

A Comparative Analysis of Environmental Education in
North Carolina, California, and Hawaii

by

Abbey L. Allen

A Thesis
Submitted in partial fulfillment
of the requirements for the degree
Master of Environmental Studies
The Evergreen State College
June 2014

© 2014 by Abbey L. Allen. All rights reserved.

This Thesis for the Master of Environmental Studies Degree

by

Abbey L. Allen

has been approved for

The Evergreen State College

by

Dr. Kevin Francis
Member of the Faculty

Date

ABSTRACT

A Comparative Analysis of Environmental Education in North Carolina, California, and Hawaii

Abbey L. Allen

Federal funding for environmental education programs through the U.S. Environmental Protection Agency was reduced from \$10 million a year to \$0 in the 2013 fiscal year, despite the agency's funds being increased. With the severe budget cuts at the federal level, state agencies are now left to secure funds on their own for environmental education programs, which can lead to complicated relationships between those involved in environmental education and those involved in the political realm.

Due to the various levels of involvement in these initiatives, there are sometimes conflicts that can arise regarding interests. This thesis examines funding initiative for environmental education in North Carolina, California, and Hawaii. The analysis for each state focuses on four main categories: student achievement in environmental education, political and social relationships, funding and curriculum correlations, and the status of environmental education. This research shows the major trends in environmental education and attempts to show how some states have overcome challenges. The results indicate that through systems of government, states can self-sustain the environmental education initiatives if federal funding for these programs remains in its current state.

TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION	1
GROWING SUPPORT FOR ENVIRONMENTAL EDUCATION	1
DEFINING ENVIRONMENTAL EDUCATION	2
THE RESURRECTION OF ENVIRONMENTAL EDUCATION IN THE UNITED STATES	4
OTHER PIECES OF LEGISLATION.....	6
PROBLEMS WITH FUNDING.....	7
STATE INITIATIVES	7
STATEMENT OF PURPOSE FOR RESEARCH	8
OVERVIEW & METHODS	9
CHAPTER TWO: LITERATURE REVIEW	11
EVALUATING ENVIRONMENTAL EDUCATION PROGRAMS	11
MEASURING THE IMPORTANCE OF ENVIRONMENTAL EDUCATION IN SCHOOLS.....	12
STATE INVOLVEMENT IN ENVIRONMENTAL EDUCATION	17
POLITICS OF STATE-LEVEL ENVIRONMENTAL EDUCATION	19
CHAPTER THREE: NORTH CAROLINA	20
HISTORICAL BACKGROUND	20

ENVIRONMENTAL EDUCATION LEGISLATION.....	21
IN-STATE FUNDING	23
THE NORTH CAROLINA ENVIRONMENTAL EDUCATION PLAN.....	24
GOALS FOR ENVIRONMENTAL EDUCATION	26
ANALYSIS.....	27
CHAPTER FOUR: CALIFORNIA.....	37
HISTORICAL BACKGROUND	37
CURRICULUM DEVELOPMENT	39
MODEL CURRICULUM PLAN.....	39
INCORPORATING ENVIRONMENTAL EDUCATION	42
FUNDING ENVIRONMENTAL EDUCATION	43
ANALYSIS.....	44
CHAPTER FIVE: HAWAII	58
HISTORICAL BACKGROUND	58
HAWAII ENVIRONMENTAL EDUCATION ALLIANCE	59
FUNDING THE PLAN	61
THEMES THROUGHOUT THE LITERACY PLAN	62
HAWAII CONTENT AND PERFORMANCE STANDARDS	62
COMMON CORE.....	64
ANALYSIS.....	65
EFFECT OF ENVIRONMENTAL EDUCATION IN HAWAII.....	65

CHAPTER SIX: DISCUSSION.....	73
PARALLELS AMONG STATES.....	73
STUDENT ACHIEVEMENT IN ENVIRONMENTAL EDUCATION.....	73
POLITICAL AND SOCIAL RELATIONSHIPS OF ENVIRONMENTAL EDUCATION.....	75
FUNDING AND CURRICULUM CORRELATIONS	76
STATUS OF ENVIRONMENTAL EDUCATION.....	79
 CHAPTER SEVEN: RECOMMENDATIONS FOR FURTHER RESEARCH	 82
FEDERAL FUNDING ISSUES: ENVIRONMENTAL EDUCATION	83
GRANTS BY STATE.....	85
NORTH CAROLINA	85
CALIFORNIA.....	86
HAWAII.....	87
 APPENDICES.....	 92
 REFERENCES.....	 ERROR! BOOKMARK NOT DEFINED.

LIST OF FIGURES

Table 1: Proficiency in Reading, Math, and Writing.....	29
Table 2: Proficiency in Reading, Math, and Writing.....	29
Table 3: Summary of Paired Comparisons	46
Table 4: Comparison of Investigating and Evaluating Environmental Issues and Actions (IEEIA) vs. Non-IEEIA Students: Critical Thinking	67

ACKNOWLEDGMENTS

I could not have made it this far without the encouragement and support from my wonderful husband, Christopher, and my family who have believed in me since day one. I would also like to thank my reader, Kevin Francis, for his inspiration and guidance throughout the writing process of my thesis. I would like to extend a thank you to Lisa Tolley, the North Carolina Environmental Education Program Manager, for taking the time to discuss the program with me. Finally, thank you to the dedicated baristas at A Perfect Cup for providing exceptionally well brewed London Fogs and their fully caffeinated support.

CHAPTER ONE

INTRODUCTION

Growing Support for Environmental Education

One of the main reasons that the environmental movement took off when it did was timing. People began to see the effects of environmental degradation and the radical social reforms carrying over from the 1960s. During this time, environmental issues and their role in politics and society for the future were debated, even issues that had never been considered before were coming into the light of the environmental movement; for example, the future of the Great Lakes and their health and the role of engineers in preventing pollution (Rome, 2010). The popularity of Earth Day and its movement extended much further beyond media attention about these issues. It stretched into the discussion of environmental education being taught in schools and international conferences created for the conversation and definition of the future of environmental education.

Growing popularity for environmental education programs, both in school and as after-school-programs can provide information about trends in public interest, which can also affect how much government support these programs will receive. Government response to environmental problems can greatly affect the public's personal attitudes towards the environment and how much they feel they should contribute. These fluctuations in interest and the priorities of national agenda suggest that if government leaders acknowledge the seriousness of

environmental problems and offer genuine solutions to sustainability, perhaps young people will listen and follow their example by taking on greater responsibility (Wray-Lake, 2010).

The United States experimented with environmental education departments very early in the beginning of the modern environmental movement. Only a year after Congress passed the National Environmental Policy Act in 1969, it passed a short-lived Environmental Education Act in October of 1970. This act established an Office of Environmental Education in the Department of Health, Education, and Welfare. The office was responsible for awarding grants in order to develop environmental curricula and train teachers (Bearden, 2002). This office was eventually merged with the Department of Education, formed in 1979.

Once the Reagan Administration took office in the 1980s, it began to move the role the federal government played in many existing programs to the states (Bearden, 2002). As a result of these efforts, Congress eliminated the Office of Environmental Education in 1981, finding it to be an unnecessary expenditure in the federal budget. While the Environmental Education Act of 1970 only remained in effect for eleven years, it was able to make a lasting impact on national agenda priorities and the public's views on the importance of environmental education in schools.

Defining Environmental Education

As support for environmental education continued to grow in the United States, it also began to gain support worldwide. Leading educators felt the need to

come together and define what exactly environmental education meant as its own independent subject.

There were three major intergovernmental conferences on environmental education during the 1970s which were organized by the United Nations Education, Scientific, and Cultural Organization (UNESCO) and the United Nations Environment Programme (UNEP). These conferences took place in Stockholm in 1970, Belgrade in 1975, and Tbilisi, Georgia in 1977. The Tbilisi conference was the most influential and had five goals on the agenda to discuss: major environmental problems in contemporary society, the role of education facing the challenges of environmental problems, current efforts at the national and international levels for the development of environmental education, strategies for the development of environmental education at the national level, regional and international co-operation for the development and needs of environmental education (Intergovernmental Conference on Environmental Education, Tbilisi 1977).

In regards to the role of education with environmental problems and providing a developed structure, the conference concluded that environmental education should be integrated into formal education of all levels and that its integration would provide skills for formulating solutions to environmental questions (Intergovernmental Conference on Environmental Education, Tbilisi 1977). During the early stages of the modern environmental movement, countries were beginning to see that not only would environmental education equip future generations to deal with these increasing environmental problems, but that

economic, political, and ecological factors played a role in the success of these programs and if they were to be implemented, these systems would have to adapt.

Because of the various factors recognized at the Tbilisi conference that influenced environmental education, part of the core definition was for these programs to be practical and interdisciplinary and that students should learn from the environment, as well as about it (Intergovernmental Conference on Environmental Education, Tbilisi 1977). Throughout the discussion of environmental education, it was emphasized that these programs would be the most successful if they were conducted both inside and outside of schools. These conferences resulted in the Tbilisi declaration and the definition of environmental education, expected to be used as a guideline for countries implementing such programs:

“Environmental education... should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment... By adopting a holistic approach...it recreates an overall perspective which acknowledges the fact that natural environment and manmade environment are profoundly interdependent. It helps reveal the enduring continuity which links the acts of today to the consequences for tomorrow... Environmental education must look outward to the community. It should involve the individual in an active problem-solving process within the context of specific realities, and it should encourage initiative, a sense of responsibility and commitment to build a better tomorrow” (Intergovernmental Conference on Environmental Education, Tbilisi, 1977).

The Resurrection of Environmental Education in the United States

In 1990, President George H.W. Bush signed the National Environmental Education Act into effect. It was similar to the original, except that it mandated

environmental education become a priority within the EPA and gave the agency the authority to provide grants, fellowships for the pursue of environmental professions, sponsoring workshops and conferences, and provide curriculum guidelines (Bearden, 2002). According to Bearden, the reason Congress made the decision to create a new piece of environmental education was due to an analysis of existing federal programs designed to educate the public about environmental problems and train professionals. It was ruled that these areas were inadequate and that the role of the federal government was necessary for their success (Bearden, 2002).

Once implemented, this bill gave the EPA the responsibility of establishing a new office of environmental education. Congress felt that this task would be appropriate for the EPA due to its mission to “protect human health and the environment” (Potter, 2010). The office was given a budget of \$6.5 million in 1992 to begin new environmental education initiatives. Some examples of the initiatives included national environmental education standards for materials, students, and teachers, the first environmental education research project to provide a baseline for literacy for middle school students across the United States, and states were also given support for developing their own programs (Potter, 2010). According to Potter (2010), an environmental educator, the National Environmental Education Act is the single largest funding source for environmental education. Since the formation of the bill in 1992, until it expired seventeen years later, funding averaged less than \$6 million per year to provide

education to the general public about environmental issues and solutions (Potter, 2010).

Other Pieces of Legislation

The National Environmental Education Act expired in 1996. However, Congress continues to provide money for programs and initiatives that the act originally implemented (Potter, 2010). Although this act has not been reauthorized, there have been other amendments proposed to reintroduce a stronger authority of environmental education and provide more funding on the federal level because of widespread public support, about 95% (Potter, 2010). The National Environmental Education Act was able to work on the level it did because the number of people in the United States was not as large as it is currently. Trying to educate the public on its fixed budget is nearly impossible and therefore, makes the National Environmental Education Act quite outdated.

The second most impactful piece of legislation for environmental education would have been the No Child Left Inside Act. This proposal was originally attached to the No Child Left Behind Act, were it to be reauthorized in 2009 (Potter, 2010). If the act passed, it would have set the budget at \$14 million, with \$100 million for a national grant program to be managed by the Department of Education. Unlike the National Environmental Education Act which focused on Grades K-16 in non-formal and formal experiences, and the general public, the No Child Left Inside Act only focused on formal education of Grades K-12 (Potter, 2010). However, Congress did not pass this bill in 2009. This bill has been reintroduced in Congress several times over the last four years, the most

recent being July 16, 2013 and it is currently waiting to progress through the legislative process.

Problems with Funding

Although there have been pieces of legislation for funding environmental education, there is still a huge problem with the consistency of funding the programs. Environmental education is not the only area that has taken a funding hit over the years. As of 2010, the federal government in the United States only spent about 1.26 percent of the total budget on natural resource and environmental protection, compared to 2.35 percent in 1980 (Wang, 2011). The actual amount allotted by the federal government is much lower than suggested by scientists for environmental services, which was \$5 to \$8 billion, and the real amount was \$3.2 billion a year (Wang, 2011). Much of this back and forth support for funding these services is because of the priorities of the political agenda. Due to economic uncertainties and lack of priority, state and local governments have taken on a much larger role than previous years to fill the gap of dwindling funds for environmental protection from the federal government. This goes for environmental education as well.

State Initiatives

Many states have developed their own environmental education initiatives with the state EPA and like the federal government, have created offices strictly for the support of environmental education. Since the implementation of the National Environmental Education Act in the 1990s, the public has become more aware of just how important is it for citizens to be environmentally literate,

meaning that they “understand how natural systems function and how humans and the environment are intertwined” (North Carolina Environmental Education Plan, 2006), both adults and children. Many states are beginning to draft initiatives and others, like North Carolina, have had them since the mid-1990s and have renewed or enhanced them as needed over the years.

Statement of Purpose for Research

Due to the lack of updated legislation from the federal government, many states have developed their own environmental education initiatives. This is a much more efficient and effective way for states to control how environmental education funding and materials are distributed in their own territories. By developing comprehensive plans with the help of outside sources, such as NGOs and the North American Association for Environmental Education, states can ensure that every student, at the bare minimum, has basic environmental literacy without waiting for legislative action from the federal government.

This research will attempt to show the successes that state environmental education plans have had with implementation in higher education and K-12 schools, as well as securing funding sources for short and long term goals, compared to the federal government. Although federal organizations such as the Environmental Protection Agency and the National Oceanic and Atmospheric Administration (NOAA) provide a source of funding for environmental education programs nationwide, it is still funding that must be approved for the current fiscal year and, unfortunately, is not guaranteed to be as much as the previous year or available at all. Without an up-to-date legislative bill, the government does

not have an obligation to provide funding or increase funding to meet the standards of modern times.

In order to show the success of these initiatives, three states will be analyzed and compared to the federal government; California, Hawaii, and North Carolina. Each plan was developed at a different time and experienced different challenges and setbacks to get to the point they are now. The analysis of state environmental education initiatives will include the political and social relationships, the funding and curriculum correlations, while also determining if there is a possibility that a funding source also influences the curriculum content, and if the initiatives accomplished the goals set forth in the master plans.

Overview and Methods

In the next three chapters, the following methods will be outlined for the state case studies, which include North Carolina, California, and Hawaii. The methods for analysis will be based on:

1. The effect of the environmental education initiatives on student achievement within the state, specifically within core areas of study and the behavioral changes within these classes. Furthermore, a systematic review of related research will be conducted to show similar studies outside of the scope of this research, as well as those relevant to academic achievement in the three case studies.
2. The political and social relationships that can influence the efficiency and effectiveness of environmental education.

3. Funding relationships between the states, schools, and outside influences and if curriculum content is influenced because of these relationships.
4. The status of environmental education in selected state and if the initial goals outlined within the initiative are being accomplished.

The framework for this evaluation was influenced by Dr. Deborah Simmons, a professor at the University of Illinois and a board member of the North American Association for Environmental Education (Hollweg, 2011). The sections above will provide insight of the key areas in environmental education initiatives and trends across states. The three states were chosen for this research because the initiatives are very comprehensive, well developed, and in different regions of the United States. These initiatives were implemented at different times, but each faced individual challenges and successes. I will look at the challenges, successes, and patterns within the states and compare each to the federal government's amount of funding input later in chapter eight.

There are two goals for this research; the first is to investigate what is happening at the state level in regards to implementing environmental education in schools and funding their own initiatives, and the second is to research how each state is handling budget cuts both at the state level and federal.

CHAPTER TWO

LITERATURE REVIEW

Evaluating Environmental Education Programs

There are many ways to evaluate environmental education programs, both in the federal and state sectors. Careful evaluation can give a lot of information about the program and help direct the future of the program for environmental education professionals. As discussed in the chapter one, the Tbilisi Conference was important in earlier developments of environmental education curriculums. There were four main objectives for individuals to accomplish in order to gain a full understanding as environmental stewards (Stapp 1969):

1. A clear understanding of the parts of a system
2. A broad understanding of the environment, both natural and man-made
3. An understanding of environmental problems man faced and how they can be solved, by both citizens and the government
4. Attitudes of concern for the quality of the environment

Nearly a decade later, the Tbilisi Declaration produced its own objectives for environmental education that focused more on motivating individuals rather than understanding every part of a system; the objectives included awareness,

knowledge, attitudes, skills, and participation (Stapp 1997). These objectives were meant to be incorporated into each environmental program developed.

While the objectives provided by the Tbilisi Declaration were universally adopted by countries, each have separate entities responsible for evaluating environmental education programs. The largest association in North America is the North American Association for Environmental Education (NAAEE). According to both the Tbilisi Conference and the NAAEE, there are three critical components of environmental education: awareness, understanding, and the capacity for appropriate actions (Thomson & Hoffman). The programs are then based on the successes of these three components together.

There are four main elements of evaluations that are taken into consideration for the NAAEE: systematic assessment, activities and outcomes, standards for comparison, and improvement of the program (Thomson & Hoffman). These elements shed the most light on the successes or failures of the program and can contribute significantly as tools for analyzing funding, accountability management, and decision making (Thomson & Hoffman). They are also the most commonly used forms of evaluation, known as utilization-focused evaluations. (Hug, 2010).

Measuring the Importance of Environmental Education in Schools

The North American Association for Environmental Education has provided many frameworks and evaluations for environmental education programs, which have also contributed to assessments conducted for state

programs to ensure they are effectively meeting their goals. Assessments of environmental literacy for grades K-12 in the United States have been conducted since the 1990s by both a working group in the Office of Environmental Education within the Environmental Protection Agency and the National Environmental Education Advisory Council to report to Congress. The guidelines for assessment were based on UNESCO's objectives and definition for what makes environmental education successful, including cognitive skills, attitudes, awareness, and participation (Hollweg et al., 2011). These guidelines for evaluation involve various disciplines, such as ecologists, economists, energy managers, and social scientists (Hollweg et al., 2011). Each field contributed to the development of approaches and collaborative analyses.

Evaluations of non-formal and formal methods of teaching environmental education were included in the research to determine the most effective ways to deliver environmentally-based materials to students. Non-formal education programs refer to learning outside of the classroom, such as nature walks, aquarium visits, or trips to the local zoo. These programs continue to teach students about environmental concepts, but are conducted in a way so students are able to see, feel, or hear, and participate in real-life learning. Both types of learning approaches have been shown to contribute to the development of cognitive skills in students, as well as decision making and problem-solving (Hollweg et al., 2011) because they provide hands-on, applicable activities.

According to the North American Association for Environmental Education, there are certain skills that those who are environmentally literate will

have: knowledge and understanding of a range of environmental concepts, problems, and issues, cognitive and effective dispositions, cognitive skills and abilities, and behavioral strategies to apply the knowledge and understanding to make effective decisions concerning the environment (Hollweg et al., 2011). The expectations of these skills also vary among grades. One of the goals of teaching these skills is that students will carry these concepts beyond school and apply them to their personal decisions and those that affect their community in order to become more engaged citizens.

It is often difficult to determine how to measure behavior by environmental education standards, but it is also one of the most important outcomes from teaching environmental education in both non-formal and formal setting. The North American Association for Environmental Education claims that self-reporting is the best way to conclude the effectiveness of environmentally-based material, but they are often viewed as less valid or reliable than other factors that can be observed directly by the educator or clear evidence collected for evaluation, such as a test (Monroe, 2010). However, studies conducted throughout the 1990s and early 2000s show that children are becoming more environmentally conscious and adults in environmental fields had significant experiences in non-formal and formal settings that contributed to their decisions to pursue the field (Hollweg et al., 2011).

The late 1990s to early 2000s was a time when interests in environmental education were at a high in the United States since the 1970s. Many assessments of ecological knowledge, behavior, and impacts of student achievement were

done in order to show what influence environmental-based education had in the classrooms. The National Environmental Education Foundation (NEEF) conducted such surveys from 1997 to 2002 to provide an Environmental Report Card in regards to environmental literacy of US citizens (Robelia & Murphy, 2012). The questions of the meta-analysis were designed to gain more insight into citizen awareness of problems, feelings of guilt, attitudes, moral norms, and finally, their intentions to act (Robelia & Murphy 2012). In the study, NEEF found that knowledge is a key contributing factor to alternating behavior because it provides understanding of many factors involved with environmental education, such as economics, policy, natural and man-made environments, biological functions, and the complexity of these relationships (2012).

Other studies have been provided to show the influence that environmental education has on students when introduced in the classroom, aside from gaining ecological knowledge. In 2000, NEEF commissioned NAAEE to publish a report about successful environment-based education programs across the United States in order to better educate the public and the education community on the benefits environmental education can have when taught as part of the standard curriculum. This report studied seven elementary schools, which included two in Texas, North Carolina, Wisconsin, Minnesota, Kentucky, and Florida that had already implemented environmental material and used the evidence collected to compare traditional student learning to how environmental-based education improves academic performance across the board (Glenn, 2000).

The core subjects included in the study were reading, math, science, and social studies. Students in this study showed a much higher passing rate and overall increase on test scores than the total public school populations in the states and in some cases, at the national level. Other areas of focus contributed to the evidence in this report, such as “learning how to do” rather than just “learn about”, discipline problems within the classroom, and abilities to make connections in various contexts (Glenn, 2000). This study was a follow-up for *Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning*, published by the State Education and Environment Roundtable (SEER), which shed light of further evidence that environment-based education provided students with overall large improvements in their learning.

Closing the Achievement Gap was a comprehensive study involving 40 schools, 400 students and 250 teachers and administrators interviewed, and comparative analyses of standardized test scores, GPAs, and attitudinal measures (Lieberman & Hoody, 1998). According to the results from the study, significant improvements in language arts were reported and students showed much more enthusiasm about the subjects because the material greatly appealed to their interests. Math was another interesting subject that reported much higher scores, mainly due to students taking complex principles and turning them into tools that could be used in the real world to analyze information (Lieberman & Hoody, 1998).

Finally, students showed a higher connection to their community through environment-based education and recognition of how decisions affect more than

aspect and became more responsible citizens. SEER's study was later recognized by the Education Commission of the States (ECS), a nonpartisan organization designed to help policymakers make decisions on effective practices for public education, as a practice that showed evidence of success for student achievement and could be a promising for effecting school reform and education improvement (Glenn, 2000).

State Involvement in Environmental Education

In past years, states have relied on a majority of federal grants for environmental spending, about \$10 million in 2012, especially for environmental education, rather than factor the costs into their own budgets. Clarke and Whitford (2011) explain that the state/federal funding relationship works in two ways: federal funds can make states put more effort into projects and therefore, more of their own funds, or state's efforts can bring in more federal funding. There are also many factors that can affect this funding relationship as well, such as policy processes, state cooperation with federal law, state interests, and partisan control in the U.S. House of Representatives and Senate (Clarke & Whitford, 2011). Many researchers are concerned that funding from the federal government will crowd out state spending and result in a lack in funds raised independently by the state, more reliance on federal funds, and more costs to the median voter for environmental goods (Clark & Whitford, 2011).

Arguably, the control and position within the U.S. House and Senate are two of the most important factors, in regards to the distribution of available environmental grants. This can occur when citizens make demands for more

environmental initiatives and their representatives respond by pushing for more funding from the EPA (Clarke & Whitford, 2011). Observed by Clarke and Whitford, it is more likely that liberal states that are also more environmentally friendly will receive more grants and any extra funding that the EPA can accumulate for environmental education or other environmental services.

Recently, however, states have taken more initiative not only with drafting environmental education initiatives, but also providing funding due to economic uncertainties and general cuts made to the federal budget in areas considered to be “unnecessary”. In a survey of state-level environmental education in 1998, Ruskey, Wilke, and Beasley found an increase of state funding from 8 states to 32 (2001) from their initial 1996 survey, which provided 113 responses from environmental education association specialists, presidents, coordinators, and those involved in state departments of education and natural resources from all 50 states. The survey contacts were chosen based on the assumption that they would have a solid understanding of the state programs and their needs (Ruskey, Wilke, and Beasley, 2001). Of these 32 states, 27 reported \$7,250,000 in federal grant money provided for environmental education programs, much lower than what is needed for environmental education training, curriculum, and formal and non-formal programs (Ruskey, Wilke, and Beasley, 2001). Furthermore, the number of state trust funds specifically for environmental education were still at a very low number in 1998, but had increased to eight states from five. Trust funds are an important component for the security of funding sources within states (Ruskey, Wilke, and Beasley, 2001).

Politics of State-Level Environmental Education

Although environmental education is much further developed than it was just twenty years ago, there are still skeptics who think environmental education is nothing but a liberal agenda. There have been bi-partisan attempts to revive the National Environmental Education Act and pass No Child Left Inside, but both have been unsuccessful due to the political atmosphere in Washington D.C. Aside from pushing the liberal agenda, arguments against environmental education have that it “feeds children environmental misinformation” and “scares children into becoming tomorrow’s environmental activists” (Crouch & Abbot, 2009).

Traditionally, states considered blue were more willing to adopt environmental education practices, and red states were less willing. However, some surprising exceptions have emerged in the last 15 years with traditionally conservative states, such as Kentucky and Pennsylvania, developing their own comprehensive state-level environmental education plans, and traditionally liberal states, such as Oregon and Rhode Island are lacking in comprehensive environmental education plans (Crouch & Abbot, 2009). The results of a survey conducted by Crouch and Abbot of red and blue states and their environmental education plans revealed that party affiliation has little influence over plan implementation or development at the state-level. The study attributed this finding due to the fact that these decisions are much more complex than simply choosing a political affiliation (Crouch & Abbot, 2009).

CHAPTER THREE

NORTH CAROLINA

Historical Background

After the federal government signed the Environmental Education Act into effect in 1970, many states followed closely after with environmental education initiatives at the local level. North Carolina was one of the first states to draft an environmental education plan. It was led by Governor James Holshouser Jr. in 1971 and passed by the General Assembly in 1973. (EE North Carolina, History). North Carolina's initiative was supported by the U.S. Department of Health, Education, and Welfare, which at the time was responsible for overseeing the growth of environmental education. The department was able to offer a starting grant to provide adequate resources and materials for the development of this plan, called *A State Master Plan for Developing Environmental Education Programs in North Carolina* (EE North Carolina, History). The Master Plan outlined coordination and efforts between various state agencies in order to increase the success of environmental education within the state. This also meant evaluating existing resources across the state that would be able to provide a base for student learning, as well as teacher training (EE North Carolina, History).

While North Carolina was making strong headway in developing its environmental education program, legislation for EE was struggling at the federal level. In the early 1980s, funding for the Master Plan was no longer available due to cuts made in the federal budget during the Reagan Administration. Once this occurred, implementation of environmental education fell to the responsibility of the state government and agencies with “little financial support” (EE North Carolina, History). Although federal funding was no longer provided, North Carolina kept pursuing statewide environmental education. It was the highest priority for the Department of Environment and Natural Resources during the late 1980s and into the early 1990s. Additions were made to the original Master Plan, including establishing an Office of Environmental Education, considered to be a “long-term funding base for environmental education programs” (EE North Carolina, History). North Carolina was one of the few states at the time that had an office specifically for overseeing environmental education, which was included in the state budget. The Office of Environmental Education continues to provide funding for the implementation of environmental education today.

Environmental Education Legislation

Legislation for environmental education in North Carolina developed early in the resurrection of environmental education in the 1990s. In 1993, the North Carolina General Assembly passed the Environmental Education Act, authorizing funding for environmental education within the state budget. This act also created the Department of Environmental Education and Natural Resources, with which the Office of Environmental Education is attached. The act not only gives full

responsibility of coordinating environmental education needs and evaluations, but it is also responsible for providing grants to “promote the further development of local and regional environmental education...especially, but not limited to, school-age children” (NC General Statutes-Chapter 143B Article 7).

Curriculum Development

In order for environmental education to be successful on this level, educators, department staff, and the General Assembly felt it was necessary to include curriculum standards. Article 7 established a clause that would provide the Superintendent of the Department of Public Instruction the responsibility to coordinate environmental education within North Carolina, integrate topics within the various curriculums in core areas of study, and provide materials for instruction and the dissemination of information to teachers and schools (NC General Statutes-Chapter 143B Article 7). Extending from Article 7, the North Carolina Environmental Literacy Plan, developed by the North Carolina Department of Environment and Natural Resources, the Department of Public Instruction, and the North Carolina Environmental Literacy Plan Working Group further outlined how environmental education curriculum content would be incorporated. The content was integrated throughout Pre K-12 classrooms, as well as allowing students the opportunities for outdoor learning and classroom activities designed to increase environmental awareness (NC Environmental Literacy Plan).

Because this is such an important area of focus, state department staff and working groups have provided enough support and materials to make teaching environmental education an easy process, as well as evaluations to ensure that the programs are working as they were designed. These materials are used in a wide variety of environmental education programs, ranging from the local level to the national level; such materials include Project WILD, Project WET, and Project Learning Tree. Each project is supported at the national level and the international level, with contributions coming from private foundations, large companies, such as Nestle and ConocoPhillips, and federal agencies, such as the Environmental Protection Agency (NC Environmental Literacy Plan).

In-state Funding

Initially, to secure funding for environmental education across the state, the North Carolina General Assembly proposed an additional bill known as the Environmental Education Trust Fund. This bill was sponsored by Senator Odom in 1997 and was projected to go into effect the same year. The purpose of this bill was to create a fund to provide grants and awards for environmental education in both formal and non-formal programs. Once enacted, the bill would provide \$200,000 to the Environmental Education Trust Fund from the General Assembly for the 1997-1998 fiscal year and the same amount for the 1998-1999 fiscal year (General Assembly Senate Bill 139, 1997), as well as any money donated to environmental education from contributors or grants from both public and private sources. The trust fund was not established, but funding was still secured through grants, donations, and the North Carolina Department of Environment and Natural

Resources. As of 2009, state funding for the Office of Environmental Education was \$377,000, which was to be distributed throughout the state (EENC, Letters). Even without a trust fund, the state was able to go forward in its plans to promote and coordinate environmental literacy, as intended.

The North Carolina Environmental Education Plan

The North Carolina Environmental Education Plan is the backbone for providing environmental education to children and adults across the state. It provides a framework for the most efficient, effective ways to deliver environmental literacy (North Carolina Office of Environmental Education, 2006). Developing alongside this plan was the North Carolina Environmental Education Advisory Council. The council has representatives from various backgrounds, such as business, environmental communities, and academia and is responsible for advising the Office of Environmental Education on programs and policies for the most beneficial outcome for increasing environmental literacy (North Carolina Office of Environmental Education, 2006).

The original plan was published in 1995, right after the General Assembly passed the North Carolina Environmental Education Act in 1993. The plan certainly had room to improve and allowed environmental educators and other members within the environmental education community to provide their feedback and opinions in the direction that the Office of Environmental Education should pursue (North Carolina Office of Environmental Education, 2006). To date, there have been three editions of the Environmental Education Plan, the most recent being 2006. Only minor revisions have been made since 1993 and

have mainly been updates to education plans or including more council backgrounds, such as agriculture and cultural arts. Due to increasing environmental concerns, it was extremely important for the advisory council and the office to enhance their goals and tools in and out of the classroom in order for people to be knowledgeable about natural systems and the human relationship with the environment in hopes that the skills developed and interest in nature would continue throughout their lives.

One of the most important aspects about the North Carolina Environmental Education Plan and the passing of the Act is that they are controlled by the state. This means that environmental education does not have to be limited to an after-school activity and can be implemented into schools. North Carolina has especially made an effort to provide environmental education in PreK-12 classrooms and environmental education certification programs for teachers so that this can become an integrated subject of learning in schools (North Carolina Office of Environmental Education, 2006). According to the North Carolina Environmental Education Plan, the Office of Environmental Education's primary focus is "providing support to formal and non-formal educators to improve their effectiveness and on increasing the number of educators who provide environmental education" (North Carolina Office of Environmental Education, 2006). In this context, non-formal environmental education is defined as education that takes place in settings such as parks, zoos, community centers, or nature centers and is not incorporated into the formal education system (North Carolina Office of Environmental Education, 2006).

Providing education in both types of settings makes it very easy for anyone to access environmental education resources and information.

In 1995, North Carolina began the implementation process for integrating environmental education curricula into the state curriculum standards in PreK-12. It was not until 1997 that there was an effective change. The Office of Environmental Education was highly impactful in changing graduation requirements across the state for students. This change meant that high school students were required to take an earth/environmental science course before graduation (North Carolina Office of Environmental Education, 2006). The curricula for these courses was developed by the Office of Environmental Education and the Department of Environment and Natural Resources.

Goals for Environmental Education

There have been four major goals met since the plan was first published in 1995:

1. Improve Access to Environmental Education
2. Build Leaders and Organizations throughout the State that Provide Quality Environmental Education
3. Enhance Environmental Education for Adults
4. Support Preparation and Professional Development of Teachers

Aside from providing access to environmental education to virtually everyone, the plan has made huge accomplishments for building leaders and supporting preparation in the field. North Carolina was the first state to “create a professional

development program for environmental educators” (North Carolina Office of Environmental Education, 2006), both formal and non-formal. Originally, North Carolina used its own model, but revised the program with guidelines set by the North American Association for Environmental Education in 2009, an organization that has also been responsible for state environmental education evaluation and guidelines for implementation and will later be addressed.

ANALYSIS

One of the most important aspects in an environmental education program’s success is funding. Having a strong source of funding can provide so many opportunities for students, teachers, and the state itself. It can also help meet goals outlined in the original plan without compromising important strategies. However, a lack of funding or budget cuts can completely break a program and a department’s ability to successfully fulfill the goals. In North Carolina’s case, the environmental education initiative has been so well developed over the years and so much has been invested into it, that it will likely remain even with severe cuts made to the state and federal budgets. Using the methodology outlined in the introduction will provide a solid foundation with which North Carolina’s initiative can be compared to that of the federal government’s legislation and contribution, as well as the three other states involved in this research.

1. Effect of Environmental Education in North Carolina

Student Achievement in Environmental Education

In 2000, NEEF conducted a progress report on several schools across the United States, including North Carolina for the success of Environment-based Education in schools. As mentioned in Chapter 2, this study involved 40 schools and a total of 650 students and teachers in the interview process. In NEEF's study, Isaac Dickson Elementary School in Asheville, North Carolina was analyzed for its environmental education integrated into the school's curriculum. Other than its integrated curriculum, this school was chosen because of its demographics. 330 of the K-5th grade students were reported living in housing projects, and 50% of the total number of students are from low-income families (Glenn, 2000). The decision was made to implement environmental education material into the school in hopes that the school would catch up to state learning standards, as directed by Asheville City's plan to increase student achievement. The plan specifically for the school was implemented slightly differently by incorporating nature activities into all subjects (Glenn, 2000).

The plan for Isaac Dickson Elementary involved outside forces such as government agencies, community organizations, as well as teachers and students. Combined, they created the Gardening/Science Club, the Mountain Area Gardens in Community Program, and restoration of nature trails around campus (Glenn, 2000) in order to help students actively learn about the environment. The curriculum was assessed during the 1998-1999 school year and it was revealed that students met the standard state achievement tests, and exceeding the standard in writing, and the overall improvement of school achievement was 9.1 points

above the *expected* growth (Glenn, 2000). Below are two tables from the case study by NEEF in North Carolina reflecting the percentage increase from 1998 to 1999 of student proficiency in reading, math, and writing. It is very important to note the drastic increase from 1998 to 1999 in each core area of study once environmental education was implemented and how proficient students at Dickson Elementary were in these areas compared to the state as a whole:

**Table 1: Proficiency in Reading, Math, and Writing
Isaac Dickson Elementary School Averages**

	Reading	Math	Writing
1998	70%	70%	46%
1999	79%	76%	57%** (state average was 55.3%)

*Percentage of students proficient in skills needed to perform at grade level.

**For the first time, Dickson's proficiency ratings rose above the state average.

**Table 2: Proficiency in Reading, Math, and Writing
Isaac Dickson Elementary, By Cohort Group**

	Reading			Math		
	Gr. 3 Cohort	Gr. 4 Cohort	Gr. 5 Cohort	Gr. 3 Cohort	Gr. 4 Cohort	Gr. 5 Cohort
1998 (Dickson)	55.0%	53.8%	73.3%	48.0%	46.1%	77.7%
1998 (NC State)	N/A	71.6%	70.9%	N/A	68.2%	79.3%
1999 (Dickson)	75.4%	75.0%	91.7%	68.4%	77.1%	91.7%
1999 (NC State)	73.6%	71.4%	75.8%	70.0%	82.7%	82.4%

*Percentage of students proficient in skills needed to perform at grade level

A second study regarding high school biology students was conducted within the state of North Carolina, involving a faculty member from the University of North Carolina and the North Carolina Department of Public Instruction. Specifically, how students developed critical thinking and problem solving skills with environmental problems, both natural and man-made (Fleetwood & Hounshell, 1976). The purpose of this study was to assess the cognitive development throughout a course integrated with environmental education. The framework for this study used the objectives outlined by the North Carolina Task Force, which included ecosystems, natural resources, pollution, and environmental decision making and were also used to conclude the outcomes of student learning.

In order to determine these outcomes, two different tests were made for 1,633 biology students of seven selected schools to take. One was a multiple choice achievement test, modeled after the Likert Method and was designed to test the students' understanding of environmental concepts and application. The second test was based on behavior outcomes and used a scale of measurement with agree, undecided, and disagree to gauge individual feelings towards environmental issues and protection, both positive and negative (Fleetwood & Hounshell, 1976). Once details were agreed upon, the two model tests were sent to a panel of professionals within the environmental education field to provide an "answer key". After students finished both tests, they were sent back to the panel, which then evaluated the responses and determined that students who scored higher on their tests had more positive feelings about the environment. The test

also gave a better indication as to what should be included on an achievement test in order to gauge the effectiveness of environmental education and if goals are met (Fleetwood & Hounshell, 1976).

2. Political & Social Relationships of Environmental Education

State Stakeholder & Organization Influence

One of the biggest obstacles when integrating environmental education into a class is the political influence that some of the material may have or may not have. There are several controversial topics that are important for students to learn about when it comes to the core messages of environmental-based material, for example, climate change, coal mining, and oil spills. These issues can be controversial across the nation, but at least two of them are region-specific and may be influenced by particular stakeholder interests. In 1987, a non-profit organization was created called the Environmental Educators of North Carolina (EENC). This organization involved many stakeholders, including professors from both universities in North Carolina, schools around the state, park rangers, naturalists, agency officials, utility professionals, and policy-makers (EENC, History, 2013). The EENC held meetings in attempts to raise environmental awareness and push environmental education more throughout the state.

The EENC was able to gain popularity through affiliation with the NAAEE in its early years, which allowed it to also make wider connections in the environmental education community in North Carolina. Once the first board meeting occurred in 1990, the EENC grew into an organization recognized as the

key organization of environmental education professionals in the state and soon took part in drafting the North Carolina Environmental Literacy Plan and support for the NC Green Schools Program (EENC, History, 2013). The EENC is perhaps one of the most important ways stakeholders can become involved in environmental education projects that may affect them and have input or provide expertise.

Agency Influence

North Carolina public schools adopted the new *Standard Course of Study* in 2010 and implemented them for the 2012-2013 school year, which also aligns with the Common Core State Standards for English, math, social studies, and science, an initiative developed by the National Governors Association (NGA) which acts as the collective voice for the governors in the fifty states and territories within the United States. The NGA is bi-partisan and in order to prevent one party from controlling the Chair for too long, the position alternates between Republican and Democrat each year (NGA, About, 2011).

As mentioned before, North Carolina implemented a required earth science credit for high school students in order to graduate. The inclusion of what was recognized as the environmental education curriculum was a very long process, largely headed by an interest group known as Education and Industry Committee for Earth Science in NC. This organization lobbied politicians for fifteen years and was comprised of scientists, universities, and the EPA (Watson & Tucci, 2002). The title of the class was somewhat controversial amongst

committee members within the legislature, mainly due to the fact that the environment was to be a core subject in this class. The subjects within the class included weather, atmospheric science, geology, and general concepts about Earth, but did not mention what many think of when they hear “environmental”; the human impact on these systems or ways to alter behavior (Watson & Tucci, 2002). Although some committee members fought it, the title settled upon Earth/Environmental Science.

Along with the Common Core Standards, the North Carolina Department of Public Instruction created Essential Standards for each subject, which serve as supplementary materials students in various grades are expected to learn. For example, a supplementary and also required course is Earth/Environmental Science. Although these standards are state-wide, they still maintain respect for the Local Education Authority to design the specific curriculum that delivers content to the students (North Carolina Essential Standards, Earth/Environmental Science, 2010). The environmental material was integrated into the science curriculum and was meant to provide students with the same skills that other science courses teach, such as inquiry, experiment design, and problem-solving, while also providing hands-on activities to successfully engage students in the course material.

3. Funding & Curriculum Correlations

For many initiatives and programs related to environmental education, the EPA still provides funding, but it is not nearly enough to support the entirety of

programs across the state. Through a program called Project Tomorrow Environmental Education Model Library Grant Program, the initiative was able to establish some source of funding and also accomplish one of the outlined goals, which was for everyone to be able to access environmental education materials. Over the years, the program has gathered quality materials, including journals, curriculum guides, books, and media and created an online category that can be accessed by anyone needing environmental education resources across the state (N.C. Environmental Education, Accomplishments). From 1995 to 2005 Project Tomorrow provided \$685,050 to 93 counties in North Carolina and 388 public and private schools, as well as other centers supporting environmental education (N.C. Environmental Education, Accomplishments). However, this was a one-time appropriation for the state has not been renewed since 2001.

Like most environmental education programs, North Carolina receives grants from outside sources such as foundations, industries, the public, and businesses. North Carolina does not have a program for environmental education grants specifically. There is however, a non-profit organization called the Environmental Education Fund was formed in 1998 that acts as a “middle man” to ensure that funds going towards environmental education programs in North Carolina will enrich the programs and promote the values outlined in the initiative. Usually, funds that come from these kinds of programs are interested in investing in science curricula, but the funding provided can allow teachers to purchase materials that help children fully grasp the concepts in environmental education courses. Many states, North Carolina included, rely solely on public

and private donations rather than major state grants that once came from the EPA because funding is limited and extremely competitive.

4. Status of Environmental Education in North Carolina

Like many states and the federal government, budget cuts have had to be made across the board, in many agencies. In regards to environmental education in North Carolina, 2001 was a major turning point for designated funding sources. Up until this point, the U.S. Environmental Protection Agency provided funding for environmental education programs within states and a state appropriation was provided for Environmental Education Centers and libraries to arrange for collections of environmental education to be made available (North Carolina Office of Environmental Education, 2006). Federal funding for these programs is very limited in the amount allotted and number of available grants and was not provided past 2005. The state appropriation was also eliminated in 2001 because of budget cuts within the state (North Carolina Office of Environmental Education, 2006). Despite setbacks in finding a secure funding source, more and more teachers are becoming certified to teach environmental education. As of 2009, eight hundred and thirty-two educators had completed the certification process and seven hundred and sixty-six were enrolled for the next period (Burke, 2009). Students are also still required to complete the earth science credit in order to graduate. The 2012-2013 graduate statistics report from the North Carolina Department of Education Environmental recorded a graduation rate of 82.5%, which includes the number of students who completed high school in four years or less. This means that because earth science is a required course, 353,949

students were exposed to environmental literacy in a public school setting (NCDPI, Communications & Information, 2013). Environmental education in the state remains as important as it was when the initiative was in the early stages.

CHAPTER FOUR

CALIFORNIA

Historical Background

California's environmental education initiative was introduced by Assemblywoman Fran Pavley in 2003. The bill was also supported by many non-profit organizations and school districts around the area such as The Ocean Conservancy, Jefferson School District Governing Board of Trustees, and Heal the Bay, to list a few. Its main purpose was to "develop and implement a unified education strategy on the environment for elementary and secondary schools" (California AB 1548, Pavley, 2003). At the time, a law previously in place instated an Office of Integrated Environmental Education as a part of the Integrated Waste Management Board. The proposed initiative, however, created the Office of Education and the Environment, which was part of the California Environmental Protection Agency (CalEPA), holding similar responsibilities as the two separated offices; thus, disbanding those offices. California's initiative was projected to be the leader of environmental literacy in the United States, mainly due to the state's reputation of being innovative and progressive in green initiatives.

The initiative was signed into effect by Governor Gray Davis during the 2003-2004 legislative session. In order to push this initiative forward, the Office of Education on the Environment was required to develop key concepts and a

model curriculum for environmental education for elementary and secondary students by July 1, 2004. Once developed, the curriculum content had to be approved by the State Board of Education and could not duplicate or conflict with existing academic content standards (EEI Principles and Concepts). According to the initiative, there were fourteen topics that were to be included in the concepts:

1. Environmental sustainability
2. Water
3. Air
4. Energy
5. Forestry
6. Fish and wildlife resources
7. Oceans
8. Toxics and hazardous waste
9. Integrated waste management
10. Integrated pest management
11. Public health and the environment
12. Pollution prevention
13. Resource conservation and recycling
14. Environmental justice

During the time of implementation, climate change was not included as one of the major issues, but was later added to the topics list (California AB 1548, Pavley, 2003, EEI Principles and Concepts).

Curriculum Development

In order to ensure that the curriculum would be as comprehensive as possible, the CalEPA partnered with the Natural Resources Agency, the State Department of Education, and the State Board of Education, which allowed interested parties, including state and federal agencies, universities, non-governmental organizations, and educators, to give their input and feedback throughout the process (EEI Principles and Concepts). This process continued until 2005, when the curriculum was approved by the Secretary for Environmental Protection. From this point, the Model Curriculum Plan was created, which defined the methodology, scope, and sequence in which the content would occur (EE Curriculum and State Standards Alignment).

Model Curriculum Plan

The model plan was created to support K-12 teachers, schools, and districts in order to teach environmental concepts and learning objectives required by the state of California. Throughout its development, a team was created as a guide to align the proposed objectives to the standards in grade-level sequence (EEI Model Curriculum Plan, 2005). The team included representatives from CalEPA, State Department of Education, State Board of Education, Office of the Secretary of Education, and the Natural Resources Agency. Once established, the team sent an Educator Needs Assessment to 10,000 teachers to gather suggestions in regards to the design of the environmental education curriculum (EEI Curriculum and State Standards Alignment). The model curriculum was designed

so that it could be easily distributed by grade and discipline and so that they could stand on their own as a separate course.

Although the environmental education is designed to be a separate course, in this plan, it is also meant to correspond with core course curriculum. It is designed this way for students to learn environmental literacy and the standard course material at the same time (EEI Model Curriculum Plan, 2005), rather than become material that is time consuming or does not end up being integrated into the core curriculum due to the volume of material within each subject and pressure on time. The environmental education content was originally aimed at being integrated into each standard core course, but developed to work best in science and history/social sciences (EEI Model Curriculum Plan, 2005) that could also be applied to students' surroundings and real-life environmental situations within the state, it was called "California Connection" (EEI Curriculum Development and Field Testing). This process took a total of three months in the beginning of 2005.

As defined in the environmental education legislation, the material would be integrated into each core standard of instruction. The Model Curriculum Planning Team created a section outlining supplemental environmental education materials designed for non-science or history related courses, such as English, vocabulary, and math (EEI Model Curriculum Plan, 2005). The content used for the supplemental comes from the model previously used for science and history and includes the use of reading comprehension and analytical skills. The targeted grades for introducing this material are K-3rd and would begin the focus on

environmental literature to teach students about the world around them and how to process information through critical thinking, with the intention that students will have a better sense of the world's interconnectedness in grades 4-12 (EEI Model Curriculum Plan, 2005).

The California Board of Education developed a way to evaluate the environmental education instructional material to make certain that it was lining up against the core standards. There were five categories of evaluation for the materials;

1. Science Content, History-Social Science Content
2. Program Organization
3. Assessment
4. Universal Access
5. Instructional Planning and Support

The first category certifies that the content of the material is accurate, used at an appropriate age level, and does not instill bias or prejudice (Education and the Environment Initiative Instructional Materials Evaluation Criteria). The second through fourth categories look at the various tools used for the course and how they work logically together or what methods are most effective when teaching students about environmental concepts. Finally, category five determines if students will understand the material presented in lesson plans and homework and what materials would be needed to make the experience the most effective and valuable.

Incorporating Environmental Education

In order to test the plan development, a pilot test was conducted of the first drafts of the environmental education curriculum. The drafts went to nineteen school districts, which included over one hundred and ninety teachers and four thousand seven hundred and fifty students (EEI Curriculum and Field Testing). In the pilot tests, instructors taught the proposed curriculum in their classrooms, using multiple units so the students would be exposed to various concepts and background information for the material. To determine the questions and possible changes that needed to be made, teachers were asked by the State Board of Education to make changes on the actual drafts which they received. To gather a clear consensus, the demographics were spread to all socio-economic levels and a large portion of California (EEI Curriculum and Field Testing). The final results of the pilot test and the surveys sent in the early developments of the curriculum were overwhelmingly positive, reaching in the high 80s and mid- 90s, stating that the material was useful and would be used again in a course.

The Environmental Education Initiative in California is one of the most developed and comprehensive environmentally based curriculums in the United States. There were eighty-five curriculums for K-12 developed pertaining to basic environmental concepts and California specific materials and exercises designed to help students understand the world around them. The cumulative process once the initiative was passed in 2003 spanned seven years, after final approval from the State Board of Education in 2010, making it ready to use in classrooms across the state.

Funding Environmental Education

As stated in the Environmental Education Initiative legislation, funding for this program would come from federal, state, local, public or private organizations, and individuals. CalEPA is the only agency allowed to distribute the funds from the Environmental Education Account within the State Treasury and the Secretary for Environmental Protection administers the amounts as needed (California AB 1548, Pavley, 2003). Further addressed in the bill is the question of what happens to the donations made by private contributors and their influence over the allocations of the funds. It was expressed that individuals and other private sources of contribution have no authority in how their donation is distributed or influence beyond the donation itself (California AB 1548, Pavley, 2003).

One of the most important ways California secures general funding for K-12 education is Proposition 98, passed in 1988. This proposition guarantees a minimum funding level for K-12 schools and fluctuates with positive and negative revenue for the fiscal year. If revenue is especially bad one year, the state is responsible for restoring the funding level in the following year (Proposition 98 Basic Principles, 2012). For example, in the 2013-2014 fiscal year, Proposition 98 provided \$49.2 billion for education. This was actually \$1.3 billion less than the previous year due to a one time grant for the implementation of the Common Core Standards. Although this funding is general for California schools, there is an amount for environmental education, plus various contributions from private, public, and corporate donors.

In the 2012-2013 results for environmental education funding, eleven counties received an amount from the California Department of Education. The amounts were consistent for each county, ranging from \$46,170 to \$30,980. The total amount from Proposition 98 Sources, which included the State General Fund and Local Property Taxes was \$47,651,000 and the total from all sources, including the State Lottery, other state funds, Federal funds, and Local debt service was \$68,363,000 (California Department of Education Funding Results 2012-2013 Fiscal Year). In the case of environmental education in California, specifically from the K-12 education funds in the 2013-2014 fiscal year, the amount provided was \$360,000. This amount came from the California Environmental License Plate Fund, which is a program that offers specialized license plates in support of a specific cause or interest (California Fiscal Policy Office, Non-General Fund Appropriations for K-12 Education, 2013-2014) and is also a way for there to be guaranteed funds that support environmental education in California.

ANALYSIS

1. Effect of Environmental Education in California

Student Achievement in Environmental Education

The “effect” of something can mean different things and include various factors, but in this context, student achievement with environmental education integrated into core courses will be the focus. The specific evaluation to

determine the effect on student achievement will come from the State Education and Environment Roundtable (SEER) and two previous studies known as the California Student Assessment Project I and II. The first project was conducted in 2000 and the second in 2005. Since the California Department of Education is a member of SEER, it is easier to gather support among teachers, principals, and administrators for studies to show improvement within programs and gauge student achievement and attendance when environmental education is integrated. Not only did the California Department of Education provide materials and cooperation during the study, it also provided funding from the Office of Environmental Education (California Student Assessment Project I, 2000).

California Student Assessment Project I

In 1999, SEER conducted a study of eleven schools throughout California that integrated environmental education into core classes. In order to compare student achievement in these programs, the study also evaluated students only in traditional classes (California Student Assessment Project I, 2000). Data was collected from standardized test results, attendance rates, grade-point averages, and an instrument developed by SEER called Qualitative Program Comparison, which is used when assessing the status of programs and how they align with environmental education principles (California Student Assessment Project I, 2000). The Qualitative Program Comparison considers six criteria during evaluation:

1. Natural and community settings as a context of learning

2. Integrated, interdisciplinary instruction
3. Problem and issue-based instruction
4. Collaborative instruction; and,
5. Learner-centered, constructivist methods
6. Independent and cooperative learning (2000)

These criteria were then used in surveys and interviews for both groups, which mainly included teachers of various grades and disciplines (California Student Assessment Project I, 2000).

The results of this study revealed that students exposed to environmental education integrated into traditional subjects outscored students in only the traditional courses by 72% in academic assessments and 77% in attendance assessments (California Student Assessment Project I, 2000). Below is a chart comparing the scores of environmental education based curricula to traditional (20),

Table 3: Summary of Paired Comparisons

Assessment Content	Number of Assessments Indicating Higher Score for EIC Students	Total Number of Assessments	Percent
Language Arts	69	91	76%
Math	17	27	63%
Science	7	11	64%
Social Studies	8	11	73%
TOTALS	101	140	72%

Assessment Content	Number of Assessments Indicating Higher Scores for EIC Students	Total Number of Assessments	Percent
Attendance	17	22	77%
TOTALS	17	22	77%

More specific examples of schools also revealed the level at which students exposed to environmental education scored higher on standardized tests and in which areas to those in traditionally taught courses. The scores were evaluated based on the six criteria mentioned above and were sometimes influenced based on how the instructors presented the information and how the materials were integrated. For example, Yreka High School and Del Norte High School were paired together in this study, both located in the most northern part of California. Yreka High School applied real-world concepts into the curriculum, and also emphasized local issues. Hands-on, applicable activities were incorporated using a nearby stream and resources that could be found in natural world to give students more of a connection with the living world (California Student Assessment Project I, 2000).

In contrast, Del Norte High School students were mainly taught with a textbook discipline approach, with classroom activities rather than outdoor activities. It was rare that real-world problems were brought into the curriculum (California Student Assessment Project I, 2000). Overall, Yreka High School students scored higher than Del Norte High School students in 20 of the 21 areas evaluated, which were academic and attendance. Yreka students scored 8% higher

in language arts, 11% higher in science, and had higher annual attendance rates than Del Norte students. Del Norte students scored higher in only one area than Yreka students, 11th grade spelling at a 3% higher score (California Student Assessment Project I, 2000).

California Student Assessment Project II

Going forward five years, SEER conducted another study similar to the first California Student Assessment Project. It was the California Student Assessment Project II. In this study, SEER used a qualitative framework known as a Concerns Based Adoption Model and Innovation Configuration as a tool to evaluate how methods of instruction are being used by teachers in classrooms (California Student Assessment Project II, 2005). The model used focused on seven major areas; integrated-interdisciplinary instruction, community-based investigation, study of natural and social systems, collaborative instruction, learner-centered constructivist approaches, cooperative and independent learning, and authentic assessment. The overarching motivation for the strategies was student learning and interactions (California Student Assessment Project II, 2005).

The comparison for this study used eight elementary schools and were matched together using the results from California's Standardized Testing and Reporting (STAR) system in math, reading, language and spelling (California Student Assessment Project II, 2005). In this study, the treatment schools experienced hands-on activities and real-world learning application, which

resulted in much higher test scores in each category than the control groups, 96% in all cases conducted, with only 4% of control schools scoring higher than treatment schools (California Student Assessment Project II, 2005). As a more specific example, Edna Maguire Elementary School and Pleasant Valley Elementary School were two schools paired together in this study. Edna Maguire students were introduced to environmentally-based concepts at beginning of the school year. Students are taught about native habitats that can be found locally and how human interactions affect the environment (California Student Assessment Project II, 2005).

Similar to the example from the first project, students explore components of a local creek and some of the classes at Edna Maguire are even associated with Students and Teachers Restoring A Watershed (STRAW). There are many organizations involved with STRAW, including the California Center for Eco-literacy, The Bay Institute, and restoration experts within the community (California Student Assessment Project II, 2005). Classrooms are also provided resources in order to study the watershed and give students an opportunity for hands-on learning experiences and problem solving. While the watershed project is an off-campus study, it is not the only source for environmental education at the elementary school.

During spring of the school year, students and teachers construct a garden filled with vegetables and wheat to simulate how early settlers of the area gathered food, which brings in the history course. Students are also taught how to make their own snacks from food gathered in their gardens and how to compost

(California Student Assessment Project II, 2005). Growing plants and vegetables in the garden allowed the students to be innovative and learn valuable problem-solving skills due to circumstances that often affect gardens, such as insects or birds. Each learning experience incorporated both traditional subjects and environmental education so that the students were not missing out on any viable subject required by federal and state (California Student Assessment Project II, 2005).

In contrast, Pleasant Valley Elementary School students were taught using traditional, classroom-based methods. Students were occasionally taken on field trips, where teachers used state science standards, mainly focusing on earth science (California Student Assessment Project II, 2005). As a result of the differences between Edna Maguire and Pleasant Valley Elementary Schools, students taught using environmentally-based instruction scored higher than traditionally-based methods in almost all subjects. For example, students at Edna Maguire scored higher in reading, math, and language arts than Pleasant Valley students. Only in spelling did Pleasant Valley students score higher than Edna Maguire students (California Student Assessment Project II, 2005).

Conducting these assessments provides valuable insight about which methods seem to be working best amongst educators in their programs, the grade levels certain materials work best in, and how other schools that do not integrate environmental education can do so. By conducting a similar assessment five years later, it sustains the findings in the first California Student Assessment Project and allows other states or organizations to build upon this research by integrating

environmental education into schools (California Student Assessment Project II, 2005).

Other studies of the impact of environmental education on children have been led by SEER, specifically K-12 student experiences. In 1994, the efficacy of environmental education in state-based programs was evaluated to determine the effectiveness of student achievement in environmental education (Hoody, 1996). It was also valuable to assess these types of programs because the content and effectiveness was believed to be very useful in the education reform movement, which was especially picking up speed in the 1990s and adopted outcome-based education models to determine if students were learning what was set as the standard for each grade level in K-12 (Hoody, 1996). In this study, twelve case studies were reviewed measuring the effectiveness of knowledge and attitudes towards environmental issues and concerns.

One of the case studies included was a measurement of the attitudes of high school seniors who attended an outdoor science school in Orange County, California during the 1975-1976 school year. At the time, these students were sixth graders and later asked about their time in this program. There was a total of 3,278 sixth graders who attended the Forest Home Outdoor School and when asked again, 449 students responded to the survey. The survey reflected some of the topics that were taught to the students, including interest in natural sciences, interest in camping, appreciation of the environment, impact on home responsibilities, and feelings about conservation and preservation (Hoody, 1996).

The results of the surveys reflected that students who attended the outdoor school in sixth grade retained positive attitudes towards the environment. The study revealed that there was an 80% increased appreciation for the environment, 59% showed a higher interest in natural science and 95% felt that every sixth grade student should have a similar experience (Hoody, 1996). Although this study differs from showing cognitive development in students over a period of time with environmental education, it does show the positive impacts of an environmental education course that helps achieve one of the goals within the definition of environmental education, agreed upon at the Tbilisi Conference in 1977; fostering an environmentally aware citizenry.

2. Political and Social Relationships of Environmental Education

During the discussion of the environmental education curriculum, major issues were agreed upon, such as fish and wildlife, water, air, and several others. At the time, climate change was not included on the list of topics to be covered in the curricula. Then, California governor Arnold Schwarzenegger vetoed Senate Bill 908 that would have required the State Board of Education within California to add frameworks for climate change instruction (Tanton, 2008) Schwarzenegger felt that it was the state's place to established academic standards, but not be "overly prescriptive in specific school curriculum" (Boudreau, 2008) and leave the environmental curriculum to the Office of Education and Environment. The bill was introduced by State Senator Joe Simitian in January of 2008 and was approved in the Senate later that month. California's General Assembly followed in July of 2008.

There were three main reasons that SB 908 did not make the final pass. The first reason Governor Schwarzenegger did not sign the bill was because of California's textbook industry. California is a major distributor of textbooks, about 11% of all textbooks nationwide as of 2008 (Martin, 2008), and if mandated, climate change would have been added to new textbooks and distributed nationwide, which was not something to which he was willing to attach his name. This brought up controversy across the nation, especially in states with previously mandated content regarding certain science standards. Whatever California mandated to be in its textbooks would have influenced other state's students (Martin, 2008). Although states are currently picking up speed with introducing climate change discussions into course material (Watanabe, 2013), California's legislation was a bit ahead of the times with the proposal in 2008.

Second, the bill was flawed in the fact that it did not require scientific balance between scientists who support or dispute climate change. Discussions were not required to be analytical of all sides of the debate. Finally, the third reason was that Governor Schwarzenegger did not feel that legislators should be the ones to dictate what should or should not be taught in schools and those decisions should be left to advisory committees in the State Board of Education (Tanton, Boudreau, Martin, 2008). Although vetoing this bill was mainly a political move, it did have serve as an important starting place for the discussion of adding climate change to the environmental education topics that were later finalized in the curriculum at the discretion of the State Board of Education.

3. Funding & Curriculum Correlations

In the beginning of the initiative implementation, the state budget provided the majority of the funding to launch the program. However, since its completion, California has suffered a budget crisis and funding for environmental education was one of the first things to be cut. Due to the size of California and the initiative's goals to reach every student in the state, it has been estimated that it would take approximately \$22 million to continue implementation. All of these factors have led to the need to find funding from outside sources and in California's case, funding has mostly come from big oil corporations such as Chevron and BP (Chevron, California Partnership, 2009, BP A+ For Energy Program).

In 2009, Chevron announced the California Partnership which was designed to strengthen partnerships with non-profit organizations and public school districts to provide program materials for energy education. Other education projects also in partnership with Chevron are Project Lead the Way, Science Technology Education and Mathematics (STEM), which are geared towards middle and high school students (Chevron, California Partnership, 2009). This initiative is also geared towards community involvement because California is Chevron's home-base and there are several facilities within the state. Part of the funding coming from Chevron in this initiative is \$7 million for community investments alone, and \$28 million total for 2009, which were given to the non-profit organizations in partnership to deliver educational materials.

In Chevron's view, the local partnerships are a way to "give back to the community". Jobs are provided and students are given resources, specifically in the Richmond, California area. Richmond is home to one of Chevron's oil refineries that has had fourteen incidences since 1989 (Lee, 2013). With its most recent troubles, a fire at the refinery in 2012, the city of Richmond sued Chevron for negligence of the community and several warnings from California Occupational Safety and Health Administration (Cal/OSHA) about a corroded pipe that was later found to be the cause of the fire (Wilkey, 2013). The smoke from the fire sent more than 15,000 residents of the surrounding area to the hospital for respiratory problems. The lawsuit resulted in a fine of \$1 million for failure to correct initial problems and \$10 million paid to hospitals, government agencies, and residents around in Richmond (Wilkey, 2013).

Even after huge complications, funding from the big oil companies remains a huge contributor to the curriculum and materials in environmental education classes in California. The educational materials include lesson plans about oil and natural gas and a book called *Oil and Natural Gas*, which is part of an environmental education program supported by the Society of Petroleum Engineers called Energy4Me. The book shows children the history of how oil and natural gas has shaped history and countries' development, but addresses very little in regards to the environmental costs that come with extracting oil and claims that creating more farms for forms of energy such as wind. Ethanol, or solar will ultimately destroy more habitats than oil fields will (Society of Petroleum Engineers, 2007). Furthermore, in the Oil and the Environment section,

claims that the oil and natural gas industry have been working to improve the natural environment are made. These claims include that since 1990, the overall carbon footprints for everyone in the United States have been reduced and much less waste has been generated due to investments made in technological innovations (Society of Petroleum Engineers, 2007).

Many environmental education professionals are concerned with the amount of input corporations may have in classrooms, considering the number of news stories covered over the years illustrating the environmental costs to the public (Smith, 2000). However, teachers are not required to use this text. There are 85 state approved units that align with the already approved science, language arts, and history standards while also promoting environmental stewardship. Because most states have adopted the Common Core standards, it is perhaps more difficult for educators to use lesson plans and materials outside of what state departments of education or closely related agencies have approved (Watanabe, 2013).

4. Status of Environmental Education in California

The initiative in California was a long time coming. It took seven years to complete, with developments and pilot tests, and was one of the most comprehensive environmental education initiatives in the United States. Throughout development, 19 school districts were tested and teacher comments were included in the final draft. Several projects in schools have been implemented, including California's Green Schools Initiative which works to

educate and reduce the environmental footprints of schools. While California has struggled to maintain full funding from the state budget, contributions have been made in support of environmental education from private and public donors that do not have a curriculum or environmental kit, but simply provide funds to reach students across the state. Although California has faced many budget cuts, there are still local environmental education agencies that have managed to receive funding through the Environmental Education Grant Program. Several education offices across eleven counties received grants during the 2013-2014 fiscal year, one office in San Luis Obispo County received \$41,205, and the rest received \$32,252. Similar to the EPA, applications are required to be submitted, but the process is far less competitive than the EPA because it is within California rather than the entire United States.

CHAPTER FIVE

HAWAII

Historical Background

The discussion of environmental education in Hawaii is not a new concept. During the 1970s, many groups were involved in developing a foundation for the state's future in environmental education. Local environmental groups were spurred into action due to concerns about Hawaii's native ecosystems and diminishing natural resources. The first main contribution to these activities came from the John D. and Catherine T. MacArthur Foundation in Chicago, a total of more than \$3.5 million. The funds from the foundation were used to create a curriculum by the 'Ohi'a Project (Stone, 1992). Shortly after, state agencies began to take notice and invest energy into developing environmental education programs. In 1976, the Hawaii Department of Education established an outdoor education center for 6th grade students on Hawaii Island and the National Park Service developed an interpretation program at Hawaii Volcanoes National Park and Haleakala National Park to give visitors education about the various historical influences of the area.

The late 1970s was an important period for environmental education in public schools. The state legislature passed a constitutional requirement that environmental education had to be taught in schools and later implemented

Environmental Education: K-12 Curriculum Guide to aide educators in finding resources and effectively teaching environmental education to students.

Unfortunately, there was little compliance with the law, but definitely more awareness of the importance and need to teach environmental education, both formally in schools and in informal settings (Stone, 1992). The majority of the money given by the John D. and Catherine T. MacArthur Foundation was used for conservation efforts throughout the state, however \$1 million was reserved strictly for the needs of environmental education. The development of environmental education in Hawaii was changing, at this point, but lacked a strong foundation for state-wide implementation.

Hawaii Environmental Education Alliance

When No Child Left Behind was implemented in the early 2000's, there was a shift for schools to focus heavily on English and math. As a result, extra courses such as environmental education were cut or reduced (Appendix E, 2010). Similar to several states, Hawaii created a plan for environmental education during the same time that No Child Left Inside was projected to pass. The main proponent of environmental education in Hawaii is the Hawaii Environmental Education Alliance, formed in 1989. During the 1990s and early 2000s, it provided the only state-wide structure for environmental education in Hawaii, but without support from other state departments, it became fractured and dissolved. Later, in 2010, the alliance was brought back by the Division of Forestry and Wildlife with funding from various organizations and working groups (Appendix E, 2010).

The Hawaiian Environmental Education Alliance is comprised of partners, a leadership team, advisory group, and citizens within the community. Perhaps the most important aspect of this alliance is the Hawaii Environmental Literacy Plan (HELP), which was fully completed in 2011. HELP encompasses multiple state agencies follows the guidelines outlined by NAAEE. This initiative is designed to not only affect schools and how environmental education reaches students, but also non-formal environmental education programs, such as outdoor education and other programs that are independent of the school districts (HELP, Our Island Community).

HELP was largely designed by the Hawaii Department of Land and Natural Resources and the Hawaii Department of Education and aligns with the educational standards already in place. Hawaii's initiative was based on four main goals which are also supported by NAAEE:

1. Setting expectations for performance and achievement in 4th, 8th, and 12th grades
2. Suggesting a framework for effective and comprehensive environmental education programs and curricula
3. Demonstrating how environmental education can be used to meet standards set by the traditional disciplines and to give students opportunities to synthesize knowledge and experience across disciplines and;
4. Defining aims of environmental education

Many states have used the NAAEE guidelines from *Developing a State Environmental Literacy Plan*. No Child Left Inside outlined that in order to receive environmental education funding, a state plan was required.

Funding the Plan

Throughout development, implementing HELP was estimated to be \$4 million per year, which was a fairly reasonable amount compared to Hawaii's total education budget. The Hawaii State Department of Education operates on about a \$1.7 billion budget, which comes from state, federal, and public funds. The estimated state cost of the environmental education plan is not restricted to just one or two schools, but the entire state. One of the goals outlined in the Hawaii Environmental Literacy Plan was to provide sustainable funding the environmental literacy, which were projected to come from the Hawaii Department of Education, as well as partners within the non-profit sector, and businesses (HELP Timeline, 2012). As of 1999, environmental education funding within Hawaii was categorized together with 28 other programs to receive a lump sum of funds, which also included science and music equipment (Thompson & Marlow, 1998).

Environmental education was in this category rather than general education due to its nature of being "non-traditional". Hawaii education reform in 1994 created legislation that allowed schools to convert to charter schools, but there can only be 25. By law, charter schools, known as Student Centered Schools in Hawaii are considered public schools and therefore, receive public funds (Thompson & Marlow, 1998). The charter schools also

assume a larger responsibility for student achievement outcomes because they implement innovative programs that other schools have not yet implemented or may not implement (Thompson & Marlow, 1998). The total amount allotted for the public school budget for the 1998-1999 school year was \$661.3 million.

Themes throughout the Literacy Plan

A central theme that HEEA wanted to stress throughout the literacy plan was Hawaii's unique landscape, culture, isolation, and biodiversity. This meant teaching about students about the vulnerability of the islands caused by agriculture, human impact, climate change, and invasive species (Sato & Staab, 2012). Because culture is such an important aspect in Hawaii, a separate environmental education curriculum was provided by the Pacific American Foundation (PAF). PAF is a non-profit organization established in 1993 that is dedicated to improving the lives of Pacific Americans and provides environmental education materials in schools (Sato & Staab 2012). The Aloha 'Aina Curriculum focuses on teaching students in 3rd-8th grade, using hands-on activities, and measures student achievement in the core areas. Each grade is taught about a different subject; for example, 5th grade students learn about stream life, 7th grade students learn about coral reefs, and 3rd grade students learn about wetlands (Aloha 'Aina Curriculum).

Hawaii Content and Performance Standards

Because this curriculum is designed to be taught in public and private schools, as well as any non-formal education setting, it meets the Hawaii

Content and Performance Standards, which are benchmarks, or proficiency levels, that students are expected to reach upon completing the grade level. The Hawaii Content and Performance Standards was the result after the publication of *A Nation at Risk* in 1983. The report highlighted the many failures of the American school system and called for reform action at the local, state, and federal levels. Hawaii created the Hawaii Commission on Performance Standards in 1991 which outlined three main ideas, including setting performance standards of achievement of all public school students, recommend how to assess student attainment of these standards, and develop a school-by-school model (Hawaii Content and Performance Standards III, 2005).

The standards were finally implemented in 2006, after much revising and teacher input about what the benchmarks should be and how many there should be. Originally, there were 1,544 standards, but the State Legislature reduced the standards down to 139. One of the main reasons teachers were concerned with the original amount of standards was due to time constraints. Teachers felt that there was only so much time during the school day for these benchmarks, as well as federal standards that are required of students to learn during primary and secondary levels of education (Hawaii Content and Performance Standards III, 2005).

Included in full implementation of HCPS III were large-scale assessments and report cards on standards of each grade. There are resources for teachers to get their students to where they need to be based on the benchmark

standards, such as curriculum guidelines and benchmark maps. The benchmark maps are reports from previous years to use as an indicator on what worked and what did not. For example, at the end of the first part of the year, first grade science students should understand three major ideas; that there are different kinds of changes that occur in the natural environment, changes occur as the result of natural events, and some of these changes may affect living things (Benchmark Map, Science: Grade 1). The second part of the year focused on organisms and their needs, and how plants and animals differ characteristics based on species type. Based on the overall curriculum outcomes for science, students are expected to learn complex thinking and problem solving skills and skills to recognize quality work. The type of skills expected are the same as what is expected of environmental education to teach children, which is why it is easiest to incorporate the learning into the existing curriculum standards.

Common Core

Like most states, Hawaii later adopted the Common Core standards. The Hawaii Department of Education adopted these standards for K-8 for the 2012-2013 school year, and grades 11-12 adopted them the next year. The Common Core standards are also included as standards to be met that are outlined in the HELP standards. It is expected that by the time students reach their final year of high school, they will possess a basic understanding of environmental issues and actions to take to make an impact and know the types of questions to ask in order to analyze the issue (Webb, 2011). The

standards are not only designed to foster environmentally aware citizens, but to also prepare students for college and careers, which is the main goal of the Common Core standards. HELP argues that environmental education integrated into core curricula can provide a strong context within the core classes and prepare students for what college professors will expect, such as critical thinking skills and clearly articulate the issues at hand.

ANALYSIS

1. Effect of Environmental Education in Hawaii

Student Achievement in Environmental Education

In 2001, an environmental education program on the Hawaiian Island of Molokai called Investing and Evaluating Environmental Issues and Actions (IEEA) was evaluated for its success in student achievement and community impact. Molokai is the fifth largest of the Hawaiian Islands with a population of only 7,404 when this study was conducted. Over the years, Molokai has explicitly resisted efforts to increase tourism efforts (Volk & Cheak, 2003). Because Molokai is so small, any environmental issues or issues with the island in general quickly become community issues, which is exactly what the IEEA curriculum addressed.

At the point of evaluation, the IEEA curriculum had been in place for five years, taught to 5th and 6th grade students as an “umbrella” to cover the core courses. The curriculum was designed to develop critical thinking skills and

decision making skills based on data and real environmental problems at hand and make recommendations of the next steps to take (Volk & Cheak, 2003). In the IEEA program, students are expected to investigate an environmental issue for two years and develop a plan for another two. Finally, students in 5th grade pair up with students in 6th grade to further develop the final project to present at a community symposium at the end of the school year called Promoting Resolutions with Integrity for a Sustainable Molokai (Volk & Cheak, 2003).

In order to gauge the effectiveness of the program on student achievement, interviews were conducted with teachers, students, administrators, and parents. At the time of study, 101 students were enrolled, which accounted for both fifth and sixth graders (Volk & Cheak, 2003). For the purpose of the study, students were divided equally into separate classes taught with and without the IEEA curriculum. However, in both classes, students had the option of completing a critical thinking and environmental literacy skill set, which was included 66 fifth and sixth grade students (Volk & Cheak, 2003).

The critical thinking portion of the program was measured using the Critical Thinking Test of Environmental Education. There were three sections included, which were making conclusions, making inferences, and identifying bias (Volk & Cheak, 2003). After making an estimate of an acceptable range within .65 to .75, Volk and Cheak found that the sixth grade students included in the study measured .72, which was certainly within the accepted range of critical thinking skills (13). Students involved in the critical thinking skill

building were also shown to outscore students in the traditional core classes on critical thinking and environmental literacy tests, which were comprised of questions regarding issue identification, issue analysis, and action planning (Volk & Cheak, 2003).

In order to measure the success of incorporating environmental literacy into the classroom, the Middle School Environmental Literacy Instrument was used. The measurement was comprised of eight subtests, which included knowledge of issues, ecological foundations, issue identification, issue analysis, action planning, perceived knowledge of action, perceived skill in action, and self-reported action (Volk & Cheak, 2003). Within the environmental literacy portion, 38 students were tested and their scores compared to students taught with traditional core classes. Volk and Cheak found that the average score of students taught with the IEEA curriculum was 14.18, compared to 10.86 of students taught with traditional methods and material. Below is a table reflecting the scores of IEEA students to non- IEEA students.

Table 4: Comparison of Investigating and Evaluating Environmental Issues and Actions (IEEIA) vs. Non-IEEIA Students: Critical Thinking

Group	N	M	SD	T	Df	Significance
Non-IEEIA	28	10.86	3.24	-3.757	64	000*
IEEIA	38	14.18	3.77			

*p< .05 Volk & Cheak (2003)

Aside from test scores, the IEEA curriculum students considered themselves to be more knowledgeable about the environment and their ability to make a difference than students taught the traditional curriculum. However, there was still a high percentage of non-IEEA students, which included 63%, that believed they could make a difference within the community and had taken some sort of environmental action, which was 43%, compared to 75% of IEEA students. The environmental actions reported included beach and roadside cleanups (Volk & Cheak, 2003). Students became more involved with their surrounding community and some were even reported by teacher and parents to travel to the island of O'ahu to speak in legislative hearings or write letters to their representatives regarding environmental issues and the actions that needed to be taken (Volk & Cheak, 2003).

2. Political and Social Relationships of Environmental Education

Native Hawaiian Education Council

One of the most unique influences in Hawaii is its native cultural influence. The Native Hawaiian Education Council (NHEC) has input on certain guidelines that are implemented in education programs, especially if programs affect Native Hawaiian students. The environmental education initiative certainly fell into that category and has strong support within the council. In 2002, the NHEC published Hawaii Guidelines for Culturally Healthy and Responsive Learning Environments. The Hawaii Department of Education used these guidelines in Hawaiian Studies courses, although not mandated. The guidelines

stress the importance of culturally aware citizens and the importance of having a sense of place and caring for that place (Committee Guidelines, 2002), much like what is expected in environmental education. Many of the same ideas behind cultural education courses have created a good segue for educators and administrators to implement environmental education into the current curriculum while still adhering to state standards.

Influence of State Education Standards

Another increasingly influential factor of Hawaii's environmental education plan is the education standards that have been implemented throughout the state, such as Hawaii Content and Performance Standards. While the standards were still being debated, a science course called Malama I Ka 'Aina (Caring for the Land) was in place as one of the standards required by Hawaii public schools. This course was very similar to a traditional environmental education course because it incorporated systems thinking and engaged students in problem solving for the greater good (Sato & Staab, 2012). The science course was designed to help students learn about and practice sustainability through traditional Hawaiian practices by exploring waste treatment methods, better agricultural practices, or curricula relevant to a school's geographical location (McGinn, 2008).

Because the course was part of the science standards, it was able to receive funding from the US Department of Education and the Native Hawaiian Curriculum Development, which was a program that provided educational opportunities to underachieving Native Hawaiian high school students, developed

by the University of Hawaii (McGinn, 2008). Unfortunately, once the new Hawaii Performance and Content Standards were finalized, Malama I Ka 'Aina was no longer available, but the concepts and resources used in the course continue to help educators engage their students in environmental learning.

3. Funding and Curriculum Correlations

Unlike the previous case studies, North Carolina and California, Hawaii does not have drawn out environmental education curricula. The Hawaii Environmental Literacy Plan is a document that outlines the most effective and efficient ways to promote environmental education, but uses previously implemented environmental education programs within schools. There are, however, many programs with curricula available to use from neighboring islands and foundations that contribute to the implementation of environmental education in schools. Even with the standards adopted, such as the Hawaii Performance and Content Standards and Common Core, environmental education has been integrated into classes over many decades, especially in science. One of the most influential foundations within Hawaii is the Kokua Hawaii Foundation. This organization was founded in 2003 by well-known musician and native Hawaiian, Jack Johnson and his wife Kim Johnson. The organization provides programs that support environmental education in public, charter, and private schools throughout Hawaii (Kokua Hawaii Foundation, 2014).

There are three main programs that the Kokua Hawaii Foundation provides for schools, including 'Aina in Schools, Plastic Free Hawaii, and 3R's

School Recycling. One of the most important aspects about this organization is that it provides field trips and mini-grants up to \$1,000 for environmental education programs in schools (Kokua Hawaii Foundation, 2014). The idea behind providing grants and field trip opportunities is to give students a chance to have hands on learning experiences that may not occur otherwise, especially after the huge budget cut specifically towards field trips. In the 1980s, the amount of funding for field trips from the Hawaii Department of Education was \$900,000. Unfortunately, the current amount provided is zero, which leaves educators to find funds from outside sources. On a positive note, foundations such as the Kokua Hawaii Foundation and in some cases, cities can provide funds to close the gap between costs.

4. Status of Environmental Education in Hawaii

Although Hawaii has developed an environmental plan, it continues to struggle with a sustainable source of state-wide funding. Hawaii is not an exception though, each case study has struggled to provide necessary funds, even with operating on huge education budgets from the state and federal governments. For the 2012-2013 fiscal year alone, North Carolina provided \$7.74 billion state funds for education, with \$856 million from the federal government (North Carolina Department of Public Instruction, 2013) and California operated on a \$70 billion budget during the 2013-2014 school year (Education Budget, CalEdFacts, 2013).

Hawaii is also in a unique position to keep their environmental education programs “pure” due to the heavy influence of Native Hawaiian traditions and

culture, as well as the state's isolation from the mainland. The education council is usually involved in state programs dealing with education or assesses how effective existing programs are in regards, especially when they affect Native Hawaiian students. The importance of Hawaii's culture and history amongst its people keeps environmental education programs local and deals with issues that most affect the islands. There are also many education driven organizations that are designed to help students succeed, whether that is going to the school and helping the set-up of a new program or giving funds so that recycling and other environmental programs have a chance to continue and make an impact much further than the current school year.

CHAPTER SIX

DISCUSSION

Parallels among States

There are several parallels that can be taken away from the research of each state. These parallels will be shown through the consistent numbering system in chapters three, four, five, and six.

1. Student Achievement in Environmental Education

The first parallel that can be seen in all three states is student achievement in environmental education, as well as the core classes when environmental education is integrated. The drastic rise in standardized test results of students exposed to environmental concepts in classes taught using traditional, textbook-disciplined is the first major indicator that environmental education makes a difference in the way students learn and are engaged in the material, especially beginning in early childhood education.

To test relevance between environmental education and test scores, a systematic review was conducted. There are many examples of evaluations, both in the United States and internationally that reflect the benefits for students when environmental education is implemented into the existing curriculum. For this research, we will focus on the three case studies, North Carolina, California, and Hawaii. In order to find these examples, a search was conducted in multiple databases, including EBSCOhost, ScienceDirect, and ERIC using an advanced search with three different search terms within peer-reviewed journals, “test

scores AND environmental education AND the state” (California, or North Carolina, or Hawaii), “academic achievement AND environmental education AND the state”, “student achievement AND environmental education AND the state”. The results came from the Evergreen State College Library, as well as the University of Oklahoma Library. The listed articles were chosen because of their relevance to understanding the impact of environmental education programs on student achievement in core courses through environmental education programs. The results and articles are listed in Appendix A.

The systematic review found that there were 10 articles that supported positive influence of environmental education on test scores. From these searches and the studies found to be relevant for the purpose of this study, it can be concluded that introducing environmental education has positive impact on standardized tests and improvement in other areas, such as behavior in classrooms and community involvement.

Although the main focus in schools and both state and the federal departments of education are standards that are set like No Child Left Behind, Common Core, or Race to the Top, the results of studies of environmental education within classrooms show that there is a significant effect on the standards previously in place and can offer so much improvement in standardized tests at each grade level, in each core subject, and even attendance and classroom behavior. From Isaac Dickson Elementary School in North Carolina, there was

almost a 10% increase in test scores for students exposed to environmental education integrated into core classes.

However, there was a much larger result from the California Student Assessment Project conducted in 2000, with students in environmentally-based material courses compared to their peers in courses taught with traditional methods by 72% in academic assessments. Students involved with the environmental education program on Molokai also outscored their peers by 3.32 points, which was based on the model designed by Volk and Cheak for the purpose of the study. Overall, California students experienced a much more dramatic increase in test scores over students who were not exposed to environmental education methods or materials.

2. Political and Social Relationships of Environmental Education

The political and social relationships of environmental education within North Carolina, California, and Hawaii is where there is less of a pattern than the evidence for student achievement success. There is however, a correlation between North Carolina and California. In both cases, political decisions affected what type of environmental education curriculum would be acceptable and align with the standards in place. More specifically, climate change was the number one topic that was highly controversial to implement in both states. North Carolina legislative committee members were appeased by creating an Earth/Environmental Science course as required credit for high school students, with more of an emphasis on geology, general concepts, and atmospheric science

than climate change or how humans have impacted the environment and altered systems.

California experienced initial controversy in the form of a proposed bill to include climate change as a topic of the available state environmental education curriculum units. Governor Schwarzenegger vetoed the bill to essentially avoid attaching California to the change of the textbook content that would eventually be distributed across the country. His reasoning behind the veto was also influenced by the amount of control the legislature should have over California Department of Education territory. Although the bill was vetoed in 2008, it was later added to the list of topics included in the 85 available curriculum units, which was decided by the State Board of Education in California. Both examples show that the political atmosphere and legislative input have quite influential positions when dealing with educational content, especially when discussing environmental issues.

3. Funding and Curriculum Correlations

California possibly had the most interesting example of a situation where funding influenced curriculum content. There was hardly any overlap of North Carolina or Hawaii in regards to funding having negative implications on the curricula used in environmental education programs. Perhaps due to California's status among the other states as a leader in environmental innovations and influence, it was a greater target than the other states in this case study for corporations to fill the gap between being an outside influence on education, more specifically in science, and becoming a direct influence. After all, the survival of

these companies that produce oil or plastic bags depends on the public being reliant on their products. If children are taught from kindergarten all the way to their senior year in high school that drilling for oil is detrimental to the environment and plastic bags create health hazards for marine animals, then there may be little support from those generations in the future.

Budget cuts, both federal and in-state have also not made the situation easier. Although most states operate on very large education budgets, it does not always mean those function the way they should. Plus, these set budgets are supposed to provide for every student, teacher, and administrator involved in education and are also under pressure from federal and state standards, which leaves little room for other activities. Without full funding from either the federal or state government, teachers and schools have to find the money somewhere, which can then lead to corporations with their own curriculum to fill the gap. Fortunately, the environmental education programs discussed in at least one of the states, North Carolina, have “filter systems”, which are partnerships associated with state agencies that decide where the money will go and how it will be used. However, the scope of this study does not include states outside of the three case studies discussed.

The Environmental Education Fund in North Carolina was a non-profit organization that supported projects designed to promote environmental education. Unfortunately, it is no longer in existence and the best guess as to why is because there are so many organizations like this today and it was too difficult for the Environmental Education Fund to keep up without a full time staff and

budget problems. Originally, it was assumed that the organization would provide grants, but it became a source of funding through campaigns and was based only on need and was specific to projects. For example, if the Office of Environmental Education had a project proposal in mind, it would handle the administrative side and the Environmental Education Fund would handle the finances of that specific project, but did not provide annual funding.

The focus of the Environmental Education Fund was not to create a curriculum, but to draw up plans for funding while the Office of Environmental Education provided the work and outline of the project. This kind of relationship allowed North Carolina to be creative with environmental education projects and let another organization deal with the financial aspects and grant writing.

Although the Office was responsible for the majority of planning, the Environmental Education Fund was able to give input throughout the projects, but did not find it necessary. This was due to most ideas being run by the Environmental Education Fund and the fact that for the most part, grants dictated what the projects did or what type of environmental issue would be funded.

The non-profit organization and the state agency were a natural fit to work together. State departments cannot accept donations and it is often difficult to find another agency to work with or share funds with, mainly due to budget cuts across the board. One of the main reasons the Environmental Education Fund was created and worked well with the state agency was because it enabled the Fund to have more control over where funding for environmental education came from, meaning that if a business was questionable, the Fund could refuse their donation.

There were, however, some instances where the Environmental Education Fund accepted funding from industries with a less than desirable track record, such as energy companies and a large local farming company in North Carolina that had many environmental violations later in the relationship. The ability to fund environmental education programs can sometimes come at a price. Funds are based on availability and if the only substantial incoming donations are from corporations, then it makes it difficult to turn down all donations from the types of industries that are not known for their environmental consciousness. However, organizations in partnership with state environmental education offices can have a better chance of screening who donates and how the funds are used.

4. Status of Environmental Education

Although it has not been an easy process to secure state funds for these programs, environmental education is still thriving. More states have created state environmental education plans with the projection of No Child Left Inside, which will likely continue to be reintroduced to pass and more certification programs have emerged for educators to teach environmental education. The benefits for students are clear and, obviously, teaching students and adults about these issues can be beneficial for the environment as well because there will be more of a feeling of obligation to change behaviors and become involved with local communities.

Based on the research shown in previous chapters, trust funds specifically for state environmental education programs would be the best route to secure funds. To clarify, these “trust funds” are state government accounts that are given

a base amount each year from the budget and then accumulate from donations made from private or public donors, foundations, and individuals that want to contribute to environmental education programs. Agencies involved, likely the Office of Environmental Education within the state can then distribute the available funds to classrooms. This scenario could protect environmental education funds at the state-level when budget cuts occur at the federal level, like what is happening for the new fiscal year. That way, state programs do not suffer as much or are not scrambling around to find any source of funding, which may not provide adequate materials for all students in the classroom.

A successful example of a trust fund program can be seen in Maryland with the Chesapeake Bay Trust. This program is a non-profit organization founded in 1985 that focuses on the Chesapeake Bay, rivers, and watershed restoration through outreach and environmental education. In order to provide grants, the trust is in partnership with the Maryland Treasure and the sale of Chesapeake license plates. Grant money also comes from donations to the Bay, Endangered Species Fund, individuals, by purchasing a special license plate or contributing directly from state income tax returns, corporations, private foundations, and federal and state agencies (Chesapeake Bay Trust, About, 2010). These donations total about \$5 million annually, 90% of the funds going directly to grant programs, and are distributed throughout the counties, Baltimore City, and the Chesapeake region.

To put these figures into perspective, it is useful to look at the 2012- 2013 Impact Statement from the Chesapeake Trust Fund. Because of these grant funds,

59,547 students were involved in outdoor learning experiences, and 4,643 teachers taught environmental education in the classroom. Outside of the classroom, 24,575 individuals volunteered 26,303 hours of clean-up time to the Bay and rivers around the area where 17 million people call home. Finally, these programs included creating rain gardens, planting native trees and plants, and restoring acres of stream buffers and wetlands (Chesapeake Bay Trust Fund, Impact, 2012-2013). Whole communities are becoming involved with environmental stewardship, and it can be seen throughout the United States. The example in Maryland is a great illustration that shows how creating partnerships with state governments and agencies as a way to fund environmental education can result in very impactful and beneficial ways for local communities.

CHAPTER SEVEN

RECOMMENDATIONS FOR FURTHER RESEARCH

Based on information provided in the previous case studies, environmental education shows to have huge benefits for students, not only for becoming more environmentally literate, but in every core class that is required by the federal government. In many studies, environmental education has shown to increase students' cognitive abilities in critical thinking and problem solving, as well as contribute to their behavioral issues in the classroom and towards other students. Due to these benefits, it is questionable as to why the federal government would cut funding that is so necessary for environmental education programs across the state to thrive.

In 2010, President Barack Obama announced the launch of a campaign called Educate to Innovate. The campaign was intended to help U.S. students reach higher science and math achievement levels throughout the next decade. These field are science, technology, engineering, and mathematics, or commonly referred to as STEM fields. In order to promote achievement, the President's campaign plan developed partnerships with companies, universities, non-profit organizations, and government agencies that will also help train educators for these field (Office of the Press Secretary, 2010). The partnerships will not only help with training, but they will also provide substantial funding, initially \$250 million just for support and \$260 million to further the campaign.

As expected, the United States Department of Education is involved with the campaign and has committed to contribute \$100 million to help license and train teachers and after the first year, another \$200 million will help support teachers in the classrooms (Office of the Press Secretary, 2010). Because the STEM project is supported financially by the federal government, as well as other partners, there had to be cuts made in order to secure the funding necessary for the implementation of this campaign. Unfortunately, this is where environmental education comes in.

Federal Funding Issues: Environmental Education

One of the major reasons so many states decided to create a state-wide environmental education plan was the hope that federal funding for these programs would be much more than the current level and be available for more than a handful of programs. Without the passing of the No Child Left Inside Act and the launch of the STEM campaign, states are basically left floating out to sea with no support, due to cuts made to the budget. As of 2012, the U.S. Environmental Protection Agency Office of Environmental Education had a budget of \$10 million and the National Oceanic and Atmospheric Administration's (NOAA) environmental literacy grant program had a budget of \$8 million. NOAA not only had a specific program for environmental literacy funding, but it also provided funding through its Bay-Watershed Training (B-WET). This funding provided \$7 million in the last two years (Office of Management and Budget, Fiscal Year 2013). The federal budget for 2013 essentially eliminates this funding, although each agency, NOAA and EPA

received budget increases from 2012 (Office of Management Training and Budget, Fiscal Year 2013).

Receiving funding for environmental education programs was already challenging enough. The grants provided by the agencies were limited and quite competitive. Educators were required to apply with details of the budget, a projected timeline, a summary of the project, models of the inputs and outputs of the project, and their qualifications (EPA, Environmental Education Grants, 2014). Even after providing this information, it was no guarantee that funding would be provided, simply due to the volume of applicants and programs in each region.

The amount awarded in 2013 for the Environmental Education branch of the U.S. EPA was \$2.77 million and introduced a new functioning system for awarding these grants. There were still applications that were required to fit the criteria and outline the projects, but in 2013, the EPA awarded regions and headquarters grant money to distribute within the locations (EPA, Environmental Education Grant Program, 2013). There are 10 regions in which states are grouped and several headquarters disbursed throughout the United States. Two programs were combined in 2013, the Model Grant Program and the Sub-Award Program, both from federal grant money. The EPA provided 2-3 grants per region and 1-2 grants per headquarters, which was not to exceed \$200,000 per project (EPA, Environmental Education Grant Program, 2013).

In certain years, the EPA requires that proposed projects focus on specific environmental issues or groups to involve, and with the EPA's 2011-2016 Strategic Plan, the projects that focused on reaching a broad audience were considered favorable. There was already a requirement that projects be "cross-cutting strategies for expanding the conversation of environmentalism", which included reaching low-income, tribal, and minority audiences (EPA, Environmental Education Grant Program, 2013). Based on the first review of the applications within the federal office, the projects that are not eliminated are then distributed to the regional offices. Aside from regional offices awarding grant money, the 2013 Environmental Education Grant Program is unique because it emphasized projects being used as models, able to fit into other settings or subjects for future use. This would also aid in spreading the conversation of environmentalism.

Grants by State:

North Carolina:

The most recent grant awards for North Carolina were in 2010 and only two were provided for programs in the state. The first was for the Centralina Council of Governments for the Regional Storm water Partnership Hispanic Education Outreach program. The amount awarded was \$11,095. The program was designed to increase environmental awareness of storm water for Hispanic residents (EPA, Environmental Education Grants, North Carolina, 2010). In order to promote change, the program proposed to put posters within the community

and after six months, hold focus group meetings to assess the effectiveness (EPA, Environmental Education Grants, North Carolina, 2010).

The second program to receive award money was Duke University in order to integrate environmental health content into an existing nursing curriculum. This program received \$36,527. The major cost for this program was the implementation of resources to be provided in class and online, as well as training. This program differs from what is considered to be an average environmental education program because it focuses on environmental health rather than recycling or pollution. However, was still considered “environmental” and was able to receive appropriate funds from the EPA (EPA, Environmental Education Grants, North Carolina, 2010).

California:

Environmental education programs in California received funding as recent as 2011, which included three programs. The first was California ReLeaf Project, with a total of \$150,000. This project sought to deliver hands-on activities through planting trees and caring for them within 20 communities in California. The overarching goal for this project was to educate the public on how urban forestry can serve as a component to help with climate change, while also protecting water and improving air quality (EPA, Environmental Education Grants, California, 2011). The materials were delivered through webinars, workshops, presentations, and activities within the classroom (EPA, Environmental Education Grants, California, 2011).

The second program to receive grant funds was the Marine Mammal Center's Marine Science Discovery Program. The total amount for this program in 2011 was \$34,693. The goal of this program was to target low-income high school students and offer hands-on activities to teach students about marine science and other research in the field. Teachers are also provided education materials. Students take part in lab work and research with marine ecology, coastal habitats, marine mammals, and stewardship (EPA, Environmental Education Grants, California, 2011). Through this program, students are expected to produce a final project showing their research at the end of the year.

Finally, the last project to receive a grant for environmental education program in 2011 was the Watershed Project's Wild Oysters Habitat Restoration in San Francisco Bay. This program received \$20,645. The funds for this project went predominantly to establishing four native oyster reefs near high-traffic public spaces with the hope that the public would become more involved with the stewardship to protect the reefs (EPA, Environmental Education Grants, California, 2011). The project not only installed new reefs, it also works to restore the native habitats of oysters and eelgrass. The target group for outreach is urban high school students who are not often exposed to nature. Students are brought on fieldtrips and monitor the progress of the reefs through classroom activities and available data from stakeholders involved with the restoration (EPA, Environmental Education Grants, California, 2011).

Hawaii:

For Hawaii, 2011 was also the most recent year grants were provided. Only one program received a grant, the Malama Kai Foundation's North Kohala Ocean Warriors program. Like many of the programs previously mentioned, this also promotes marine and coastal conservation initiatives. It received \$74,600 to provide materials for high school and middle school students over a two year period (EPA, Environmental Education Grants, Hawaii, 2011). Students, teachers, and volunteers participate in activities and projects around the community that include beach clean-ups, habitat restoration, and training. These projects were completed after school and throughout weekends, but students were taught about the issues through lessons and activities in the classroom.

The examples above are meant to show two things: how much impact environmental education funding from the federal government has on local programs and the diversity of environmental topics of these programs. Depending on what the approved curricula is, how much time there is during the school year, and grade level, students may only be exposed to a few topics. Non-profit organizations can fill this gap for topics by providing resources and speakers for the classroom to discuss the goals and topics within the organization. However, providing classroom support means funding, whether it is from the pool of grant money from the federal government or private donors.

Without the funding provided by the EPA, these programs may not be able to continue. While individually it is not substantial enough to provide for all schools across the states, the funding from the federal government alleviated some of the costs that will now have to be provided by the states or an outside source,

such as a private or public organization. As seen with California, when there is not enough funding to go around, programs may seek funding and resources from outside sources, such as big corporations. When this happens, the material can often be twisted or leave out crucial details than curricula that is approved by state education departments, which is why it is important to establish curricula approved and funded within the state.

Based on available data shown in chapters four, five, and six, more consistent evaluations of these programs need to be conducted to determine if the goals originally outlined in the initiatives are being met and if they are not, how they can be improved. Evaluations can also serve as resources or models for other states with environmental education plans. However, conducting evaluations requires time and funds which may not be available, even from organizations, due to current budget cuts that may have strained the available funds.

In order to fully understand the impact environmental education has on students and their roles as environmental or community leaders, comprehensive evaluations must be available. If a problem within a program persists, then it is not meeting the goals that it should be meeting. Full evaluations on student performance, behavior, and attendance within the classroom will be a huge determining factor for the success of environmental education programs implemented at the state level and integrated into core courses.

Finally, there is the matter of the correlation between environmental education and STEM fields. Currently, the federal government is pouring millions

of dollars into programs that support these types of fields, at the expense of federal funding for environmental education. However, this is not to say that the funding cannot support both fields of study. Environmental education has been shown to increase test scores in science and math courses, both of which are valued courses within STEM fields, and also increase critical thinking and problem solving skills. Therefore, it would make sense for environmental education programs to be funded with federal money allotted for the STEM campaign.

A foundation that supports both types of programs is the National Environmental Education Foundation (NEEF). The organization supports many Environmental Education Weeks, which have themes related to environmental issues. In 2014, the EE Week's theme was Greening STEM: Engineering a Sustainable World, which focused on incorporating engineering lessons and activities for all grade levels to apply to real world environmental challenges (NEEF, Greening STEM Learning Center, 2013). This was also a continuation of the 2013 EE Week, called Greening STEM: Taking Technology Outdoors, which combined environmental education learning styles with STEM concepts.

NEEF also provides lesson plans to draw correlations and real-world applications between environmental challenges and STEM subjects. These lesson plans include content ranging from Sustainable Energy and Design, Environmental Conservation, Recycling and Reusable Materials, and Engineering, and are able to be broken down by grade level starting in Kindergarten and ending in 12th grade (NEEF, Engineering a Sustainable World,

Educator Toolkit, 2014). Both subjects are very important to teach children in a today's changing world and have become top priorities to educators and governments over the years. NEEF's Environmental Education Week provides a thriving example of how the two subjects can work well together and benefit one another. By combining environmental education and STEM field concepts, funds can help further the two types of programs throughout America's schools in one fell swoop.

APPENDICES

A: Meta-analysis

Below is a summary of the systematic review conducted to test the relevance of academic achievement and environmental education among North Carolina, California, and Hawaii.

ERIC

Test Scores

California: Two results, but only one relevant.

Black, S. (2006). A transforming partnership. *Science and Children*, 43(4), 42-44.

-This article is relevant to this specific search because the study sought to increase student's test scores at Jefferson Elementary in San Diego County. The study evaluated a partnership between the school and the San Diego Natural History Museum, which focused on a local watershed. Students studied local issues and concerns with the watershed and were taught about water and soil quality, plants, animals, and the habitats around the area. The study concluded that student test scores increased in the school's science classes, from 574 to 750 composite scores (Black, 2006).

North Carolina: One result, but not relevant.

Hawaii: Three results, but only one relevant.

Stepath, C. M. (2005, July). *Reef education evaluation: Environmental knowledge and reef experience*. National marine education association conference, Maui, HI.

-This article is relevant to the specific search because it is an evaluation of environmental and coral reef knowledge of high school students. Students were taught monitoring techniques both in the classroom and on field trips and ways to maintain the reef's sustainability. In this study, 389 students were given a pre-test and scored a total of 4.87 out of 9. After the exposure in the classroom and reef field trips, students were given a post-test and resulted in a 44.73% increase to a score of 7.11 out of 9 (Stepath, 2005).

Academic Achievement

California: Nine results, but relevant result was same as the first.

North Carolina: One result, but not relevant.

Hawaii: 0

Student Achievement

California: Nine results, but only two relevant results.

Black, S. (2006). A transforming partnership. *Science and Children*, 43(4), 42-44

Educational Development Specialists, (1990). *Think earth environmental education program. report on may 1990 field test of units for kindergarten through third grade*. Lakewood, CA:

-This article is relevant to this specific search because this project implemented environmental education units in kindergarten through third grade classrooms in Southern California. The units were tested in 42 classrooms at 12 schools, with 1,000 students. The study revealed an increase in student achievement in units and increases in attitudes towards material ("Think Earth" Project, 1990).

North Carolina: Five results, but non relevant.

Hawaii: Two results, but none relevant.

EBSCOhost

Test Scores

California: One result

Cleaver, S. (2007, November). Classrooms are going green. *Instructor*, 117(3), 20-24.

North Carolina: 0

Hawaii: One relevant, but same as ERIC search.

Stepath, C. M. (2005, July). *Reef education evaluation: Environmental knowledge and reef experience*. National marine education association conference, Maui, HI.

Academic Achievement

California: Four results, but only one relevant.

Educational Development Specialists, (1990). *Think earth environmental education program. report on may 1990 field test of units for kindergarten through third grade*. Lakewood, CA.

North Carolina: 0

Hawaii: 0

Student Achievement

California: One result, but no relevant

North Carolina: 0

Hawaii: 0

ScienceDirect

Test Scores

California: One hundred and twenty-seven, but no relevant results

North Carolina: Seventy-nine, but no relevant results.

Hawaii: Three, but no relevant results.

Academic Achievement

California: Fifty-three, but no relevant results.

North Carolina: Seventy-nine, but no relevant results.

Hawaii: Fourteen, but no relevant results.

Student Achievement

California: Fifty-four, but no relevant results

North Carolina: Forty-four, but no relevant results

Hawaii: Twenty-six, but no relevant results.

Further evaluations from California, North Carolina, and Hawaii within the search parameters showed only four relevant results. Other results revealed new findings from other states across the nation, including Florida (2006), Washington State (2009), Missouri (1990-1991), New York (1975-1976), Louisiana (2007), and the United States (2000) as a whole. The following will include a break-down of the results found in the studies:

Florida: This study focused on four hundred high school students, grades ninth and twelfth in eleven schools. The results showed that environment-based programs increased critical thinking in both grades.

Ernst, J., & Monroe, M. (2006). The effects of environment-based education on student's critical thinking skills and disposition toward critical thinking. *Environmental Education Research*, 12(3), 429-443.

Washington: This study focused on student achievement with environmental education based standardized tests in math, English, and listening. The study included eighth grade students and compared participating schools to traditional schools, revealing that environmental education integrated into traditional disciplines improved student performance.

Bartosh, O., & Tudor, M. (2009). Impact of environment-based teaching on student achievement: A study of Washington state middle schools. *Middle Grades Research Journal*, 4(4), 1-16.

Louisiana: This study focused on an elementary school that implemented a school-wide environmental science curriculum, which included Project Learning Tree, Project Wild, and Project WET. Before implementation, the school was facing very low enrollment rates and facing closure, but after the environmental education was brought in, the school saw huge improvement in enrollment, test scores, and behavior.

Irvin, T. (2007). Nature lessons. *Educational Leadership*, 64(8), 54-56.

Missouri: This article focused on an evaluation of an environmental science program at a high school in the Kansas City, Missouri area. The program conducted field trips, environmental projects, and kept an environmental theme throughout the school year. The evaluation revealed that test scores improved positively.

Seever, M. (1991). East environmental science magnet high school: 1990-1991. formative evaluation.

New York: This study was an evaluation of an environmental education program focused on marine science. The study included one hundred and eighty-five 7th grade students from four schools around the area. Students took a pre-test and a post-test to determine if there was improvement in academics. The evaluation concluded that students reading skills and language arts achievement improved.

Gunther, P. Office of Educational Evaluation, (1976). *Reading improvement through marine environment exploration, 1975-1976*. Brooklyn, NY: New York City Board of Education.

REFERENCES

- Bearden, D. M. Congressional Research Service, Library of Congress. (2002).
National environmental education act of 1990: Overview, implementation, and reauthorization issues CRS Report for Congress.
- Boudreau, J. (2008, July 26). Governor vetoes climate change curriculum. *San Jose Mercury News*. Retrieved from http://www.mercurynews.com/ci_10010291
- BP. (2005). *Bp a + for energy*. Retrieved from <http://www.bp.com/en/global/aplus-for-energy/about-bp-a--for-energy/program-overview.html>
- California Department of Education, Education and Environment Initiative. (2000).
Evaluation criteria for eei instruction materials. Retrieved from website:
<http://www.cde.ca.gov/ci/sc/ee/eeievalcriteria.asp>
- California Department of Education, Fiscal Policy Office. (2012). *Proposition 98 basic principles*
- California Department of Education, Office of Public Instruction. (2013). *Education budget*
- California Department of Education, State Education and Environment Roundtable. (2000). *California student assessment project: Phase one, the effects of environment-based education on student achievement*. Retrieved from website:
<http://www.seer.org/pages/research/CSAP2000.pdf>
- California Department of Education, State Education and Environment Roundtable. (2005). *California student assessment project: Phase two, the effect of environmnet-based education on student achievement*. Retrieved from website:
<http://www.seer.org/pages/research/CSAPII2005.pdf>

- California Department of Education. (2012-2013). *Statewide totals and averages for school districts general fund*. Retrieved from http://www.ed-data.k12.ca.us/App_Resx/EdDataClassic/fsTwoPanel.aspx?
- California Environmental Protection Agency, Office of Environmental Education. (2005). *Model curriculum plan*. Retrieved from website: <http://www.calepa.ca.gov/Education/EEI/documents/ModelPlan.pdf>
- California Environmental Protection Agency. (2011, July 26). *California's environmental principles and concepts*. Retrieved from <http://www.calepa.ca.gov/Education/Principles/EPC.pdf>
- Chesapeake bay trust .*impact*. (2013). Retrieved from <http://www.cbtrust.org/site/c.miJPKXPCJnH/b.5435813/k.C14F/Impact.htm>
- Chesapeake Bay Trust. *about*. (2010). Retrieved from <http://www.cbtrust.org/site/c.miJPKXPCJnH/b.5435807/k.AFFA/About.htm>
- Chevron. (2009, October 21). *Chevron announces california partnership to invest in education and jobs*. Retrieved from <http://www.chevron.com/news/press/release/?id=2009-10-21>
- Clark, B. Y., & Whitford, A. B. (2011). Does more federal environmental funding increase or decrease states' efforts? *Journal of Policy Analysis and Management*, 30(1), 136–152. doi:10.1002/pam.20547
- Crouch, R. C., & Abbot, D. S. (2009). Is Green Education Blue or Red? State-Level Environmental Education Program Development Through the Lens of Red- and Blue-State Politics. *Journal of Environmental Education*, 40(3), 52–62.

Department of Education State of Hawaii, Office of Curriculum, Instruction, and Student support. (2005). *Hawaii content and performance standards iii*

Department of Environment and Natural Resources Act of 1993, 7 NC General Statutes. § 143B-279.1-279.2.

Department of Land and Natural Resources, Hawaii Division of Forestry and Wildlife.

(2010). *Appendix e conservation education*. Retrieved from website:

<http://dlnr.hawaii.gov/forestry/files/2013/09/SWARS-Appendix-E.pdf>

Department of Public Instruction, Public Schools of North Carolina. (2010). *North*

carolina essential standards: Earth/environmental science. Retrieved from

website: <http://www.ncpublicschools.org/docs/acre/standards/new-standards/science/earth-env.pdf>

Education and the Environment Initiative. (n.d.). *Eei curriculum and state standards*

alignment. Retrieved from <http://www.californiaeei.org/History/default.htm>

Education and the Environment Initiative. (n.d.). *Eei curriculum development and field*

testing. Retrieved from <http://www.californiaeei.org/History/default.htm>

EENC - In The News. (n.d.). Retrieved May 5, 2014, from

<http://www.eenc.org/index.php/features>

EENC. (2013). *History*. Retrieved from

<http://www.eenc.org/index.php/typography/history>

Environmental Education Trust Fund of 1997. 7 NC General Statutes. § 143-285.26.

Environmental Protection Agency, Office of Environmental Education. (2014).

Environmental education grants program. Retrieved from website:

<http://www2.epa.gov/education/environmental-education-ee-grants>

Environmental Protection Agency, Office of Environmental Education. (2010).

Environmental education grants north carolina. Retrieved from website:

<http://www2.epa.gov/education/profiles-environmental-education-grants-awarded-north-carolina#2010>

Environmental Protection Agency, Office of Environmental Education. (2011).

Environmental education grants california. Retrieved from website:

<http://www2.epa.gov/education/profiles-environmental-education-grants-awarded-california#2011>

Environmental Protection Agency, Office of Environmental Education. (2011).

Environmental education grants hawaii. Retrieved from website:

<http://www2.epa.gov/education/profiles-environmental-education-grants-awarded-california#2011>

Fleetwood, G. R., & Hounshell, P. B. (1976). Assessing cognitive and affective outcomes of environmental education. *Journal of Research in Science Teaching*, 13(1), 29–35. doi:10.1002/tea.3660130106

Glenn, J. L. North American Association for Environmental Education, National Environmental Education & Training Foundation. (2000). *Environment-based education: Creating high performance schools and students*. Retrieved from website: <http://www.neefusa.org/pdf/NEETF8400.pdf>

Hawaii Environmental Education Alliance. (2011). *Help for our island community*.

Retrieved from <http://heea.org/resource/about.aspx?s=95217.0.0.89929>

Hawaii State Department of Education, Hawaii Content and Performance Standards
III. (2005). *Benchmark map: Science, grade 1*. Retrieved from website:
http://165.248.30.40/hcpsv3/benchmarkmaps/search_results.jsp

Hollweg, K.S., Taylor, J.R., Bybee, R.W., Macinkowski, T.J., McBeth, W.C., &
Zoido, P. (2011). *Developing a framework for assessing environmental literacy*.
Washington, DC: North American Association for Environmental Education.

Hoody, L. L. State Education and Environment Roundtable, (1996). *The educational
efficacy of environmental education*. Retrieved from website:
<http://www.seer.org/pages/research/educeff.pdf>

Kokua hawaii foundation. (2014). Retrieved from
<http://kokuahawaiiifoundation.org/home>

Lee, H. K. (2013, August 2). Richmond sues chevron over refinery fire. *SFGate*.
Retrieved from <http://www.sfgate.com/bayarea/article/Richmond-sues-Chevron-over-refinery-fire-4703370.php>

Lieberman, G., & Hoody, L. State Education and Environment Roundtable, (1998).
Closing the achievement gap. Retrieved from Science Wizards website:
[http://www.magicoflandscapes.com/Research/Closing the Achievement Gap.pdf](http://www.magicoflandscapes.com/Research/Closing%20the%20Achievement%20Gap.pdf)

McGinn, J. (2008, July 10). *Malama i ka 'aina*. Retrieved from
<http://malama.hawaii.edu/overview/>

National Environmental Education Foundation. (2013). *Greening stem*. Retrieved from
<http://eeweek.org/greening-stem-educator-toolkits>

National Environmental Education Foundation. (2014). *Engineering a sustainable
world*. Retrieved from <http://eeweek.org/engineering-sustainable-world>

- National Governors Association. (2011). *About*. Retrieved from <http://www.nga.org/cms/about>
- Native Hawaiian Education Council, Office of Hawaiian Affairs. (2002). *Hawaii guidelines for culturally healthy and responsive learning environments*.
- North Carolina Department of Environment and Natural Resources, Office of Environmental Education. (2006). *The north carolina environmental education plan*. Retrieved from website: http://www.eenorthcarolina.org/ee_plan_web_print.pdf
- North Carolina Department of Public Instruction. (2013). *2012-2013 cohort graduation rates*. Retrieved from <http://www.ncpublicschools.org/newsroom/news/2008-09/20080807-03>
- North Carolina State Board of Education, Office of Public Instruction. (2013). *Fiscal year 2012-2013 budget comparison*
- Office of Education on the Environment of 2003. 1548 CA Assembly Bill. § 33541
- Pacific American Foundation. (n.d.). *Aloha 'aina curriculum*. Retrieved from <http://heea.org/net/org/info.aspx?s=93282.0.0.89929>
- Potter, G. (2010). Environmental Education for the 21st Century: Where Do We Go Now? *Journal of Environmental Education*, *41*(1), 22–33.
doi:10.1080/00958960903209975
- Robelia, B., & Murphy, T. (2012). What do people know about key environmental issues? a review of environmental knowledge surveys. *Environmental Education Research*, *18*(3), 299-321. doi: 10.1080/13504622.2011.618288

- Rome, A. (2010). The Genius of Earth Day. *Environmental History*, emq036.
doi:10.1093/envhis/emq036
- Ruskey, A., Wilke, R. & Beasley, T. (2001). A survey of the status of state-level environmental education in the United States – 1998 update. *The Journal of Environmental Education*, 32(3)
- Sato, P., & Staab, J. Hawai'i Department of Land and Natural Resources, Hawaii Environmental Education Alliance. (2012). *Hawaii environmental literacy plan*. Retrieved from website:
http://heea.org/Files/eehi/2012/HELP_Report_401_FINAL_021312_lores_lock.pdf
- Society of Petroleum Engineers. (2007). *Oil and natural gas*. New York: DK Publishing.
- Stapp, W. B. (1969). The concept of environmental education. *The Journal of Environmental Education*, 1(1),
- Stone, C. P. (1992). Environmental education in hawaii: History and overview. In C. Stone, C. Smith & J. Tunison (Eds.), *Alien Plant Invasions in Native Ecosystems of Hawaii: Management and Research* Honolulu: University of Hawaii Press.
- Tanton, T., & Martin, M. (2008). Schwarzenegger vetoes global warming curriculum mandate [Web log message]. Retrieved from <http://heartland.org/policy-documents/schwarzenegger-vetoes-global-warming-curriculum-mandate>
- The Office of Environmental Education. (2006). *Accomplishments since 1995*. Retrieved from <http://www.een>
- Burke, E. (2009). *Letters and testimonials regarding the nc office of environmental education*. Retrieved from

<http://rtpnet.org/eenc/oeletters.html>
northcarolina.org/about-us--accomplishments.html

The White House. Government. Federal Budget, Office of Management and Budget. (2013). *Fiscal year 2013 cuts, consolidations, and savings*

The White House. The White House, Office of the Press Secretary. (2010). *President obama launches "educate to innovate" campaign for excellence in science, technology, engineering & math (stem) education*. Retrieved from website: <http://www.whitehouse.gov/the-press-office/president-obama-launches-educate-innovate-campaign-excellence-science-technology-en>

Thompson, J. A., & Marlow, S. E. National Center for Education Statistics, (1998). *Public school finance programs of the united states: Hawaii*. Retrieved from website: <http://nces.ed.gov/edfin/pdf/StFinance/Hawaii.pdf>

Thomson, G., & Hoffman, J. Canadian Parks and Wilderness Society, Calgary-Banff Chapter. (n.d.). *Measuring the success of environmental education programs*. Retrieved from website: http://macaw.pbworks.com/f/measuring_ee_outcomes.pdf

Volk, T. L., & Cheak, M. J. (2003). The effects of an environmental education program on students, parents, and community. *The Journal of Environmental Education, 34*(4), 12-25.

Wang, X. (2011). Exploring trends, sources, and causes of environmental funding: A study of Florida counties. *Journal of Environmental Management, 92*(11), 2930–2938. doi:10.1016/j.jenvman.2011.07.002

- Watanabe, T. (2013, April 9). New teaching standards delve more deeply into climate change. *Los Angeles Times*. Retrieved from <http://articles.latimes.com/2013/apr/09/local/la-me-0410-schools-science-20130410>
- Watson, Mary E., and William Tucci. (2002, September). A victory for earth science. *Geotimes on the web*. Retrieved May 5, 2014, from http://www.geotimes.org/sept02/feature_victory.htm
- Webb, S. Hawaii State Department of Education, Hawaii Environmental Education Alliance. (2011). *The hawaii environmental literacy plan educational standards alignment*
- Wilkey, R. (2013, August 2). Richmond sues chevron: California city alleges negligence following 2012 refinery fire. *The Huffington Post*. Retrieved from http://www.huffingtonpost.com/2013/08/02/richmond-sues-chevron_n_3697056.html
- Wray-Lake, L. (2010). Examining trends in adolescent environmental attitudes, beliefs, and behaviors across three decades. *Environment and Behavior*, 42(61), doi: 10.1177/0013916509335163.

