009a, 2010) identified that approximately 10% of the parent were, or ever had been, certified. Numerous studies have also been done which demonstrates that students receive about three (3) hours of instruction each day. It must be noted that identifying instructional time
accurately is difficult. However, in his research, Lee (1994) stated that homeschooled students spent more time in one-on-one instruction than students in the public realm (Murphy, 2012).

**Research Rationale**

All the literary research I have done is directly related to my Capstone focus of: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?” This analysis has encompassed an enormous amount of material with the single purpose of understanding from multiple perspectives, academic fields and my own experiences, what would constitute an effective pedagogical and methodology in educating the young citizens being taught in a homeschool environment. Our leaders of tomorrow must be exposed at an early age that choices come with consequences; and to make an informed decision one must be aware of the causes, effects, stakeholders and diverse aspects of environmental education issues.

Environmental education is a multi-faceted endeavor which includes a vast array of disciplines. However, despite its complexity, an individual must eventually look inside themselves to arrive at a realistic decision. In order to guide students to this platform, an educator must have a working knowledge of the psychological, physical, and emotional states of their students at any point on their developmental continuum. In so doing, a teacher will be then able to employ an affective education track. Additionally, I personally believe that to categorize any one subject as a stand-alone entity is short-sighted and a mistake. It is my opinion that an educator must view the learning process as a wheel with many spokes connecting the various disciplines. This perspective will assist
the student because they will learn to evaluate from a variety of positions. Consequently, this process required that research and analysis is the cornerstone by thoroughly investigating the research findings conducted by others.

**Summary**

In this chapter I documented the research literature that was used in my analysis and the findings of this examination. Included in my examination were studies conducted in the fields of child psychology, education, natural and environmental science, by researchers which include, but are not limited to, Jean Piaget, Erik Erikson, Benjamin Bloom, Maria Montessori, Carl Rogers, Abraham Maslow, David Orr, and Donald Ecroyd. Further examination will included current readings and studies in the fields of environmental science, education, and the impact of outdoor activities as they apply to child development in a home school environment with classes being conducted at nature centers. In all cases, I will link these findings to the particular research and the impact each has on the stakeholders involved.

Chapter three will document the particular methodology used to evaluate the best practices of the identified stakeholders. Specific methodological methods to be used will be dependent upon the information and data to be obtained. However, I will use surveys, observations, interviews, questionnaires and the like, for the purpose of conducting a thorough examination. These research tools will be administered to environmental education practitioners at selected nature centers which have a given percentage of homeschool programs to examine and measure their best practices.
Chapter Three

Methods

Research Question: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?”

Underlying factors of this study.

All research studies must take into account the constraints of time and resources. It is reasonable to postulate that a more complex research question will consequently require more time and resources in order to conduct a professional, thorough and reliable project. I was the only one conducting this study, so resource availability was not an issue; although the issue of time was a constraint which was accounted for. This study was conducted in a professional, thorough and reliable manner. In the sections to follow, I outline the parameters of the study as they relate to the best practices for educating elementary aged home school student’s natural science and environmental education at nature centers. Furthermore, the appropriate and specific methodologies employed are presented. Nonetheless, the actual approaches used will be chosen based on review and analysis as applicable to the formulated question, not the methodology. In an article written in 2009, Eric Anderman noted: “Most social scientists agree that a preferred methodology should not be used as a framework to guide research (Anderman, 2009).”

My research included the geographical characteristics of the nature center (land mass, wetlands [if available], ease of access to the center, etcetera); available recreational and adventure programs (canoeing, snowshoeing, hiking, bird watching, and the like);
and home school programs (number of classes conducted; methodologies used; average number of participants by age, number of home school groups attending, etcetera). Additionally, it was my intention to contact this state’s Department of Education for home school specific data as it relates to the geographical study area limits. The data supplied will serve as a benchmark for the investigation of the participant nature centers. I anticipate this phase of my research to take approximately one month to complete.

**Background Information of this Study**

The physical parameters of this study encompassed the seven counties that comprise the majority of the metropolitan area of an Upper Midwest state. These seven counties consists of an area of three thousand square miles, fifty-two parks, twenty-one nature centers, and 340 miles of interconnected trails. (Metropolitan Council, n.d.) The seven county areas are home to 2.85 million people, with the state median family income of $56,874 ($23,198 per capita) for the same time period (U.S. Census 2010).

The nature centers involved in this study are those which are located in the seven counties under the policy-making body guidance of this Upper Midwest state’s Metropolitan Council and provide home school programs. Specifically, I conducted interviews with the environmental education practitioners at a select number of nature centers throughout the studies range. These interviews were done only with adults and no children were involved in this study. Since this area has one of the highest concentrations of nature centers in the country, I will randomly select those nature centers which provide an on-going home school program, or have a line item in their budget for home school revenue. Furthermore, the nature centers involved were for day use only. I began this study once permission was granted by the Human Subjects Committee. These interviews
were conducted at the each nature center which meets the sample criteria. In this respect, the investigation is random and based on a quantitative selection process. Appendix J lists the questions have developed at this point. However, additional follow-up questions were asked based on the conversations I had with the environmental education practicioners.

A nature center is a designated community space where trained professionals guide and facilitate visitors in their exploration of the natural world, and in developing a relationship with nature. Additionally, this experience should subsequently foster a sustainable connection between the people of the community and their environment (Association of Nature Center Administrators, 2005-2016).

**Geographical Characteristics of Participant Nature Centers**

An understanding of the geographical characteristics of the participating nature centers was essential in order to fully evaluate the potential learning resources available to teach home school students. A greater variety of accessible environments will dramatically increase the learning opportunities for students. Outdoor education takes additional time, planning, effort and money. However, the benefits greatly out way the input because students not only learn the objectives, but realize that they are important to the future sustainability and preservation of the environment. Furthermore, they can be become lifelong environmental stewards, and they have more fun (Elliot, 2007).

A case in point would be a nature center that has a wetland area. A nature center that offers and uses this resource can immensely expand their learning opportunities for their students. With this resource students can learn about the chemical and biological measurements/characteristics of a healthy body of water; explore the habitats of muskrats, examine muskrat engineering of their dens, and learn how scientists conduct a
population survey by using sampling analysis; and develop hypotheses on the importance of cattails to water quality and animal populations and the effects water pollution has on this environ. In each of these scenarios, students have the freedom to learn about the complex and multifaceted make-up of environmental science under the guidance of their instructor.

Lesson planning framework is the key factor in program development because it permits the teacher to guide the students learning opportunity. In so doing, students can make progress, actively participate in the lesson, and accomplish their objectives. These actions will in turn, enhance student motivation and key learning points of the lesson being presented (Ganihar, 2007).

My investigation of this portion of best practices included factors such as available animal exhibits/dioramas, animal mounts, and live animals available; land mass; wetland type and expanse; proximity to rivers and streams; the watershed of the area, and prominent geological features.

**Recreational programs and adventures**

Accessible adventure and recreational programs of the participating nature centers is essential in order to fully evaluate the potential learning resources available to teach home school students. A greater variety will dramatically increase the learning opportunities for students.

An example of this type of learning opportunity would be snowshoeing. Snowshoeing is a wonderful way to integrate numerous subjects concurrently, in a safe, fun and adventurous endeavor. Students can learn about the history and origins of snowshoeing, the natural history of this mode of transportation as practiced by the Native
Americans, and also why different snowshoe types were developed. Furthermore, students will be able to practice the basic skills of snowshoeing while conducting scientific experiments such as bird counts, searching for coyote sign, and the like. Furthermore, they will enhance their confidence and participate in group activities while exercising their bodies.

The English Outdoor Council of the United Kingdom noted that outdoor activities promote the advancement of self-esteem and self-confidence in youth by providing a worthwhile alternative achievement path; and direct outdoor experience builds a positive attitude which greatly contributes to team-building and the desire to learn across all curriculum areas. Furthermore, outdoor learning fosters an understanding and appreciation of our natural world which contributes to thinking on a global level which subsequently results in adaptability and responsibility to all communities (English Outdoor Council).

Further evidence of the nurturing aspects of outdoor, placed based education was noted in the book, *Teaching Green: The Elementary Years*. In her article, Ruth A. Wilson noted that young children, when exposed to positive outdoor environmental education provided by caring teachers, will subsequently enhance the shaping of behaviors and attitudes that will last a lifetime. When children are taught to respect and care for their environment, they will develop a protective attitude toward nature. Furthermore, experiential learning where a child uses all their senses in exploring and manipulating the elements of the natural world, intensifies a child’s desire to experiment, and inspires them to learn more (Wilson, 2005).
My investigation of this portion of best practices included factors as to the types of adventure and recreational programs including, but not limited to canoeing, birdwatching, hiking, archery, swimming, geologic digs, etcetera. These variables will be noted for each of the participant nature centers.

**Home school programs composition**

The purpose of this project was to explore what are “best practices” used at nature centers for elementary aged home school students involved in the study of environmental science. To accomplish this, an analysis of the current and widespread teaching parameters used at these local nature centers was investigated. I collected data on the ages of the students, number of programs offered each month, number of different home school groups; average attendance; program topics, and methodology of instruction. Methodology of instruction analysis examined facets such as puppetry, time outdoors, program variety, natural history of lesson specific content, experiential learning, classroom instruction, integration of multiple subjects into one lesson plan, and content related to environmental issues. Iozzi (1989) noted that experiences in nature need to start during early childhood, because the values and attitudes developed during this time period can have a lifelong impact (Ernst, 2014).

**Research Methodology Employed**

The design of your research methodology is essential to providing reliable, accurate results and conclusive findings. The two approaches to the research question are quantitative (information converted to number form) and qualitative (non-numerical data) the focus of which is to collect verbal data rather than measurements. Quantitative collection and analysis is used most frequently in pure science fields, while qualitative
collection and analysis is frequently used in the social sciences (Shuttleworth, 2008). For this research study I will be using both qualitative and quantitative collection and analysis.

**Qualitative collection and analysis.** My initial data collection efforts were qualitative for the examination of the geographical characteristics and recreational/adventure programs of the participant nature centers. I examined the websites of the individual nature centers in order to first determine which centers offer home school programs. Once this was completed, I used their web-sites to collect the geographical characteristics and recreational/adventure data. Furthermore, I did a physical evaluation of the information provided by personally visiting each facility. Additional collection efforts were done by interviewing the naturalists who coordinate the centers home school program.

**Quantitative collection and analysis.** I examined the websites of the individual nature centers to first determine which centers offer home school programs. As a follow-up, I called the nature center to verify the accuracy of their web-site. This procedure is necessary to insure that valuable data is not lost. Once this was determined, I did a survey of their individual home school programs by interviewing the naturalist in charge of these programs. (See Appendix J: Questions on a Nature Centers Homeschool Program). The quantitative analysis was conducted once all relevant data, both qualitative and quantitative, is complete. The initial analysis was done in absolute numbers, with more advanced inquiry to follow.
**Human Subjects Review.** The purpose and benefit of this study is that since little if any research has been done concerning my thesis topic; nature centers that have home school programs will be able to obtain a quick reference guide to teaching this age group about environmental science. Additionally, public and private schools would also be able to incorporate the identified best practices in their curriculum. The nature centers that were involved in this study were those which are located in the seven counties under the policy-making body guidance of this Upper Midwest state’s Metropolitan Council and provide home school programs. The Metropolitan Council’s governing authority was used only as a way of limiting the geographical area of the proposed study. In this case, that geographical authority includes a seven county area surrounding a large metropolitan area in the Upper Midwest.

I randomly selected those nature centers which provide an on-going home school program, or which have a line item in their budget for home school revenue. Furthermore, the nature centers involved were for day use only. These interviews were conducted at the each nature center which met the sample criteria.

Specifically, I conducted personal interviews with the environmental education practitioners at the selected nature centers throughout the studies range. These interviews were done only with adults and no children were involved in this study. There was little to no risk for the environmental educator who chose to be interviewed. All results will be confidential and anonymous. Participation in the interview was voluntary, and, at any time, you may decline to be interviewed or to have your interview content deleted from the capstone without negative consequences. The interview recordings used hand written notes and the names of the participant(s) or the nature center were not used. Additional
questions were presented and examined based on participant responses. Pseudonyms for
the nature center and participants were used. I coded the interviews responses based on
the nature center, not on the individual educator. Upon completion of the study, all
interview written notes/documents will be destroyed.

I obtained consent from the individual nature center prior to interview
participation, and the signed Intent to Participate form were collected when I interviewed
the selected practitioner. The questionnaire (See Appendix J), Site Permission Letter,
Informed Consent to Participate in Qualitative Interview, and Letter of Informed
Consent Requesting Permission of Adults to Take Part in Research (See Appendix T.)
were all sent to the nature centers prior to the interview being conducted.

On 10 August, I spoke with Dr. Vivian Johnson, Chairperson of the HSC
Committee. She advised me that I could speak with the nature centers in the research
subject area in order to determine which centers had home school programs. The date and
the documents that were sent to the nature centers and their responses were entered into a
master event log.

Since this area has one of the highest concentrations of nature centers in the
country, the data collected should be a contribution to the environmental education field.
My research included the geographical characteristics of the nature center (land mass,
wetlands [if available], ease of access to the center, etcetera); available recreational and
adventure programs (canoeing, snowshoeing, hiking, bird watching, and the like); and
home school programs (number of classes conducted; methodologies used; average
number of participants by age, number of home school groups attending, etcetera).
On 3 October 2016, I was notified by Dr. Vivian Johnson on behalf of the Human
Subjects Committee, that they were pleased to inform me that my application was fully
approved and that I was now able to collect data related to my capstone. (A copy of this
approval is in Appendix U.)

**Appropriateness of Research Methodologies.** In his article entitled: “Research
Methods: An Overview”, Eric Anderman discussed the strengths and weaknesses of
various research methodologies. (See Appendix I.) A brief summary of these
methodologies follows. Correlational Research is the quantitative study of variable
relations, even though the cause and effect relation cannot accurately be determined. This
is not a viable methodology for my study since the number of variables are too numerous
and diverse. Likewise, Experimental Research, although the most scientifically accepted
method, is not viable either because this method requires the absolute control of
randomly assigned experimental and control groups; and the time required is beyond the
scope of this study. Quasi-Experimental Research which is used often in educational
research, is also not a viable method for this study because I do not have enough
information on the home school students to statistically control the experimental
variables; random assignment of participants is not possible given the geographical and
fluid nature of the participants; and the amount of time to conduct this type of analysis is
prohibitive. Longitudinal and Cross-sectional Research methodologies are often used in
educational studies that focus on developmental issues and changes over time. I
dismissed these methods since time is an important factor in this type of research. I also
rejected conducting Design Experiments, because my focus is investigating generalized
best practices as compared to examining the implementation of the effects of educational
interventions in actual classroom. This type of inquiry also requires that continuous analysis and changing the intervention parameters, which are then re-evaluated, and the cycle is repeated (Brown, 1992). Likewise, I dismissed Microgenetic and Single-Subject Research studies, because of the inordinate amount of time involved, and, more importantly, my focus is on a generalized approach, not a single individual (Anderman, 2009).

Consequently, I decided on a hybrid of Action and Qualitative Research that is conducted by teachers and examines their own practices using a holistic approach to naturalistic settings. This hybrid, or mixed method, research is appropriate because environmental science is a multifaceted and complex subject. Despite the challenges of this inquiry procedure, I believe it to be the most appropriate given the participants involved.

Summary

In this chapter I have outlined the rationale for conducting a hybrid of Action and Qualitative Research methodology. The data will be collected using surveys of the selected nature centers educational, recreational and geographic characteristics. Further analysis of best practices will be gained by interviewing the environmental education practitioners at the randomly selected nature centuries located in the metropolitan area of an Upper Midwest area. A key component of the selected nature centers was the programs involving home school students at a day use facility and/or those that depict a budgetary line item for home school revenue. This hybrid, or mixed method, research was appropriate because environmental science is a multifaceted and complex subject.
In chapter four I have documented the research I conducted and the data obtained. Additionally, analysis was conducted and presented using both qualitative and quantitative methods in order to assess what are the best practices for teaching environmental education to elementary aged home school students at nature centers located in this large metropolitan area in this Upper Midwest region.
Chapter Four

Results

Research Question: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?”

Background Information of this Study

This study encompassed the nature centers that are located in the seven counties under the policy-making body guidance of this Upper Midwest state’s Metropolitan Council and provide home school programs. There are twenty-one facilities within this geographical area that are categorized as nature centers. Therefore my first task was to identify which facilities were in fact nature centers in accordance with the guidance of the Association of Nature Center Administrators. This Association noted that a nature center is a designated community space where trained professionals guide and facilitate visitors in their exploration of the natural world, and in developing a relationship with nature. Additionally, this experience should subsequently foster a sustainable connection between the people of the community and their environment (Association of Nature Center Administrators, 2005-2016). In applying this definition, I concluded that there were sixteen facilities which met this interpretation. The remaining five facilities were wildlife refuges or rehabilitation centers; scientific research study and educational programming facility; or an outdoor discovery center. The second qualifying consideration was to determine which of the sixteen nature centers currently offer homeschool programs. This information was obtained by telephoning the centers and
asking about their homeschool programs. Of these, nine have home school programs; five do not currently have home school programs; and the remaining three I classified as undetermined since no response was received.

Upon receiving approval from the Hamline Human Subjects Committee, I conducted interviews with environmental education practioners at five of the nine nature centers that currently offer home school programs. These interviews were done only with adults and no children were involved in this study. Since this area has one of the highest concentrations of nature centers in the country, I randomly selected those nature centers which provide an on-going home school program, or have a line item in their budget for home school revenue; and are for day use only. These interviews were conducted at the each nature center which met the sample criteria. In this respect, the investigation is random and based on a quantitative selection process. Furthermore, interviewing and examining these five nature centers gives a completion study of 56%; significantly more than is required for an adequate study.

The Characteristics of the Nature Centers in this Study

My research included the geographical characteristics of the nature center, their available recreational/adventure programs, and home school programs. In regard to home school teaching assets for best practices, factors such as available animal exhibits/dioramas, animal mounts, and live animals available; land mass; wetland type and expanse; proximity to rivers and streams; the watershed of the area, and prominent geological features were examined. All these features contribute to an expansive, interesting, informative, and fun learning experience. Their collective impact stimulates each of our senses and results in an experience of the awe of nature. A significant advantage of home
school participation at a nature center is that the naturalist leading the exploration can use the natural world as the learning environment with minimal preparation of the physical features. This instructional feature is supported by the research done by Dr. Montessori concerning a prepared environment. A teacher’s role is to prepare the learning environment so children can experience learning stimuli on their own. The learning environment is arranged in an orderly format that emphasizes active learning through exploration, freedom and movement (Kreider).

My findings will be presented by individual nature center. However, since all results are confidential and anonymous, pseudonyms for the nature center and participants will be used. This portion of the study will give an overview of each of the individual nature centers specific learning environments. However, it will not be a listing of all of the specific activities offered at the location. (A comparative analysis of these offerings and geographical characteristics for the specific center can be found in Appendix K.)

**Whiskey 1 Nature Center.**

**Characteristics of Whiskey 1 Nature Center.** Whiskey 1 Nature Center is a unique entity in that it encompasses some 725 acres over a two state area separated by a major river. It is a private, non-profit natural preserve and educational facility established by an endowment. This facility has over six miles of trails for exploration; an apple orchard; access to a major river; maple trees for harvesting sap for maple syrup production; and a wetland for educational programs. Since the nature center has extensive open space, it offers some unique programs available which includes bird banding and an annual raptor
release. In addition to the previously noted events, activities also include snowshoeing, birding, mapping classes, boating and picnic areas.

Whiskey 1 Nature Center area includes a deciduous forest, oak savanna, restored prairie, and a pine plantation. It also provides a river overlook, ravine lookout and educational docks at the wetland and the river. Non-administrative buildings available include a visitor center, interpretative center, apple shack, farmhouse, pavilion and trailside lodge.

The interpretive centers primary use is for educational programs. It has many wildlife mounts and animal artifacts for educational use as well as for exploration. One of the features that I thought was really beneficial was a wall sized calendar (approximately ten by nine feet) of the current months phenology events.

The visitor center allows guests to explore numerous natural area dioramas, live animal exhibits, purchase educational and souvenir items, snacks and program information. This building can also be used for small group gatherings and is an ideal place for home school parents to talk while their children are in class.

**Home School Programs at Whiskey 1 Nature Center.** Whiskey 1 Nature Center has been conducting home school programs for at least thirty years. The program offering include both public and private (cooperative home school groups) classes. Public programs are currently offered twice each year. Each public offering is available for age ranging from five-to-nine year olds, and from ten plus years old. The topic for the class is the same for each season, but the content complexity is varied based on the age of the students.
Private programs require a nine month commitment and are taught once each month with the number of different classes ranging from six to nine; depending upon the needs of the home school cooperative.

The home school programs at Whiskey 1 Nature Center are developed with an overarching annual theme and individual classes are subsequently written based upon the annual orientation. Each class will last from an hour and one-half to two hours depending on the age of the students. The classes have a written format and are in compliance with the Teacher Naturalist Guide which specifically references the state’s educational standards (Petersen, 2014). There is currently one educator that was previously a licensed teacher.

To insure that classes are effective, the environmental education practioners do an assessment after each class. Evaluations are also done by the home school parents, but the responses are limited. Home school parents can participate in the instruction, but most do not. Many elect to drop-off their children at the nature center for the duration of the program. In the event that younger siblings are in attendance, or that the conversations of the parents become disruptive to the learning, they are notified that the visitor’s center is available for the younger children to explore and for the parents to converse. As a point of reference, the fifteen year annual average attendance for home school programs is approximately 2.5% of the population of public and private school students in grades kindergarten through twelfth grade that participate in school programs at Whiskey 1 Nature Center. From a budgetary stand-point, the monies collected for home school programs are not a separate line item, but are included in the general program funds. (A
summary of Whiskey 1 Nature Center’s homeschool offerings for a thirteen year period can be found in Appendix L.)

**Best Practices at Whiskey 1 Nature Center.** The program manager stated that the best practices for this student population were for the students to: 1) Receive accurate scientific information; 2) Have fun; 3) Feel safe outside; 4) Build awareness and knowledge of the environment and the issues concerning it’s protection; 5) Become better stewards of the environment; and 6) Spend the majority of class time outside.

**Alpha 1 Nature Center**

**Characteristics of Alpha 1 Nature Center.** Alpha 1 is a nature center located on a peninsula nestled in the woods with access to a chain of lakes encompassing 5500 acres. It is home to a large diversity of plant and animal life; which can be found in the wetland areas, wooded forests and a restored prairie. Visitors can hike the easily accessible, self-guided trails to explore and learn. Children can use the natural play area which provides a safe outdoor space for exploration and developing a connection to the natural world. The interpretive centers building is a two-story structure which has a large display room with numerous animal artifact mounts for visitors to examine and explore; two classrooms which are equipped with video and Smart-board capability; a library/conference room; a large multi-purpose room, equipped with a serving kitchen; an inside viewing room for observing the wildlife; and a “Touch and See “ room designed for young children to read, do puzzles; crawl through a replica beaver lodge, or explore the four live animal exhibits along on wall. Some of the program offerings include snowshoeing, fishing, Nordic walking, canoeing, biking, bird watching, and maple syruping.
My visit to the Alpha 1 Nature Center afforded me an opportunity to hike some of the trails where I noticed numerous educational signs to educate visitors on the diversity of the plant and animal life. Additionally, I observed a live red-tailed hawk on display that I later found out is used for educational programs. I also walked to a dock where students were actively engaged in a pond study by using dip nets to capture, explore and learn about the many invertebrates that make their home in this wetland. By examining these animals, a person can determine the biological health of the body of water and gain a sense about the affects pollution has on the wildlife. These resources can easily be used to teach homeschoolers about environmental issues.

**Home School Programs at Alpha 1 Nature Center.** Home school programs have been offered at Alpha 1 Nature Center for the past thirteen years. Classes are taught twice per month for each of the separate three age groups (kindergarten to second grade; third to fifth grade, and sixth to twelfth grades) with an average of fifteen students per class. Classes are developed on an individual basis for each of the specific grade brackets, and include lessons which mirror state public school standards in regard to objectives, activities, supplies and concepts. Each class is approximately two hours in length. However, older students will be in class longer and lessons are developed using a scaffolding technique where the current lesson is built upon previous instruction and experiences. Higher level instruction may include activities such as crayfish or worm dissection. Curriculum and instruction of this type is in keeping with the tenets outlined in Dr. Benjamin Bloom’s Taxonomy (Using Bloom's Taxonomy as an Instructional Tool, 1996). Although the lesson plans incorporate state public school standards, the standards
are not referenced in the written plans. Classes are centered on instruction that is set primarily in an outdoor setting.

To insure that classes are effective, the environmental education practitioners do an assessment after each class. The home school parents are given the opportunity to do class evaluations after each session by using the on-line evaluation form on Survey Monkey. [Survey Monkey is a registered trademark, software data collection portal developed by Survey Monkey in conjunction with the Harvard Graduate School of Education and the U.S. Department of Education to create surveys for education that allows an organization or particular program to target organization improvements using high quality data. Furthermore, the survey may contain benchmark questions that allow an organization to compare its program to other similar programs or organizations. Survey development can be tailored to the homeschool parent(s) to solicit their feedback on the subject matter, their feelings and attitudes in regard to the effectiveness of the instruction or program (Survey Monkey, 1999-2016)]. The surveys were previously done using a paper evaluation form once a year. The use of this technology allows the educator to adjust and improve their instruction in a faster and consequently, more effective manner. Home school parents can participate in the instruction, but most do not. At present Alpha 1 Nature Center, does not have a current or previously licensed teacher on staff, and home school programs are not classified in their budget as a separate line item entry. (A summary of Alpha 1 Nature Center’s homeschool offerings for a two year period can be found in Appendix M.)
Best Practices at Alpha 1 Nature Center. The Interpretive Center Manager noted that the best practices for teaching homeschool student population’s, are those that offer a variety of programs that includes natural history, cultural history, and recreational activities. Each program must be centered on learning approaches that are open-ended, hands-on, and experiential. Classes should not be overly structured and incorporate activities that are done the majority of time outside. Feedback received from parents indicated that the programs they were most interested in where those that focused on activities that they could not do at home and using equipment that they may not have access to. Additionally, they were looking for fun, educational experiences that incorporated nature; and were not looking for science based topics to fill a void in their education at home.

Hotel 1 Nature Center

Characteristics of Hotel 1 Nature Center. Hotel 1 Nature Center is a 4900 acre reserve. Within its boundaries are four large lakes, two streams and numerous acres of ponds and wetlands. The park features extensive outdoor amenities, including a swimming pond, mountain biking areas, a winter recreation area, picnic facilities, cabins for rent, an amphitheater, orienteering courses, floating boardwalk, display gardens, and a pond observation blind. Trails are also numerous for a wide variety of activities which includes hiking (fifty-one total miles); biking/mountain biking trails (twenty-nine total miles); off-leash dog areas (twenty-two total miles); and horse riding trails (seventeen total miles). Winter visitors to Hotel 1 Nature Center can participate in such cold weather adventures as snowshoeing, cross country skiing, and downhill skiing. Years ago I enjoyed an evening cross country skiing on a brisk, snowy and occasional star lite night. Additional
exploration opportunities also include trail guide sheets, exploration kits, interpretive signs and cell phone audio stops. For the young people there is a Nature Exploration where children can let their imaginations become reality in the act of building forts, climbing logs or digging in the soil. Further interaction with nature is available at the nearby interpretive center.

The two-story, 14,000 square foot interpretive building at Hotel 1 Nature Center is on the floodplain of a nearby creek and ensconced in a sugar maple forest. Inside features include an open-air deck; a wildlife viewing area; numerous live animal exhibits; observation rooms, classrooms, and a secluded reading room. There is also an area where visitors can purchase snacks and beverages, apparel, and guide books. An additional education feature is the use of a great horned owl for various programs.

The use of raptors and other live animals is an outstanding educational feature because people have a close-up view of these animals. Presentations help educate about the characteristics, adaptations and benefits of these the animals and what the impact humans have on these animals as well. All these features contribute to exposing people to the awe of nature. As previously noted, awe, additionally, redirects the concerns a person has toward others and away from themselves. Research has shown that this state of awe is elicited by nature in approximately 75% of the time (Abrahamson, 2014).

**Home School Programs at Hotel 1 Nature Center.** Home school programs have been offered at Hotel 1 Nature Center since the year 2000. Classes are taught ten different times throughout the month in order to accommodate the various groups. At present, home school sessions accommodate two public programs and eight private cooperative home school groups. The program content is developed based upon the age of the
participants. Groups are divided into elementary and middle school, with the age ranges of six-to-ten, and eleven-fourteen, respectively. The elementary program has a five year rotation with classes developed around a particular yearly theme. The current five year rotational theme plan is as follows: Year One: Survival; Year Two: Geology; Year Three: Water; Year Four: Reptiles; and Year Five: Plants & Animals. (A summary of Hotel 1 Nature Center’s current class offerings can be found in Appendix N. Class descriptions for these offerings can be found in Appendix O.)

The middle school program takes a Citizen Science approach to instruction. Citizen Science is a growing activity where public citizens voluntarily participate in scientific research endeavors such as: formulating hypotheses, asking questions, collecting data, conducting experiments, monitoring events, and then sharing these finding with scientific organizations and/or universities (Cornell Lab of Ornithology, 2016).

The students participating in this program begin the year by selecting a particular scientific study or question that want to investigate. An example of such a study would be to research “How has buckthorn impacted Hotel 1 Nature Center?” The home school coordinator at Hotel 1 Nature Center shifted his instructional approach to a student driven format which empowers the student. He can than take an advisory role to assist and guide the students in their investigative procedures. Additionally, he acts as a liaison between the students and the scientific expert(s) that are also involved in the study. Citizen science curriculum and instruction which expands on previously acquired knowledge and skills, are in keeping with the tenets outlined in Dr. Benjamin Bloom’s Taxonomy (Using Bloom's Taxonomy as an Instructional Tool, 1996).
The average class size is seventeen students. Each class is approximately two hours in length. However, older students will be in class longer and lessons are developed using a scaffolding technique where the current lesson is built upon previous instruction and experiences. All classes have a standard written format which includes vocabulary, activities, games, learning stations, and a summary. The majority of the class time is spent outdoors and the lesson plans incorporate state public school standards. Instructors do an assessment for classes on a monthly basis. Parents are encouraged to do a monthly evaluation as well, but only about one-fourth responds. Hotel 1 Nature Center has a licensed educator presently on staff. There is a separate area for pre-Kindergarten siblings to play/explore during the instruction period. If a younger sibling wants to attend the session, they are welcome and the parent does not have to pay for the underage child. Students participating at a middle school level are generally dropped-off by their parents for the class session. Parents are welcome to assist with the various stations, but the home school coordinator stated that it is usually easier without parental involvement. The current home school coordinator at Hotel 1 Nature Center has been in the position for over four years and mentioned that the program has grown about 400% during that time frame due in part to an expanding growth in the area housing market. Additionally, the coordinator is a high school graduate of a home school program. The majority of home school programs are offered in the afternoon in order to accommodate the schedules of the public and private schools that have less flexible time frames for instruction at the nature center.

**Best Practices at Hotel 1 Nature Center.** The Home School Coordinator noted that the best practices for teaching homeschool student population’s in the age range of six–to-ten
years old, are those which offer: hands-on experiential learning; have a theme specific structure; incorporates time for individual exploration; structured so that the majority of class time is spent outdoors; includes a game related to the theme of the program; and incorporates vocabulary and science concepts.

The best practices for teaching homeschool student population’s in the age range of eleven–to-fourteen years old, are those which offer: a Citizen Science approach; are built on previous learning; and allow the students to choose the theme/project they will study over the upcoming months. The best practices for teaching the age range of six–to-ten year old homeschool student population are also used for this age group as well.

Considerations which should also be included are: to empower the student; help them make decisions; create a foundation to learn; and use an outdoor environment where the student can make a connection to nature. The Home School Coordinator at Hotel 1 Nature Center also presents a certificate to each student that attends at least six classes per year. This practice recognizes the student dedication and work, but also provides the documentation to the state board of education that specific subjects have been taught. On a final note, when the Creationist beliefs of a homeschool student is encountered, the easiest way to handle the situation is to let the student know that you are teaching from a scientific basis and that any questions that you have that contradict those teachings should be discussed with your parents.

**Hotel 2 Nature Center**

**Characteristics of Hotel 2 Nature Center.** Hotel 2 Nature Center has over 1000 acres of mature woodlands and prairies in their reserve. Within its boundaries are three large ponds, wetlands, and nearby lakes. The park features extensive outdoor amenities
including; a fishing pier; nature observation areas; biking trails; picnic facilities; cabins for rent; an amphitheater; a disc golf course; and boat launch area. The boat launch area is for non-motorized vessels, and visitors can rent kayaks, row boats and canoes. Winter recreation activities include snowboarding; alpine skiing; a ski jump; cross-country skiing; and snowshoeing. Miles of trails are available for a wide variety of activities which include hiking; biking; and on-leash dog walking. During my visit to Hotel 2 Nature I enjoyed hiking several of the trails and noticed osprey nest platforms, a bat house, and an outdoor nature exploration area. The two-story, interpretive building at Hotel 2 Nature Center has floor-to-ceiling windows, for enjoying the natural scenery, and the active bee hive. One of the first things that a visitor notices is the beautiful sculptures and vibrant mosaic tiles. Additional inside features include: a wildlife viewing area, numerous live animal exhibits; observation rooms, animal mounts, three classrooms, a puppet theater, and a secluded reading room. There is also an area where visitors can purchase snacks and beverages, apparel, and guide books. The center also has raptors for education various programs which currently include a red-tailed hawk and kestrel falcon. The use of raptors and other live animals is an outstanding educational feature because people have a close-up view of these animals. Presentations help educate about the characteristics, adaptations and benefits of these the animals and what the impact humans have on these animals as well. All these features contribute to exposing people to the awe of nature.

Hotel 2 Nature Center also uses solar energy as an alternative energy source by the use of a photovoltaic system which converts solar energy to electrical energy. This feature offsets about forty-five percent of the buildings electrical use from the local
power grid. This nature center is part of a larger park district and as such is in compliance with the district’s policy for natural resources managing and planning. An aspect of this policy is the 80/20 rule which ensures that eighty percent of the park reserve is restored or preserved to its natural state. This policy applies to native plant communities, water quality, and wildlife diversity.

**Home School Programs at Hotel 2 Nature Center.** Home school programs have been offered at Hotel 2 Nature Center for fifteen years. Classes are once a season, with three different classes offered each season for a period of two hours for each session. At present, home school sessions are public programs only. The age range for home school participants is from eight-to-twelve, and the average number of students in attendance per class is ten. The home school program has a two year rotation with classes developed around a particular seasonal theme. Last year the theme series included: Wetland Series; Alternative Energy Series; and Bird Series. Series currently under development/offerings include: Ecology Series; Environmental Scientist Series; Cultural resources Series; and reptiles and Amphibian Series. (A summary of Hotel 2 Nature Center’s current class offerings can be found in Appendix P.)

All home school programs take a Citizen Science approach to instruction. Citizen Science is a growing activity where public citizens voluntarily participate in scientific research endeavors such as: formulating hypotheses, asking questions, and doing research. This instructional technique emphasizes that lessons are developed using a scaffolding technique where the current lesson is built upon previous instruction and experiences. All classes have a standard written format which includes introduction with concepts or vocabulary, use of tools for research, a hike to a specific area of the nature
center in order to do hands-on, experiential learning activities, and completion of specific research requirements.

The majority of the class time is spent outdoors and the lesson plans incorporate state public school standards. Instructors do an assessment for classes on a monthly basis. Parents are encouraged to do an evaluation using Survey Monkey software. Hotel 2 Nature Center does not have a licensed educator currently on staff. There are two separate areas for siblings to play/explore during the instruction period. One is the creative play area where children have the opportunity to climb, swing, and slide on various equipment pieces. The other is the Nature Exploration Area for children to play/explore by building forts, digging in the soil, collecting leaves, and the like, during the instruction period. Parents are required to attend the program with their offspring.

**Best Practices at Hotel 2 Nature Center.** The Outdoor Education Supervisor noted that the best practices for teaching homeschool student population’s, are those that offer a variety of programs that includes natural history, cultural history, and especially focus on Citizen Science endeavors. Each program must be centered on learning approaches that are open-ended, hands-on, and experiential. Classes should not be overly structured, but have a specific theme and incorporate activities that are done the majority of time outside. However, classes should be demanding in content; include laboratory requirements and tools/equipment; to do various scientific activities flexible; be individualized. Additionally, the Outdoor Education Supervisor mentioned that it is important that the naturalist build relationships with the home school group.
Hotel 3 Nature Center

**Characteristics of Hotel 3 Nature Center.** Hotel 3 Nature Center is a city owned nature center encompassing 150 acres which includes a mixed lowland forest, cattail marsh, an oak savanna, and a restored prairie. There are over four miles of running and walking trails, and a floating boardwalk trail which crosses over the cattail marsh. All trails are handicap accessible. A picnic area, covered pavilion, one hundred seat outdoor amphitheater, rain gardens, a children’s nature play area, and numerous overlooks for wildlife viewing are a few of the outdoor amenities of this facility. Winter recreation activities include cross-country skiing and snowshoeing. During my recent visit to Hotel 3 Nature Center, I enjoyed hiking several of the trails and noticed a bat house; numerous mounted maps of the center to guide visitors on their explorations; signage noting city ordinances about wildlife feeding and Clean Water Land and Legacy Amendment restorations; and many piles of buckthorn that had been pulled to control the spread of this invasive species.

The interpretive building at Hotel 3 Nature Center has floor-to-ceiling windows, for enjoying the natural scenery, and the active bee hive. Additional inside features include: a wildlife viewing area, numerous live animal exhibits; observation rooms, animal mounts, classrooms equipped with a wood burning fireplace, and a puppet theater. There are also several wall-mounted videos displays where visitors can learn about natural history subjects such as buckthorn, cross-country skiing, and prairie restoration through the use of controlled burns. Of particular note, is a state-of-the-art bird identification station where visitors can input data to see when a particular bird was last seen at the Nature Center, what it looks like, and be able to listen to its call; as well as
general information about the animal. There is also an area where visitors can purchase items such as: maple syrup, coffee cups, apparel, and guide books. Hotel 3 Nature Center also uses solar energy as an alternative energy source by the use of a photovoltaic system which converts solar energy to electrical energy. This feature offsets the building's electrical use from the local power grid.

The Center’s live animals in display exhibits are also used for various educational programs. The use of live animals is an outstanding educational feature because people have a close-up view of these animals. Presentations help educate about the characteristics, adaptations and benefits of these the animals and what the impact humans have on these animals as well. Some of the programs available include: an adult environmental book club, maple syruping, apple cider making, birdwatching, and making your own snowshoes, to name a few. All these features contribute to exposing people to the awe of nature.

**Home School Programs at Hotel 3 Nature Center.** Home school programs have been offered at Hotel 3 Nature Center for over twenty years. Classes are taught twice throughout the month for one public program and one private cooperative home school group; and each class is approximately two hours in length. The Home School Coordinator stated that the only variation in class content would be in specific activities, since the ages are consistent. Program attendance is for elementary aged students; with an average attendance of fifteen students. Each elementary program has a five year rotation with classes developed around different animals and animal adaptations, natural history events; physical sciences and outdoor skills development. (A summary of Hotel 3 Nature Center’s five year rotational class offerings can be found in Appendix Q.) All classes
have a standard written format which includes vocabulary, activities, games, learning stations, and a summary. Lesson content is planned and incorporates state public school standards, but the specific standard is not referenced in the written plan. Homework, or additional learning activities, are given for each session, so in this regard, lessons are developed using a scaffolding technique where the current lesson is built upon previous instruction and experiences.

Teaching methods emphasize inquiry based, experiential learning where opened inquiry is fostered. The majority of the class time is spent outdoors and hands-on, physical activities with movement are encouraged. Instructors do an assessment for classes on a monthly basis. At present, lesson evaluation from parents is not done; although this feedback was solicited previously from the Nature Center’s staff. Hotel 3 Nature Center has a previously licensed educator on staff. There is a separate area for pre-Kindergarten siblings to play/explore during the instruction period. If a younger sibling wants to attend the session, they are welcome and the parent does not have to pay for the underage child. Parents assist with the various stations, but the home school coordinator does the formal instruction.

The Nature Center’s Director and the Home School Coordinator both acknowledged that home school programs require more flexibility. By and large, homeschoolers are well behaved. However, since they spend most of the day with only their parents, the normal socialization protocols that exist in public/private schools needed to be developed. An example of this socialization protocol would be the raising of your hand indicating you have something to contribute and that you need to be called upon prior to speaking. Along this same avenue, students at times need to be reminded
that a sitting position needs to be maintained during instruction, and that it is not okay to lie down during this time frame.

Another aspect unique to home school students is that your activity preparation and explanation time is longer. Public/private schools students are familiar with such activities as forming a line or sitting in a circle; whereas, home school students usually need additional time to execute these procedures. With a longer time period between instructions, sessions are similar to a summer camp experience in that icebreaker familiarization activities are usually done at the beginning of each class. Additionally, this longer time period also contributes to the recession of the instructor being a central figure in the learning process students, which also adds more time in the settling down time for the students. These attributes are more frequent with public home school programs, than those programs attended by home school cooperatives, since in a cooperative; the students interact with one another on a more frequent basis.

**Best Practices at Hotel 3 Nature Center.** The Nature Center’s Director and the Home School Coordinator both noted that the best practices for teaching homeschool student population’s, are those that offer a variety of programs that includes natural history, cultural history, and are fun. Each program must be centered on learning approaches that are open-ended, hands-on, and experiential. Classes should not be overly structured, but have a specific theme and incorporate activities that are done the majority of time outside. The uses of games, (especially those that they can later play at home) which reinforce the curriculum content material for the day, are also beneficial. However, classes should also incorporate student choices in regard to the particular lesson.
For instance, the naturalist has developed a marsh study program and in this context the students can have a choice in activities which could include: observing the marsh and writing a poem or drawing a sketch of the marsh; doing a scientific study of either the invertebrates living in the pond, or the examining the chemical indicators of a healthy pond by sampling then water; or doing a survey of the wildlife living near the pond. By fostering choices, the instructor is able to appeal to the students own experiences and curiosity. In either case, it is important to develop lessons which incorporate multi-subject activities, create an experience the students can relate to; develop a connection to the role of a citizen scientist, and an ownership to the natural community and the responsibilities humans have to protect these resources, because we are all interconnected to each aspect of the environment. Most importantly, presenting choices will foster inspiration and an awe of nature.

The above noted activities are in direct correlation with two of the educational tenets for teaching children, as noted by Dr. Montessori. These two tenets are a prepared environment and autoeducation. Amplification of these tenets is as follows: a) prepared environment. A teacher’s role is to prepare the learning environment so children can experience learning stimuli on their own. The learning environment is arranged in an orderly format that emphasizes active learning through exploration, freedom and movement. b) Autoeducation. This is the term Dr. Montessori used to describe self-education when children are allowed to participate in an active and prepared learning environment (Morrison, 2014).

Further justification for these educational protocols was noted in research conducted by David Sobel (1996) and separately by Dr. David Orr. David Sobel, in his
book, *Placed-Based Education*, (page 20) stated: “My own research in the development of children’s relationship with nature resonates with Orr’s contention that there is a sensitive period during the elementary years when children are predisposed to bond with the nearby natural world” (Sobel, 2005).

**A Summary of Best Practices.**

The study I conducted involved interviewing and examining five nature centers located in a large metropolitan area in the Upper Midwest in order to ascertain the best practices for teaching environmental education to elementary aged home school students. My investigation was guided by the formulation of specific questions which would directly reveal the best practices to employ. These questions served as my inquiry base for the interviews that were conducted at the nature centers meeting the parameters of the study. The questions also framed and assisted in the discovery of what the best practices are for meeting the needs of this student population. Studies of this magnitude result in the collection of a significant amount of information which can be hard to analyze in written form. Therefore, I have consolidated the responses to the research study questions by nature centers in Appendix R. I will discuss in detail the results of this study and also present some considerations for those nature centers contemplating teaching this audience.

**Class Composition.** The ideal class size should be no more than fifteen students and last two hours. From personal experience and in discussion with other naturalists, fifteen students is the preferred maximum for class room management, safety; and conducting outside exploration or experiments. A two hour class period provides an ideal amount of time to complete the necessary content introduction, outside activities, and review time.
This time frame is directly proportional to the three hours that home school students receive on an average daily basis; and also provides students with more one-on-one instruction, which is a facet of homeschooling that Lee (1994) noted in his research (Murphy, 2012).

Another aspect of this student population is that by its very nature homeschoolers, spend more time being instructed by their parents and consequently, need practice in group socialization skills. This learning process in manifested in generally needing more time getting in place for group activities; understanding group management protocols like raising their hands and waiting to be called on; or not lying down on the floor during instruction. These activities take more time and consequently, are an augmented learning activity which is concurrent with the content being presented.

The age differentiation is also another aspect of home school programs. Ideally, it would be best to teach groups that are chronologically cohesive. The best practice would be to teach the seven-through nine year olds separately from the ten-twelve year old students (Cherry, 2005) (Gesell's Spiral, 2010) (Piaget's Stages of Cognitive Development Chart). This is not always feasible because often there are siblings attending class at the same time, or the number of students enrolled in the program does not warrant separate classes. Another consideration is for younger sibling that will sit in on class, but participate on a limited basis. Younger siblings in attendance are usually not an issue. However, if their presence is a disruption for the class, than there must be a separate area for the parents to take their child.

This is another best practice: Have a separate area for younger children to be actively engaged while their siblings are participating in class. The ideal situation would
be to have an indoor and outside area where children can explore and learn. An area
which includes live animal exhibits; animal mounts, artifacts and pelts; books, puzzles,
puppets, and other activities, helps to the younger child to experience the awe of nature
and to learn as well. A report by the National Wildlife Federation, *Back to School: Back
Outside*. This report demonstrated that time spent outside in conjunction with education
correlates to far-reaching academic benefits such as: higher scores on college entrance
exams; improvement in school behavior; and contributed to an increase in students desire
to learn (Lipman, 2010).

Learning distractions are not only shown by younger siblings, but parents as well.
These class periods can be a rare time for parents to interact on both a professional level
as well as a social level. These activities are fine, but when they disrupt the learning
process, they need to be addressed. Consequently, another best practice is to have an area
separate from the class where parents can converse. Additionally, it is best to let the
environmental educator conduct the class because it will solidify their role as the central
teacher for this period of instruction, as well as help to develop their relationship with the
students. Most teacher enjoy being around students; if they did not, than they would not
teach. In fact, this is an essential element for a productive educator- a teacher must like
their students. If an educator does not enjoy being around young people, then they are in
the wrong profession. These essential points, when combined, become a force which will
elevate not only the performance of the instructor, but the pupils as well (Highet, 1989).
Parent should assist in the indoor activities and the outdoor portions that the naturalist
directs.
The Majority of Class Time is Outdoors. This is the most important best practice that nature centers offer students. Appendix K details a comparative analysis of the characteristics and offerings that the selected nature centers studied have available. This comprehensive listing is however, in no way complete. The possibilities of study in each of these immense laboratories for exploration, adventure, and learning are immeasurable. As an example: if a naturalist was to develop a home school program whose theme was “Life Under a Log”; a person could spend hours discussing and exploring this vast microcosm of life; by the salamanders that live there; the insects and other invertebrates that decompose the wood; what the chemical composition of the decaying wood and soil are; the length of time it takes to decompose; and what other birds and animals aid in the decomposition process; to name a few studies available. This is why the majority of class time must be spent outside, regardless of the weather.

It was previously noted that time spent outside in conjunction with education correlates to far-reaching academic benefits (Lipman, 2010). When children are taught to respect and care for their environment, they will develop a protective attitude toward nature. Furthermore, experiential learning where a child uses all their senses in exploring and manipulating the elements of the natural world, intensifies a child’s desire to experiment, and inspires them to learn more (Wilson, 2005).

Within the context of outdoor activities is the use of lessons that take a Citizen Science approach to instruction; whereby students (citizens) voluntarily participate in scientific research endeavors. Such participation empowers the students; develops a sense of ownership to the natural community; and the responsibilities humans have to protect these resources. This environmental connection and subsequent protection of our natural
resources cannot be emphasized enough. Public Law noted several Congressional findings such as: threats to human health and environmental quality are increasingly complex; evidence of international environmental problems, such as global warming, ocean pollution, and declines in species diversity is expanding and documented; that these environmental problems represent a significant threat to the quality of life, economic vitality and the natural balance of urban and rural areas (Congress, 1990). Furthermore, outdoor education is mandated by Federal Law (Congress, 1990) and (Reed, 2015).

**Class Content, Format and Evaluation.** First and foremost, each lesson must be planned with contingency plans noted in the event of unforeseen circumstances. Alan Lakein once stated: “Failing to plan is planning to fail” (Lakein). Additionally, your lesson plan must be detailed and written. Lesson plans should include, but are not limited to the following: learning objectives, vocabulary noted, inside and outside activities, materials and equipment, time estimates for each facet of instruction, state educational standards noted, and a summary. Developing individual lesson plans takes a significant amount of time. However, by modifying an existing plan and adjusting the content to your specific nature centers assets; an environmental educator's planning process is more effective.

Another component of your planning process would be to develop a seasonal, yearly, or multi-year subject plan. In so doing, the instructor can link each specific lesson to the over-arching content plan. This allows students to develop connections to the particular theme as a whole; as well as, learning about the components that contribute to the larger and more encompassing theme. Although having a previously or currently
licensed teacher on staff is not necessarily a best practice per se; it can add additional depth to the planning and instruction process. Environmental educators are trained professional. As a note, additional studies conducted by Ray (2009a, 2010), identified that approximately 10% of the parent were, or ever had been, certified. Additionally, research has shown that licensed teachers impact student learning and achievement more than non-certified teachers (National Board Certified Teachers).

Being a teacher is a unique profession which requires a vast array of skills, and those skills need to be readily accessible at any given moment. That being stated, the essentials which will guide an individual in becoming a good teacher are few. The first essential is that a teacher must be well versed in their subject matter. This is an on-going process and will continue through-out an educator’s career. The second essential is that a teacher must not only enjoy the subject they are teaching, but must have a passion for learning as much as they can about it (Highet, 1989).

Essential skill #1 for a good environmental educator is to be well versed in your subject matter. The cornerstone to successful teaching is an in-depth knowledge of the subject you are instructing. Furthermore, to understand your field, continual study of that field is imperative. This deep knowledge base gives you flexibility when you are given a “teachable moment” opportunity (Paton, 2011).

Essential skill #2 for a good environmental educator is to have passion for your subject and enjoy teaching it. Environmental science is a multi-disciplined endeavor; where the natural world intersects with the needs and wants of mankind. To be a teacher of environmental science, an instructor must also be student. Likewise, the teacher must
be excited about connecting those skills to their application in the “real-world”. In so
doing, students will learn how to collect data; evaluate the data by using technology; and
present their findings to students as well as community members (Elliot, 2007).

Another very important aspect of the lesson planning process, and consequently a
best practice, is to incorporate an evaluation component to your planning. In his article,
Why is Assessment Important?, G.S. Morrison stated: “All of your assessment decisions
taken as a whole will direct and alter children’s learning outcomes” (Morrison, Why is
Assessment Important?, 2010). At a minimum, this would include an assessment by the
instructor(s) on the effectiveness of the lesson plan and should be done shortly after the
lesson was completed in order to capture the data. This evaluation could be a formal or
informal process, however, it should examine all phases of the lesson and the
recommended adjustments noted. I would also recommend giving the parents an
opportunity to give their input into the lesson process as well. In so doing, you will be
able to assess your client’s needs and wants. This evaluation could be a formal or
informal process as well. I would recommend that the process be written, either via
paper, e-mail, or an on-line survey such as Survey Monkey.

On a final note, I would present to the home school students a certificate of
completion when a specified number of instruction periods have been attended over the
course of the season or year. This simple and inexpensive action gives the students a
sense of recognizable achievement and provides the parents with documentation of
specific course requirements if such documentation is required by the state.
Summary.

In this chapter I have documented the research I conducted and the data obtained. Additionally, analysis was conducted and presented using both qualitative and quantitative methods in order to assess what are the best practices for teaching environmental education to elementary aged home school students at nature centers located in this large metropolitan area in this Upper Midwest region. The hybrid, or mixed method, research was appropriate because environmental science is a multifaceted and complex subject. The criteria for a nature center to participate in this study was that they currently offer program(s) involving home school students at a day use facility and/or those centers that depict a budgetary line item for home school revenue. The data was obtained by physically visiting, observing, and hiking the facilities at the selected nature centers. Additionally, I interviewed and discussed the best practices for teaching this student population with those environmental education practitioners at each of these sites. As a starting point, each nature center was sent an advance copy of the interview questions. These questions served as my inquiry base for the interviews that were conducted at the nature centers meeting the parameters of the study. The questions also framed and assisted in the discovery of what the best practices are for meeting the needs of this student population. The examination of five nature centers within this geographical area was significantly more than is required for an adequate study. In fact, the research conducted has a completion study of 56%. Additionally, the best practices which I have noted are supported by the literature review documented in Chapter 2.

A consolidated summary of the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large
metropolitan area in the Upper Midwest is shown in the responses to the research study questions by nature centers in Appendix S.

In chapter five I have documented the conclusions of my research. I will review the new connections to the literature review, and document the relevance of the research conducted. Furthermore, I will address the possible implications of this study; its influence on policy implications; possible future studies related to the research question; and the limitations of the study. Additionally, I will address recommendations based on the analysis that was conducted and how this research can best be communicated.
CHAPTER FIVE

Conclusions

Research Question: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?”

Introduction

For the past six years I have been directly involved with teaching environmental education to elementary, and to a limited extent, middle school aged home school students at nature centers located in a large metropolitan area in the upper Midwest. These past years have been a developmental period for me, both personally and professionally. I have come to realize that the field of environmental science is a multi-disciplined endeavor; where the natural world intersects with the needs and wants of mankind. A particularly important perspective of environmental science is in the study of the effects that mankind has on the natural world and what the consequences are for all the stakeholders, both in the long and short term. Environmental education is therefore the exposure to issues involving our environment, and effects of improper/mismanagement of natural resources. Therefore, the study of environmental topics and an understanding of the interrelated effects of the natural world and the wants/needs of humans are critical for an informed citizenry. Students must be prepared for their eventual role as an informed citizen in regard to political, economic, science and various social sciences aspects concerning economic development and governmental policies. This type of instruction is best started at a young age in order to develop citizen scientists capable of evaluating complex issues. My research into the home school
microcosm of our educational system has been validated by showing that this instruction can best be learned at a nature center where students are directly exposed to the interaction of these competing resources.

**Research Rationale**

This compilation of experience and education has lead me to undertake the thesis and research question of: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?” This question can only be adequately answered when the opinions, feelings, beliefs, and experiences of stakeholders are explored. Stakeholders involved in examining the above stated question includes, but is not limited to, nature center educators, parents, students, families and educational policy makers. It is important to evaluate the research that has been done previously in order to insure that best practices are being used. An old adage states: that you cannot know where you going, until you know where you have been. I personally believe that this is always a good starting point, not only for evaluative purposes, but also for curriculum and instructional development as well. In our current age of advanced information technology, data, lesson plans, images, movies, documents and the like are readily available in a matter of minutes. However, this information is not always in keeping with best practices for your specific student population. I have found that libraries are still an essential part of any research because not all information is on the internet. In conjunction with these resources, it is essential to include experiential, hands-on learning in an outdoor setting.
In this chapter, I will revisit the literature review and review the new connections to the literature; document the relevance of the research conducted; address the possible implications of this study; examine its influence on policy implications; present possible future studies related to the research question; and the limitations of the study. Additionally, I will address recommendations based on the analysis that was conducted and how this research can best be communicated.

**Literature Review.**

In this section I will present the literature that was pertinent to my understanding of the study of environmental education. The examination of literature related to my research topic was extensive and enlightening. I found that each of the facets is a piece of a puzzle, that when joined, the picture becomes one and is therefore more easily understood. The connection is more circular then linear, but the end result is the same. I will not be covering in detail the circumstances which predicated a particular action, rather I will concern myself with the major issues from which the resultant event occurred. A few of the topics and themes related to the need for environmental education included: educational psychology as it applies to elementary school aged children; issues concerning environmental education; current analyses of environmental education; federal and state requirements as they apply to environmental/outdoor education, and the need for outdoor education.

**Educational Psychology**

In this section I examined the research of several noted educational and child psychologists. This review emphasized to me the importance for an educator to have a working knowledge of the developmental stages of children, both physically and
psychologically, and how imperative it is in order to develop an effective method of instruction. Without such an understanding, an instructor cannot hope to aid in the effective development of young minds, adequately challenge these students, or keep them from being bored by material that is too elementary. Students develop at different rates, and each individual is unique, however, the research presented will validate that a relative norm exists given a child’s intelligence, mental maturation, and physical development. Included in my examination were studies conducted in the fields of child psychology, education, natural and environmental science, by researchers which include, but are not limited to, Jean Piaget, Erik Erikson, Benjamin Bloom, Maria Montessori, Carl Rogers, and David Orr. Of these noted researchers, the one that made the greatest impact for me was Dr. Maria Montessori.

Dr. Montessori emphasized several educational tenets for teaching children, particularly those in early childhood. The tenets that I felt were most applicable to education at a nature center were: a) Absorbent mind. This tenet states that children are naturally curious and in so doing educate themselves by being guided in a nurturing environment; b) Prepared environment where a teacher’s role is to prepare the learning environment so children can experience learning stimuli on their own. The learning environment is arranged in an orderly format that emphasizes active learning through exploration, freedom and movement; and c) Autoeducation which is the term Dr. Montessori used to describe self-education when children are allowed to participate in an active and prepared learning environment (Morrison, 2014).
New Connections to the Literature.

As I conducted my literature review, it became readily apparent to me that the amount of new literature and research being conducted which is directly related to environmental education is immense. The following recent documents which emphasize the need to have learning opportunities in an outdoor environment were astounding to me personally. The first was an article by Ms. Susan Sachs Lipman which summarized a report by the National Wildlife Federation, *Back to School: Back Outside*. This report demonstrated that time spent outside in conjunction with education correlates to far-reaching academic benefits as noted: Increased performance in core academic subjects; reduced Attention Deficit Hyperactivity Disorder; contributed to the demonstrated academic performance of under-resourced students in a significant and positive manner; scores on college entrance exams and standardized test increased; an improvement in school behavior; and contributed to an increase in students desire to learn (Lipman, 2010).

The second investigated a phenomenon categorized as “The Awe of Nature”. Humans are connected to the natural world and experiencing nature’s power, diversity and grandeur has been shown to have positive effects on them. This section will examine some of these effects and in so doing, emphasizes the need for all people to take a “nature break” daily.

When people encounter unexpected and dramatic stimuli, such as storms, canoeing in river rapids, or a traumatic personal event, the psychological state of awe can be manifested. This manifestation results in a reassessment of a person’s cognitive social models which subsequently results in actions that are more ethical and generous. Awe, additionally, redirects the concerns a person has toward others and away from
themselves. Research has shown that this state of awe is elicited by nature in approximately 75% of the time. Jake Abrahamson, in a recent Sierra magazine article (page 38) included the following quote by Dr. Dacher Keltner and Dr. Jonathan Haidt which appeared in the 2003 *Cognition and Emotion* journal: “Fleeting and rare, experiences of awe can change the course of a life in profound and permanent ways.” (Abrahamson, 2014).

Dr. Kaplan stated that in order to provide this restorative effect, the natural environmental properties, as follows, must exist. Soft fascination: where nature effortlessly seizes our attention; Being away: A condition where the natural world provides an escape from our normal routines; Extent: This is a feeling of environmental immersion; and Compatibility: This is the state when an individual not only wants the environmental exposure, but can appreciate it as well. Soft fascination is the most important property, while the other properties intensify or preserve the fascination. At present, support for the theory with empirical data is uncertain (Garside, 2016).

**Environmental Education is required under Federal Law.**

Additionally, On November 16, 1990, President George Herbert Walker Bush, signed into law the National Environmental Education Act (Pub.L. 101-619). Section 2 of this Public Law noted several Congressional findings such as: threats to human health and environmental quality are increasingly complex; evidence of international environmental problems, such as global warming, ocean pollution, and declines in species diversity is expanding and documented; that these environmental problems represent a significant threat to the quality of life, economic vitality and the natural
balance of urban and rural areas. Furthermore, United States policy concerning environmental education, as outlined in Public Law 101-619, states that educational programs at all levels must be established and postsecondary students must be encouraged to pursue careers related to the environment (Congress, 1990). Additionally, a more recent legal and societal event occurred with the Every Student Succeeds Act which was passed by the U.S. Congress in December 2015 and subsequently signed into law by President Obama. This bill included a key provision that will enhance environmental education programs in the United States. This provision was sponsored by Senator Jack Reed and Congressman John Sarbanes, and is also known as the No Child Left Inside Act (NCLI). A major component of NCLI Act is to permit school districts to integrate environmental education into their normal class programs, as well as their after-school activities, in order to foster a versatile education. It will enable students to learn about the environment in classroom and hands-on activities outdoors. In this article, Senator Reed stated that: “This new law will free up critical resources for environmental education to inspire the next generation of scientists and conservationists. It’s a smart investment in our children and their future” (Reed, 2015, para. 6).

**Relevance of the Research Conducted.**

To more fully understand homeschool dynamics, it is useful to examine empirical data. In my literature review, I learned that home school research has been conducted since the 1970’s. Since, population survey estimates of students being home schooled was limited in the 1970’ and 1980’s; a reasonable extrapolation of the data and consequently of accurate results is difficult. However, researchers tend to agree that approximately one million students were being homeschooled in 1998 (Murphy, 2012).
My research study encompassed the nature centers that are located in the seven counties under the policy-making body guidance of this Upper Midwest state’s Metropolitan Council and provide home school programs. There are twenty-one facilities within this geographical area that are categorized as nature centers. My analysis of what constitutes a nature center was formulated in accordance with the guidance of the Association of Nature Center Administrators. This Association noted that a nature center is a designated community space where trained professionals guide and facilitate visitors in their exploration of the natural world, and in developing a relationship with nature. Additionally, this experience should subsequently foster a sustainable connection between the people of the community and their environment (Association of Nature Center Administrators, 2005-2016). In applying this definition, I concluded that there were sixteen facilities which met this interpretation. The second qualifying consideration was to determine which of the sixteen nature centers currently offer homeschool programs. Of these sixteen nature centers, nine currently have home school programs. I personally conducted interviews and site visits at five of these qualifying nature centers, which calculates to a fifty-six percent analysis rate.

My investigation revealed that these five centers conduct a combined total of twenty-two home school programs per month with an average attendance of fourteen students per session. Therefore, three hundred and eight students are receiving environmental education once per month. Consequently, on a yearly basis, assuming a nine-month school year and an average class period of two hours, the numbers show that our informed young citizens are receiving five thousand five hundred and forty-four (5544) hours of environmental instruction. If we assume that each of the 308 students
shares some portion of their learning with at least one person per month, this calculates to an additional 2772 persons each year. In the language of the U.S. Department of Defense, these actions could be termed a "force multiplier". The official definition of the United States Department of Defense military term "force multiplier" is: “A capability that, when added to and employed by a combat force, significantly increases the combat potential of that force and thus enhances the probability of successful mission accomplishment. (JP 3-05.1)” (United States Department of Defense, 2016). Based on this analysis, I can only conclude that the research conducted was extremely relevant.

**Study Implications and Policy Influence.**

It is my opinion that possible implications of this study could result in an increase in attendance of home school groups at nature centers. This increase would therefore also generate increased revenue for these facilities. Additionally, it follows that if nature centers are providing instruction by trained professionals in the field of environmental education to public, private religious and private schools, then home school groups could also take advantage of these lessons as well. My rationale for this stance is predicated on home school groups being educated on the advantages of having natural science and environmental education conducted at nature centers. Furthermore, nature centers can provide a vast array of subjects and recreational access that an inexpensive cost which helps to foster the awe of nature and enjoyable and beneficial activities for students. The influencing of policy could also extent to public and private schools as well, once they are informed of the benefits. However, a presentation such as this would best be directed at the school principals or the school district superintendent’s level. From personal experience, I have noted that teachers are receptive to this educational format,
but the financial constraints to fund these learning experiences are generally above their authority.

**Substantiation of this Study.**

I have concluded that a limitation of this study was in its scope of participants, in that my focus was from an educational best practices perspective for elementary aged home school students. The field of study could very easily be expanded to include the present research question and criteria with an analysis of middle and high school students being examined. Possible future studies related to the research question would be to examine the question from the perspective of home school parents; public and private school students of varying age and grade levels; or from the perspective of classroom teachers as the learning relates to the state educational standards.

**Study Recommendations and Communication.**

It is my opinion that the scope of this study and the research that was conducted was more than adequate to answer the thesis question. The research was well thought out and conducted in a thorough and professional manner. From this point of view, the only recommendations I have would be to expand the population being analyzes as noted in the above paragraph.

The final aspect of any research study is to communicate your findings. It is my plan to forward this study to all the participants who assisted me with my research; the directors of the other nature centers within the geographical scope of this study; and to local environmental associations that provide this aspect of education such as: Minnesota Association for Environmental Education, Sierra Club-Northstar Chapter, Women's Environmental Institute, and Minnesota Naturalists' Association. It is important to note
that the members of these organizations are trained and professional environmental educators. At some point in time, I may publish my results. Additionally, I will use those best practices that I have investigated by incorporating them into my lesson plans.

On a final note, this has been an incredible and enjoyable journey, and one that will have daily implementation opportunities.
Appendix A

Piaget's Stages of Cognitive Development Chart
Jean Piaget was a developmental psychologist best known for his theory of cognitive development. Piaget's stages deal with the nature of knowledge (epistemology) and how humans come to gradually acquire it.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Age</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Sensorimotor**  | 0-2 yrs | During this first stage, children learn entirely through the movements they make and the sensations that result. They learn:  
  - that they exist separately from the objects and people around them  
  - that they can cause things to happen  
  - that things continue to exist even when they can’t see them |
| **Preoperational**| 2-7 yrs | Once children acquire language, they are able to use symbols (such as words or pictures) to represent objects. Their thinking is still very egocentric though -- they assume that everyone else sees things from the same viewpoint as they do.  
  They are able to understand concepts like counting, classifying according to similarity, and past-present-future but generally they are still focused primarily on the present and on the concrete, rather than the abstract. |
| **Concrete Operational** | 7-11 yrs | At this stage, children are able to see things from different points of view and to imagine events that occur outside their own lives. Some organized, logical thought processes are now evident and they are able to: |
- order objects by size, color gradient, etc.
- understand that if $3 + 4 = 7$ then $7 - 4 = 3$
- understand that a red square can belong to both the 'red' category and the 'square' category
- understand that a short wide cup can hold the same amount of liquid as a tall thin cup

However, thinking still tends to be tied to concrete reality

| Formal Operational | 11+ yrs | Around the onset of puberty, children are able to reason in much more abstract ways and to test hypotheses using systematic logic. There is a much greater focus on possibilities and on ideological issues. |

(Piaget's Stages of Cognitive Development Chart)
Appendix B

Erikson's Stages of Cognitive Development Chart
Erikson's Stages of Development Chart

The most widely accepted theory of how human beings develop from infancy to old age is Erik Erikson's stages of psychosocial development. At each stage, there is a crisis to be resolved and a virtue to be gained. According to the theory, failure to properly master each step leads to problems in the future.

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Age 0-1</th>
<th>Crisis</th>
<th>Virtue</th>
<th>Description</th>
<th>Freud</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Trust vs Mistrust</td>
<td>Hope</td>
<td>At this stage babies learn to trust that their parents will meet their basic needs. If a child's basic needs aren't properly met at this age, he or she might grow up with a general mistrust of the world.</td>
<td>Oral</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 2</th>
<th>Age 2-3</th>
<th>Crisis</th>
<th>Virtue</th>
<th>Description</th>
<th>Freud</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Autonomy vs Shame &amp; Doubt</td>
<td>Will</td>
<td>As toddlers, children begin to develop independence and start to learn that they can do some things on their own (such as going to the toilet). If a child is not encouraged properly at this age, he</td>
<td>Anal</td>
</tr>
</tbody>
</table>
or she might develop shame and doubt about their abilities.

<table>
<thead>
<tr>
<th>Stage</th>
<th>4-6</th>
<th>Initiative vs Guilt</th>
<th>Purpose</th>
<th>Phalic</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>As preschoolers, children continue to develop more independence and start to do things of their own initiative. If a child is not able to take initiative and succeed at appropriate tasks, he or she might develop guilt over their needs and desires.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage</th>
<th>7-12</th>
<th>Industry vs Inferiority</th>
<th>Competence</th>
<th>Latent</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>Throughout their school years, children continue to develop self-confidence through learning new things. If they are not encouraged and praised</td>
<td></td>
</tr>
<tr>
<td>Stage</td>
<td>Years</td>
<td>Conflict</td>
<td>Need</td>
<td>Resolution</td>
</tr>
<tr>
<td>--------</td>
<td>---------</td>
<td>----------------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5</td>
<td>13-19</td>
<td>Identity vs Role Confusion</td>
<td>Fidelity</td>
<td>When they reach the teenage years, children start to care about how they look to others. If a teenager is unable to properly develop an identity at this age, his or her role confusion will probably continue on into adulthood.</td>
</tr>
<tr>
<td>6</td>
<td>20-34</td>
<td>Intimacy vs Isolation</td>
<td>Love</td>
<td>During early adulthood most people fall in love, get married and start building their own</td>
</tr>
</tbody>
</table>
family. If a person is unable to develop intimacy with others at this age (whether through marriage or close friendships), they will probably develop feelings of isolation.

<table>
<thead>
<tr>
<th>Stage 7</th>
<th>35 - 65</th>
<th>Generativity vs Stagnation</th>
<th>Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>This is the longest period of a human's life. It is the stage in which people are usually working and contributing to society in some way and perhaps raising their children. If a person does not find proper ways to be productive during this period, they will probably develop</td>
<td></td>
</tr>
</tbody>
</table>
As senior citizens, people tend to look back on their lives and think about what they have or have not accomplished. If a person has led a productive life, they will develop a feeling of integrity. If not, they might fall into despair.

(Psychology Charts)
Appendix C

Gesell’s Spiral
Gesell’s Spiral

(Gesell's Spiral, 2010)
Bloom’s Taxonomy

(Cecelia Munzenmaie, 2013)
Appendix E

Bloom’s Taxonomy Revised
Bloom’s Taxonomy Revised

(Armstrong)
Appendix F

25 Easy Nature Play Ideas for Early Childhood Centers
25 Easy Nature Play Ideas for Early Childhood Centers

Great nature play doesn’t require elaborate and expensive play spaces! Even a limited outdoor area can be affordably enhanced for nature play, using common materials and plants to create a young child’s heaven that is chock-full of small-scale wonders and magical discoveries.

Try the suggestions in this brochure, and then add your own ideas over time!

Why More Outdoor Play?

For eons children have enjoyed the outdoors as their greatest playground — climbing trees, digging holes, catching frogs, building forts, picking berries, or just running gleefully through tall grass.

These are fond memories for most adults, but unfortunately they have little to do with modern childhood. Today’s children are disconnected from nature. American kids (ages 3 – 12) now spend 27 percent of their time with electronic media, versus only one percent outdoors. If you count only time for unstructured outdoor play — that is, play that kids make up themselves, on their own schedules — it amounts to just 30 minutes per week!

With a little planning, outdoor enrichment, and commitment, your early childhood program can easily double that weekly amount of outdoor free play! This kind of play is perfect for developing the “whole child.” In fact, a growing body of research shows that frequent, unstructured play in diverse natural settings is great for:

- Social and emotional development;
- Creative development;
- Intellectual development;
- Physical fitness and overall health; and
- Creation of lasting personal bonds to the natural world.

(Childhood, 2010)
Appendix G

The Nature Conservancy
Kids These Days: Why Is America's Youth Staying Indoors?

Lack of access to, and interest in, nature keeps kids from experiencing the outdoors.

“Roughly 76 percent of youth today strongly believe issues like climate change can be solved if action is taken now. They also think safeguarding important lands and waters should be a priority regardless of any ancillary benefits and the struggling economy.”

There is a growing disparity between the time kids spend indoors wired to technology and the time they spend outside enjoying nature. The vast majority of today’s kids use a computer, watch TV, or play video games on a daily basis, but only about 10 percent say they are spending time outdoors every day, according to a new nationwide poll from The Nature Conservancy.

Why? Lack of access to natural areas and discomfort with the outdoors are two primary factors identified by the Conservancy’s poll.

The poll was conducted from July 28 through August 4, and asked 602 kids between the ages of 13 and 18 about their attitudes toward nature, outdoor activity and environmental issues. Topics covered included:
reasons youth do not spend more time in nature,

words and phrases used by youth to describe nature, and

attitudes toward preserving nature and on other environmental issues of the day.

The bipartisan polling team of Fairbank, Maslin, Maullin, Metz & Associates (D) and Public Opinion Strategies (R) conducted the poll, which was funded by The Toyota USA Foundation, The Nature Conservancy, and the Foundation for Youth Investment.

HEAT, LACK OF ACCESS OR INTEREST—AND EVEN OBESITY—KEEP KIDS INSIDE

The poll found a wide range of reasons kids don't spend more time outside. However, in the face of record-breaking temperatures across much of the country this summer, discomfort from heat and bugs topped the list of obstacles youth cited for not spending time outdoors:

- 80 percent said it was uncomfortable to be outdoors due to things like bugs and heat
- 62 percent said they did not have transportation to natural areas, and
- 61 percent said there were not natural areas near their homes.

In one of the more surprising results, pollsters found that, among youth whose body mass index classifies them as obese, there are notably lower rates of participation in outdoor activities and less interest in pursuing them in the future.

However, the survey also showed that 66 percent of youth say they "have had a personal experience in nature," that made them appreciate it more.
“That subset of youth is markedly different from those who have not had personal experiences with nature," says David Metz of Fairbank, Maslin, Maullin, Metz & Associates. "They are almost twice as likely to say they prefer spending time outdoors and more than twice as likely to strongly agree that protecting the environment is cool. Clearly, getting kids meaningful experiences outside is key to getting them to care about the environmental issues of our day."

HELPING SCHOOLS STEP UP

Three quarters of the respondents reported they had little if any access to nature through their schools. With school budgets tightening, The Nature Conservancy is pioneering ways to support environmental education inside and outside of the classroom. The LEAF program for instance, works with a network of partner environmental high schools to engage urban youth in conservation activities and help foster future leaders in environmental stewardship.

Exposing kids to nature is a crucial step to getting kids to care about environmental issues, the poll finds. Those with personal, positive experiences with nature were twice as likely to view themselves as strong environmentalists and were significantly more likely to express concern about water issues, air pollution, climate change and the overall condition of the environment.
KIDS CARE ABOUT THE PLANET

Despite their lack of access to nature, America’s youth do have an over-riding concern with environmental issues and – most importantly – are optimistic that their generation can find solutions to the world’s toughest environmental problems.

The majority also stated that previous generations have damaged the environment and left it to their generation to fix. Roughly 76 percent of youth today strongly believe issues like climate change can be solved if action is taken now.

They also think safeguarding important lands and waters should be a priority regardless of any ancillary benefits and the struggling economy.

The poll suggests that the best way to get kids more involved in nature may be through peer pressure – 91 percent said that if a friend encouraged them to spend more time outdoors they would listen.

Also, 90 percent of kids who spent time outside said being in nature and taking part in outdoor activities helped relieve stress (Deputy, 2016).
Appendix H

Educational Statistics Summary
Educational Statistics Summary

Midwest State Education Statistics Summary

These data are derived from a variety of state Department of Education Sources, are intended to give a broad overview of education data and should be considered very close approximations, rather than definitive counts.

Data Sources: OrgUnit, MARSS Student, Staff Employment Report Run: 09/08/2015

Public School Districts

(2014–2015)

Public Operating Elementary & Secondary Independent Districts (type 01) 328
Non-Operating Common School Districts (type 02)
2 Special School Districts (type 03) 2
Intermediate School District (type 06) (Districts xxx, xxy, xxz) 3
Integration Districts (type 62) 4
Charter Schools (type 07) 165
State Schools/Academies (type 70) 2 Education Districts (type 61) 12 Miscellaneous Cooperative Districts (type 52,53) 21 Special Education &/or Vocational Cooperative Districts (type 52,53) 13
Telecommunication Districts (classification 75) 0

Public Schools (2014–2015)

Number of Schools 2,017

• Area Learning Centers-ALC’s (classification 41) 263
• Distance Learning Programs-state approved (classification 46) 31

• K-12 Schools (classification 40) 9
• Elementary Schools (classification 10) Grades PK-6 960
• Middle Schools (classification 20) Grades 5-8 212
• Secondary Schools (classification 31,32,33) Grades 7-12 475
  - Junior Highs (classification 31) Grades 7-9 32
  - Senior Highs (classification 32) Grades 9-12 or 10-12 222
  - Combined (classification 33) Grades 7-12 221

Public School Teachers (2013-2014)

Teachers-Full Time Equivalent (FTE) 54,054
• Pre-Kindergarten & School Readiness 1,740
• Kindergarten 3,096
• Elementary (grades 1 through 6) 24,163
• Secondary (grades 7 through 12) 21,384
• Other/Un-Graded 3,671
• Special Education 9,330 Average Years of Teaching Experience-statewide 15 New Teachers FTE (newly licensed & first teaching assignment) 2,169

Total Staff (2013-2014)

Licensed staff headcount 67,737 Non-licensed staff headcount 59,087
Public Schools Enrollment & Graduates (2013-2014)
Pre-Kindergarten & Early Childhood Enrollment 14,556

K-12 Enrollment 837,154
  • Kindergarten 65,710
  • Elementary (grades 1 through 6) 383,298
    • Grade 1 66,034
    • Grade 2 64,646
    • Grade 3 63,712
    • Grade 4 64,026
    • Grade 5 62,957
    • Grade 6 61,923
State Education Statistics Summary

These data are derived from a variety of state Department of Education Sources, are intended to give a broad overview of education data and should be considered very close approximations, rather than definitive counts.

Data Sources: OrgUnit, MARSS Student, Staff Employment Report Run: 09/08/2015

- Secondary (grades 7 through 12) 388,146
  - Grade 7 63,603
  - Grade 8 62,947
  - Grade 9 64,472
  - Grade 10 63,868
  - Grade 11 64,117
  - Grade 12 69,139
- Male (grades K-12) 428,710
- Female (grades K-12) 408,444
- Native American (grades K-12) 20,110
- Asian/Pacific Islander (grades K-12) 59,477
- Hispanic (grades K-12) 67,307
- Black (grades K-12) 92,381
- White (grades K-12) 597,879
- Special Education--receiving services (grades K-12) 126,809
- English Language Learners (grades K-12) 64,377
- Free & Reduced Lunch Eligible (grades K-12) 328,197
- Enrolled in Charter Schools (grades K-12) 43,937
  - Elementary (grades K-12) 26,849
  - Secondary (grades K-12) 17,080
- Open Enrolled to Non-Resident District [SAC 1, 4] (grades K-12) 69,443
  - Elementary (grades 6-12) 36,131
  - Secondary (grades 7-12) 33,312

Enrollment in Alternatives: 12,216
- Alternative Learning Centers: 10,180
- Alternative Learning Programs: 1,003
- Private Alternative Programs: 1,033

Graduates (2012-2013): 58,303
Non-Public Schools Enrollment (2013-2014)

Number of Students Home Schooled 17,451
Number of Non-Public Schools 467
Number of Non-Public School Reporting 462
K-12 Enrollment 69,012

- Kindergarten 6,370
- Elementary (grades 1 through 6) 35,308
  - Grade 1 5,991
  - Grade 2 6,125
  - Grade 3 5,956
  - Grade 4 5,922
  - Grade 5 5,793
  - Grade 6 5,521

- Secondary (grades 7 through 12) 27,334
  - Grade 7 5,116
  - Grade 8 5,187
  - Grade 9 4,278
  - Grade 10 4,216
  - Grade 11 4,347
  - Grade 12 4,190

-Non-Public Previous Year Graduates (2012-2013): 4,190

(Minnesota Department of Education, 2015)
Appendix I

Overview of Research Methods in Education
Overview of Research Methods in Education

Research Methods: An Overview

By Eric Anderman

Updated on Dec 23, 2009

OVERVIEW OF RESEARCH METHODS IN EDUCATION

STRENGTHS AND WEAKNESSES OF RESEARCH DESIGNS

There are many different methodologies that can be used to conduct educational research. The type of methodology selected by a researcher emanates directly from the research question that is being asked. In addition, some of the differing techniques for conducting educational research reflect different paradigms in scientific thought. In this entry, a review of the most commonly used methodologies is presented; in addition, the strengths and weaknesses of various methods are compared and contrasted.

OVERVIEW OF RESEARCH METHODS IN EDUCATION

Research methodologies can be classified in many different ways. For example, some researchers distinguish between quantitative and qualitative studies; others distinguish between experimental and non-experimental research; still others distinguish between research that is conducted in laboratories versus in the field (i.e., in classrooms). Obviously, there are many ways to categorize research methods. However, there also is much overlap in such categorizations. For example, a “non-experimental” study can be either quantitative or qualitative; an experimental study can include some qualitative components. This entry does not attempt to classify these methodologies; rather, the various methods are first briefly described and then compared and contrasted.
<table>
<thead>
<tr>
<th>Methodology</th>
<th>Major strength</th>
<th>Major weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlational</td>
<td>Can be used to examine complex relations among many variables.</td>
<td>Can’t draw conclusions about causality.</td>
</tr>
<tr>
<td>Experimental</td>
<td>Can draw conclusions about causality.</td>
<td>Other does not represent true learning environments in real classrooms.</td>
</tr>
<tr>
<td>Quasi-experimental</td>
<td>Can simulate an experiment in a true classroom setting.</td>
<td>More difficult to justify causal conclusions than in true experiments.</td>
</tr>
<tr>
<td>Qualitative</td>
<td>Can provide detailed, in-depth analyses of the contexts of learning environments.</td>
<td>Very time-consuming, both in terms of data collection and analysis.</td>
</tr>
<tr>
<td>Longitudinal</td>
<td>Can examine changes in variables over time.</td>
<td>Very costly, and subjects may drop out over the course of the study.</td>
</tr>
<tr>
<td>Cross-sectional</td>
<td>Efficient and rapid way to examine developmental differences.</td>
<td>Not nearly as accurate as longitudinal designs; cohorts may differ, and these differences may be mistaken for true developmental differences.</td>
</tr>
<tr>
<td>Design experiments</td>
<td>Occur in actual classrooms; experiments are constantly altered based on actual occurrences in the classrooms.</td>
<td>Very time-consuming, sometimes quite difficult to examine causality.</td>
</tr>
<tr>
<td>Microgenetic research</td>
<td>Allows for in-depth analyses of development in strategy usage over time.</td>
<td>Very time consuming; often uses very small samples</td>
</tr>
<tr>
<td>Single-subjects</td>
<td>Provides detailed data about changes in a specific variable in one individual learner at a time; can be particularly useful in developing interventions for learners with special needs.</td>
<td>Difficult to generalize to larger populations.</td>
</tr>
<tr>
<td>Action research</td>
<td>Involves real classroom teachers investigating questions that are directly important to practicing educators.</td>
<td>Other does not meet the stringent criteria of other designs, and results may not be acceptable to the scientific community.</td>
</tr>
</tbody>
</table>

*Table 1* ILLUSTRATION BY GGS INFORMATION SERVICES. CENGAGE LEARNING, GALE.

(Anderman, 2009)
Appendix J

Questions on a Nature Centers Homeschool Program
Questions on a Nature Centers Homeschool Program

1. What is the number of year’s home school has been taught at your nature center?

2. What is the number of classes per year/month or week that are taught at your nature center?

3. What is the average class attendance for each session taught?

4. What is the ages per classes taught?

5. Are different classes taught based on the age of the students?

6. What are the subjects that you teach?

7. Do you have a standard written format for your classes?

8. What is the length of time for each of your classes?

9. Do you have a yearly or multi-year subject plan?

10. Do you include/reference the state Curriculum Standards in your lesson plans?

11. Are any of your instructors currently or previously a licensed teacher? If so, what state, grades and subjects?

12. Are evaluations done by the instructors?

13. Are evaluations done by the parents?

14. What are the methods that you use to teach?

15. How many different homeschool groups attend?

16. Do you provide a place for pre-K children and their parents during the instruction period?

17. Do the parents assist in the instruction?
18. What are the best practices for teaching this student population?
Appendix K

A Comparative Analysis Nature Center Characteristics
## Comparative Analysis Nature Center Characteristics

<table>
<thead>
<tr>
<th>Program Offerings</th>
<th>Alpha 1 Nature Center</th>
<th>Whiskey 1 Nature Center</th>
<th>Hotel 1 Nature Center</th>
<th>Hotel 2 Nature Center</th>
<th>Hotel 3 Nature Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beach</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boat Launch</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Camping</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disc Golf</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dog Area: Off Leash</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fishing</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Picnic Area</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Historical Exploration</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Play Area</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dog Trails</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skijor/Dogsled</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hike Trails</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Horse Trails</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nature Center</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Concessions</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Cross-Country Skiing</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Downhill Skiing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sledding</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snowshoeing</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Visitor Center</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Canoeing</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Geographical Characteristics

<table>
<thead>
<tr>
<th>Geographical Characteristics</th>
<th>Alpha 1 Nature Center</th>
<th>Whiskey 1 Nature Center</th>
<th>Hotel 1 Nature Center</th>
<th>Hotel 2 Nature Center</th>
<th>Hotel 3 Nature Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres</td>
<td>5500</td>
<td>725</td>
<td>4900</td>
<td>1000</td>
<td>150</td>
</tr>
<tr>
<td>Wetlands/Lake</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>River or Steam</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Prairie</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Maple Trees</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Raptors</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Mounts/Artifacts</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Live Animal Exhibits</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Appendix L

Summary of Whiskey 1 Nature Center’s Homeschool Offerings
<table>
<thead>
<tr>
<th>School year</th>
<th>All ages</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-04</td>
<td></td>
<td>Apple Orchard</td>
<td>Wildlife Flight</td>
<td>Maple Syruping</td>
<td>April - Weather</td>
</tr>
<tr>
<td>2004-05</td>
<td>5-9 yr</td>
<td>Adapations</td>
<td>Rept &amp; Amphib.</td>
<td>Redwood</td>
<td>Biking &amp; Map Reading</td>
</tr>
<tr>
<td></td>
<td>10+ yr</td>
<td>Adaptations</td>
<td>Snowshoeing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005-06</td>
<td>5-9 yr</td>
<td>Water Quality</td>
<td>Winter Birds</td>
<td>Trees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10+ y</td>
<td>Weather Quality</td>
<td>Snow &amp; Ice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006-07</td>
<td>5-9 y</td>
<td>Change of Seasons</td>
<td>Trees</td>
<td>Maple Syruping</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10+ y</td>
<td>Photo/Graphics</td>
<td>Birds &amp; Banding</td>
<td>Maple Syruping</td>
<td></td>
</tr>
<tr>
<td>2007-08</td>
<td>5-9 y</td>
<td>Apple Orchard</td>
<td>Adaptations</td>
<td>Food Chains</td>
<td>Wetland Baggage</td>
</tr>
<tr>
<td></td>
<td>10+ y</td>
<td>Plants &amp; People</td>
<td>Wilderness Survival</td>
<td></td>
<td>Wetland Scenic</td>
</tr>
<tr>
<td>2008-09</td>
<td>5-9 yr</td>
<td>Fall Harvest</td>
<td>Backyard Animals &amp; Aquatic Species</td>
<td>Change of Seasons</td>
<td>Rock &amp; Roll</td>
</tr>
<tr>
<td></td>
<td>10+ yr</td>
<td>Wild Harvest</td>
<td></td>
<td>Weather &amp; Phenology</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map Reading Mystery &amp; Camp - June</td>
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<tr>
<td>2009-10</td>
<td>5-9 yr</td>
<td>Winter Birds</td>
<td>Seeds - April</td>
<td>Ives &amp; Butterflies</td>
<td></td>
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<tr>
<td></td>
<td>10+ yr</td>
<td>Nature Flight</td>
<td></td>
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<tr>
<td>2010-11</td>
<td>5-9 yr</td>
<td>Change of Seasons</td>
<td>Maple Syruping</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10+ yr</td>
<td>September</td>
<td>Weather &amp; Phenology</td>
<td></td>
<td></td>
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<tr>
<td>2011-12</td>
<td>5-9 yr</td>
<td>Apple Orchard - September</td>
<td>Winter</td>
<td>Maple Syruping</td>
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<tr>
<td></td>
<td>10+ yr</td>
<td>Plants &amp; People</td>
<td></td>
<td></td>
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<tr>
<td>2012-13</td>
<td>5-9 yr</td>
<td>Trees</td>
<td>Adaptations - April</td>
<td></td>
<td></td>
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<td></td>
<td>10+ yr</td>
<td>Forestory</td>
<td>Survival</td>
<td></td>
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<td>2013-14</td>
<td>5-9 yr</td>
<td>Seeds - Sept</td>
<td>Maple Syruping</td>
<td></td>
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<tr>
<td></td>
<td>10+ yr</td>
<td>Ives &amp; Butterflies</td>
<td>Maple Syruping</td>
<td></td>
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<td>2014-15</td>
<td>5-9 yr</td>
<td>Food Chains</td>
<td>Birds - April</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>10+ y</td>
<td>popcorn</td>
<td>Bees</td>
<td></td>
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<tr>
<td>2015-16</td>
<td>combined</td>
<td>Winter Survival</td>
<td>Fossil - April</td>
<td>Ives &amp; Butterflies</td>
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<tr>
<td>2016-17</td>
<td>combined</td>
<td>Adaptations - Nov</td>
<td>Maple Syruping - March</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix M

Summary of Alpha 1 Nature Center’s Homeschool Offerings
Summary of Alpha Nature Center’s Homeschool Offerings

GRADES K-2
October 15 – Apple Picking
Don’t eat all the apples! We’re going to save them in order to make apple cider. Enjoy apple cider and other apple food treats. Learn to draw apples and apples in print and cursive.

November 15 – White-Tailed Deer
You will learn about deer habitat. They are alert, like the white-tailed deer. We will try to locate them. We will find the trees that eat, sleep and walk. Draw the deer in print and cursive. We will look for the white-tailed deer.

December 17 – Getting Ready for Winter
On your winter nature walk, enjoy the cold. We are going to experience winter. Nature is a time for renewal. What do they do? Where do they go? What do they eat? We will answer these questions and more as we enjoy the season.

January 21 – Snowshoeing and Tracking
Join the fun and learn how to walk on “tracks.” Where are we going? Where are we going? Where are we going? Where are we going? Where are we going? Where are we going? Where are we going? Where are we going? Where are we going?

February 18 – Small Mammals
Join us as we explore small mammals. Let’s see if we can find them.

March 14 – It’s Alive or Is It?
Join us at three times on different days and learn how to identify living and non-living things. We will try to determine if the animals that we see are alive or not.

April 21 – Baby Animals
Spring is the time that baby animals are born. Learn to identify what they look like and how you can help them.

May 10 – Habitats
A habitat is the living environment of an organism. Explore the three main habitats: the pond, the prairie, and the forest. See what we can find.

GRADES 3-5
October 15 – Nature Superpowers
Hone your nature skills through the month by learning about the animals and plants in the area. We will learn how to observe nature, and how to use an entire walk to explore the forest.

November 19 – Out in the Cold
Animals rely on their senses to survive in cold weather. We will explore the different ways that animals can survive in cold weather.

December 17 – Birdwatching
Learn about the different birds that can be found in the winter. We will learn about the birds that migrate and those that stay.

January 21 – Ice Sculptures
Join us as we explore the world of ice. Learn to make ice sculptures and ice sculptures.

February 18 – Winter Ecology
Learn about the different ways that animals survive in winter. We will explore the different ways that animals can survive in winter.

March 17 – Art and Nature
Create a nature journal and learn about the beauty of nature. Use art to express your ideas and thoughts.

April 21 – Bird Behavior
Explore the different behaviors of birds. Learn how to identify different birds and their behaviors.

May 19 – Pond Study
Explore the pond environment and learn about the different organisms that live in the pond.

June – Lake Erie Bird Study
Explore the lake and the different birds that live there. Learn to identify different types of birds and their behaviors.

July – Field Trip to the Beach
Enjoy the beach and learn about the different organisms that live in the ocean.

August – Nature Photography
Learn about the different ways that you can capture nature. Use photography to express your ideas and thoughts.

September – Fall Festival
Join us for a fall festival to celebrate the changing of the seasons. Enjoy activities and learn about the different organisms that live in the fall.

October 15 – Minnesota and the Civil War
Learn about the history of the Civil War. We will learn about the different battles and the various outcomes.

November 19 – Advanced Survival
Learn about the different skills needed to survive in the wilderness. We will learn about the different ways that you can use to stay alive.

December 17 – Ornaments from Around the World
Learn about the different ornaments from around the world. We will learn about the different cultures and how they are made.

January 21 – X-Country Skiing
Join us for a day of skiing on the trails. Learn about the different techniques used for skiing.

February 18 – Citizen Science
Learn about the different ways that you can contribute to science. We will learn about the different projects and how they are conducted.

March 17 – Animal Dissections
Learn about the different ways that animals can be dissected. We will learn about the different organs and tissues.

April 21 – Animal Myth Busters
Learn about the different myths and legends related to animals. We will learn about the different myths and how they are created.

May 19 – Lake Erie Bird Study
Explore the lake and the different birds that live there. Learn to identify different types of birds and their behaviors.
Appendix N

Summary of Hotel 1 Nature Center’s Homeschool Offerings
### Summary of Hotel 1 Nature Center’s Homeschool Offerings

#### 5 Year Curriculum

<table>
<thead>
<tr>
<th>Month</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
<td>Insects</td>
<td>Butterflies and Monarch Tapping</td>
<td>Pond Study</td>
<td>Reptiles</td>
<td>Trees</td>
</tr>
<tr>
<td>October</td>
<td>Bees</td>
<td>Invasion of the Fungi</td>
<td>H2O Quality/Stream Study</td>
<td>Birds</td>
<td>Apple Cider</td>
</tr>
<tr>
<td>November</td>
<td>Keeping Warm</td>
<td>Rocks and Minerals</td>
<td>Web of Life</td>
<td>Migration</td>
<td>Seeds</td>
</tr>
<tr>
<td>December</td>
<td>Animal Homes</td>
<td>Astronomy</td>
<td>Recycling</td>
<td>Reptiles</td>
<td>Minnesota History: The</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Guide and the Governor</td>
</tr>
<tr>
<td>January</td>
<td>Winter Survival</td>
<td>Minnesota History-Strosections</td>
<td>Green Energy</td>
<td>Air Pressure</td>
<td>Nocturnal Adaptations</td>
</tr>
<tr>
<td>February</td>
<td>Animal Tracks</td>
<td>Volcanoes, Earthquakes, and</td>
<td>Winter h2O Properties</td>
<td>Flight</td>
<td>Mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glaciers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>Minnesota History/Maple Syruping</td>
<td>Fossils</td>
<td>Animal Life Cycles</td>
<td>Weather</td>
<td>Predator/Prey</td>
</tr>
<tr>
<td>April</td>
<td>Orienteering</td>
<td>Soil and Worms</td>
<td>Animal Structures and</td>
<td>Snakes</td>
<td>Animal Camouflage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>Map Reading</td>
<td>Spring Wildflowers</td>
<td>Amphibians</td>
<td>Turtles</td>
<td>Wild Plants</td>
</tr>
</tbody>
</table>
Appendix O

Hotel 1 Nature Center Class Descriptions for Home School Offerings
Hotel 1 Nature Center Class Descriptions for Home School Offerings

**ELM PARK RESERVE**

**ARCHERY RANGE**

**ARCHERY**

**First Day:** Form target and place it.

**Second Day:** Practice shooting.

**Third Day:** Shoot at targets.

**Date:** Sep 16-18, Sep 23, Sep 30

**NATURE CENTER**

**TREES OF THE FOREST**

**Date:** Sep 9, Sep 16, Sep 23

**DINNER ON THE 26TH CENTURY**

**Date:** Oct 7, Oct 14, Oct 21

**TREES OF THE FOREST**

**Date:** Oct 28, Nov 4, Nov 11

**FALL 2016 INVITATION**

**Date:** Oct 28, Nov 4, Nov 11

**DINNER ON THE 26TH CENTURY**

**Date:** Nov 18, Dec 2, Dec 9

**TREES OF THE FOREST**

**Date:** Dec 16, Jan 6

**UMBRELLA HUNTING**

**Date:** Jan 13, Jan 20

**HOMESTEAD COMING**

**Date:** Jan 27, Feb 3

**NOCTURNAL ADAPTATION**

**Date:** Feb 10, Feb 17

**WHAT IS A PREDATOR?**

**Date:** Mar 3, Mar 10

**HOW TO SURVIVE A MONSTER**

**Date:** Mar 17, Apr 3
Appendix P

Summary of Hotel 2 Nature Center’s Current Homeschool Offerings
Summary of Hotel 2 Nature Center’s Current Homeschool Offerings

**Homeschool 2016–2017**  
**September–May**

---

**LAKE PARK RESERVE**

**Mileski Area**

**Ski and Snowboard Day**  
**February 14, 2016**  
**March 4, 2016**  
**March 11, 2016**

**Ice Fishing Day**  
**February 15, 2016**

**Recreation Area**

**Cross-Country Skiing**  
**January 12, 2016**  
**January 19, 2016**

**Rural Area**

**Entomology**  
**September 29, 2016**  
**October 6, 2016**

**Mammology**  
**January 27, 2016**  
**February 3, 2016**  
**February 10, 2016**  
**February 17, 2016**  
**March 16, 2016**  
**March 23, 2016**  
**April 6, 2016**  
**April 13, 2016**

**Botany**  
**May 14, 2016**
Appendix Q

Summary of Hotel 3 Nature Center’s Five Year Homeschool Offerings Plan
Summary of Hotel 3 Nature Center’s Five Year Homeschool Offerings Plan
## Homeschool Curriculum Overview

<table>
<thead>
<tr>
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<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>September</td>
<td>Dead or Alive (waste &amp; resources)</td>
<td>Seeds &amp; Weeds (plant biology)</td>
<td>Bugs &amp; Bees (entomology)</td>
<td>Bats (adaptations/behavior)</td>
<td>Butterflies (metamorphosis)</td>
</tr>
<tr>
<td>October</td>
<td>Apple Cidering (plant life cycles)</td>
<td>Wild Edibles (conservation/biology)</td>
<td>Predator/Prey (adaptations)</td>
<td>Mammals (adaptations/physiology)</td>
<td>Natural Dyes (botany/chemistry)</td>
</tr>
<tr>
<td>November</td>
<td>Migration/Hibernation (adaptations/behavior)</td>
<td>Animal Camouflage (adaptations)</td>
<td>Food Web (populations/connections)</td>
<td>Animal Communication (adaptations/behavior)</td>
<td>Native American Life (anthropology)</td>
</tr>
<tr>
<td>May</td>
<td>Marsh Explorers (aquatic ecology)</td>
<td>Worms (decomposers)</td>
<td>Birds (adaptations/behavior)</td>
<td>Resource Management (soil stewardship/invasive plants)</td>
<td>Fossils (palaeontology)</td>
</tr>
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Appendix R

Selected Questions Responses on Homeschool Programs
## Selected Questions Responses on Homeschool Programs

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Question</th>
<th>Alpha 1 Nature Center</th>
<th>Whiskey 1 Nature Center</th>
<th>Hotel 1 Nature Center</th>
<th>Hotel 2 Nature Center</th>
<th>Hotel 3 Nature Center</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of year’s home school has been taught.</td>
<td>13</td>
<td>30+</td>
<td>16</td>
<td>15</td>
<td>20+</td>
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<tr>
<td>2</td>
<td>Number of classes per month.</td>
<td>6</td>
<td>1</td>
<td>10</td>
<td>3</td>
<td>2</td>
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<tr>
<td>3</td>
<td>Average class attendance.</td>
<td>15</td>
<td>15</td>
<td>17</td>
<td>10</td>
<td>15</td>
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<tr>
<td>4</td>
<td>Student ages per class.</td>
<td>7/9/15</td>
<td>7/12</td>
<td>8/12</td>
<td>10</td>
<td>10/5</td>
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<tr>
<td>5</td>
<td>Different classes based on student ages.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<tr>
<td>6</td>
<td>Subjects taught.</td>
<td>Appendix M</td>
<td>Appendix L</td>
<td>Appendix N &amp; O</td>
<td>Appendix P</td>
<td>Appendix Q</td>
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<tr>
<td>7</td>
<td>Written class format.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>8</td>
<td>Average length of class time (Hours)</td>
<td>2½</td>
<td>1½</td>
<td>2½</td>
<td>2</td>
<td>2</td>
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<td>9</td>
<td>Yearly or multi-year subject plan.</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>10</td>
<td>State curriculum standards included/referenced.</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<td>11</td>
<td>Licensed teacher on staff (current/previous).</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Question Number</td>
<td>Question</td>
<td>Alpha 1 Nature Center</td>
<td>Whiskey 1 Nature Center</td>
<td>Hotel 1 Nature Center</td>
<td>Hotel 2 Nature Center</td>
<td>Hotel 3 Nature Center</td>
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<td>------------------------</td>
<td>----------------------</td>
<td>----------------------</td>
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<tr>
<td>12</td>
<td>Instructor evaluations done.</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>13</td>
<td>Parent evaluations requested.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>14</td>
<td>Teaching Methods Used</td>
<td>See Chapter #4</td>
<td>See Chapter #4</td>
<td>See Chapter #4</td>
<td>See Chapter #4</td>
<td>See Chapter #4</td>
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<tr>
<td>15a</td>
<td>Public Homeschool Programs (Number/Month)</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
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<td>15b</td>
<td>Private Homeschool Programs (Number/Month)</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>0</td>
<td>1</td>
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<td>16</td>
<td>Place for pre-K Children.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>17a</td>
<td>Parents assist in the instruction.</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>17b</td>
<td>Parents assist at stations.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>18</td>
<td>Best Practices for Teaching.</td>
<td>See Chapter #4</td>
<td>See Chapter #4</td>
<td>See Chapter #4</td>
<td>See Chapter #4</td>
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Appendix S

Consolidated Summary of Best Practices
<table>
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<th>Application</th>
<th>Best Practices</th>
<th>Proposed HS Program</th>
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<td>[Application Info]</td>
<td>[Best Practices Description]</td>
<td>[Proposed HS Program Description]</td>
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**Consolidated Summary of Best Practices**
<table>
<thead>
<tr>
<th>Proposed H.S. Program Considerations</th>
<th>Event</th>
<th>Best Practices</th>
<th>Rationale</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal Requirements</td>
<td>Teach outdoor education</td>
<td>Mandated by Federal Law.</td>
<td>(Congress, 1990) and (Reed, 2015).</td>
<td></td>
</tr>
<tr>
<td>Class Composition</td>
<td>Focus students.</td>
<td>Effective classroom management, safety, and exploration/experiments.</td>
<td>Personal experience and input from other naturalists.</td>
<td></td>
</tr>
<tr>
<td>Assessment of the instruction: Naturalist</td>
<td>Instructors do a formal/informal assessment for each class</td>
<td>All of your assessment decisions will directly influence children’s learning outcomes.</td>
<td>(Morrison, Why is Assessment Important?, 2010)</td>
<td></td>
</tr>
<tr>
<td>Assessment of the instruction: Parents</td>
<td>Encourage parents to do an evaluation</td>
<td>All of your assessment decisions will directly influence children’s learning outcomes.</td>
<td>(Morrison, Why is Assessment Important?, 2010)</td>
<td></td>
</tr>
<tr>
<td>Lesson plan</td>
<td>Developed using a scaffolding technique</td>
<td>Current lesson is built upon previous instruction/experiences.</td>
<td>Dr. Benjamin Bloom’s Taxonomy</td>
<td></td>
</tr>
<tr>
<td>Lesson plan</td>
<td>Detailed/ written; with objectives, activities, vocabulary, state standards, etc.</td>
<td>Lesson is focused, prepared and conducted in a timely manner. Allows for flexibility.</td>
<td>Consensus from this study’s interviews.</td>
<td></td>
</tr>
<tr>
<td>Children’s relationship with nature.</td>
<td>Start exposure to nature at the elementary level.</td>
<td>Young children are predisposed to bond with the natural world.</td>
<td>(Sobel, 2005)</td>
<td></td>
</tr>
<tr>
<td>Student Recognition</td>
<td>Issue a certificate of completion for attendance.</td>
<td>Student recognition of achievement and parental documentation of specific courses done.</td>
<td>Personal experience and input from other naturalists.</td>
<td></td>
</tr>
<tr>
<td>Proposed E.S. Program Considerations</td>
<td>Event</td>
<td>Best Practices</td>
<td>Rationale</td>
<td>Documentation</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------</td>
<td>----------------</td>
<td>-----------</td>
<td>---------------</td>
</tr>
<tr>
<td>Program development.</td>
<td>Develop a seasonal, yearly, or multi-year subject plan.</td>
<td>See-Spacing technique use.</td>
<td>Personal experience and input from other naturalists.</td>
<td></td>
</tr>
<tr>
<td>Licensed teacher on staff.</td>
<td>Additional expertise. (Nice to have.)</td>
<td>A greater impact on student learning and achievement than non-certified teachers.</td>
<td>National Board Certified Teachers.</td>
<td></td>
</tr>
<tr>
<td>Controlled instruction area.</td>
<td>A separate area for pre-k siblings and parents to use during the instruction period.</td>
<td>Siblings can play, explore and learn. Parents have a space to converse. Less class disruption.</td>
<td>Personal experience and input from other naturalists.</td>
<td></td>
</tr>
<tr>
<td>Age differentiation during periods of instruction.</td>
<td>Teach the seven- through nine-year-olds separately from the ten-year-old students.</td>
<td>Groups that is chronologically and developmentally cohesive.</td>
<td>(Cherry, 2005) (Gersall's Spiral, 2010) (Plaget's Stages of Cognitive Development, Chart)</td>
<td></td>
</tr>
<tr>
<td>Class instruction.</td>
<td>Environmental educator conduces the class.</td>
<td>Solidifies your role as the teacher and aids student relationship development.</td>
<td>(Todman, 1989)</td>
<td></td>
</tr>
<tr>
<td>Lesson plan development.</td>
<td>Modify an existing plan to feed your needs.</td>
<td>More effective use of what you planning disc.</td>
<td>Personal experience and input from other naturalists.</td>
<td></td>
</tr>
</tbody>
</table>
### Best Practices for Teaching Environmental Education

<table>
<thead>
<tr>
<th>Proposed H.S. Program Considerations</th>
<th>Event</th>
<th>Best Practices</th>
<th>Rationale</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parental involvement.</td>
<td>Parents are welcome to assist with the various stations.</td>
<td>Effective classroom management, safety; and exploration/experiments. Especially for field work.</td>
<td>Personal experience and input from other naturalists.</td>
<td></td>
</tr>
<tr>
<td>Discovery activities</td>
<td>Citizen Science Approach</td>
<td>Public citizens voluntarily participate in scientific research.</td>
<td>(Cornell Lab of Ornithology, 2016).</td>
<td></td>
</tr>
<tr>
<td>Program content.</td>
<td>Incorporate puppets into the learning, when applicable.</td>
<td>Kids talk about the issues that affect their lives personally.</td>
<td>puppetsteducation.org</td>
<td></td>
</tr>
</tbody>
</table>
Appendix T

Letter of Informed Consent Requesting Permission of Adults to Take Part in Research
Letter of Informed Consent Requesting Permission of Adults to Take Part in Research

Month day, year

Dear ____,

I am a graduate student working on an advanced degree in education at Hamline University, St. Paul, Minnesota. As part of my graduate work, I plan to conduct research with environmental education home school practitioners at nature centers located in the seven counties under the jurisdiction of the an Upper Midwest governing body October-November, 2016. The purpose of this letter is to request your participation. This research is public scholarship, and the abstract and final product will be cataloged in Hamline’s Bush Library Digital Commons, a searchable electronic repository and that it may be published or used in other ways.

The topic of my master’s capstone (thesis) is: “What are the best practices for teaching environmental education to elementary aged home school students at nature centers located in a large metropolitan area in the Upper Midwest?” I plan to interview environmental education home school practitioners at nature centers to gain their perspectives and experiences about best practices for teaching home school students. The interviews will be recorded in writing and last about 60 minutes. The interview questions will be provided ahead of time. Besides the interviews, I will also analyze documents that you provide to the public and also physically hike your grounds to view your recreational and geographic resources. After completing the capstone, I will summarize the findings in a report to be distributed to interview participants, if so requested.
There is little to no risk if you choose to be interviewed. All results will be confidential and anonymous. Pseudonyms for the nature center and participants will be used. The interviews will be conducted at a place and time that are convenient for you. The interview recordings will be destroyed after completion of my study.

Participation in the interview is voluntary, and, at any time, you may decline to be interviewed or to have your interview content deleted from the capstone without negative consequences.

I have received approval from the School of Education at Hamline University to conduct this study. The capstone will be cataloged in Hamline’s Bush Library Digital Commons, a searchable electronic repository. My results might be included in an article in a professional journal or a session at a professional conference. In all cases, your identity and participation in this study will be confidential.

If you agree to participate, keep this page. Fill out the duplicate agreement to participate on page two and return it to me by mail or copy the form in an email to me no later than ______. If you have any questions, please contact me.

Sincerely,

Ronald P. Wodtke
7785 Peony Lane North;
Maple Grove, MN 55311
Phone: 763-227-6517
Email Address: ron.wodtke@comcast.net
Appendix U:

Human Subjects Committee Full Research Approval
To: Ronald Wodtke  
From: Vivian Johnson  
Date: 10-3-16  
Re: HSC Approval  
On behalf of the Human Subjects Committee, we are pleased to inform you that your application has been fully approved and that you are now able to collect data related to your capstone. Please accept our best wishes for the successful completion of your project.  
Vivian Johnson, PhD  
Chair, HSC Committee  
School of Education  
Hamline University  
vjohnson@hamline.edu  
(651) 523-2432
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