A Criteria-Based Evaluation of Environmental Literacy Plans in the United States

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To my champions,

for your never-ending love, constant support, and unwavering patience.

Mom, Bridget, Thomas, Maima, Pampa, Gamma & Gampa: for your love, and for being supportive and patient through this entire process, even when you didn't quite understand what I do.

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ABSTRACT

In response to the lack of formalized environmental education in the United States, 48 states are in the process of developing Environmental Literacy Plans (ELP) through their state environmental education organization (SEEO). The North American Association of Environmental Educators (NAAEE) produced guidelines intended to inform the states writing and development of their ELP. These guidelines provide a framework for the integration of environmental education into current state curricula, propose graduation requirements for environmental literacy, suggest steps for teacher professional development, detail assessment strategies and propose funding sources and policy action steps. Due to large variations in educational systems, policies, and politics on a state-by-state basis, the 48 ELPs are in dramatically different phases of progress.

The purpose of this study was to develop a robust and unique system of analyzing environmental literacy plans in the United States. A criteria-based matrix system was created for to examine the progress of state ELPs through a qualitative system which analyzes the quality of each recommended criterion. The matrix system also accounts for several external factors such as political status in terms of legislative progress and the process transparency in terms of public input. The matrix system is accompanied by rubrics which provide detailed citations of evidence for each of the eight criterion scores a state receives. The unique methodology requires a contextualization of the factors affecting ELP progress; therefore several states are highlighted in the findings to provide contextual evidence behind ELP success or lack thereof. .

The conclusions identify the development of a robust curriculum crosswalk as well as plan advancement on the political stage as strong components of ELP success. This study also shows that political affiliation of the state, as a conservative or liberal state, is not a strong determinant off overall success of the plan. The conclusions of this dissertation are highly relevant due to the passage of new federal legislation which, for the first time, provides funding for opportunities for environmental education in K-12 classrooms in the United States.

TABLE OF CONTENTS

CHAPTER I: INTRODUCTION & LITERATURE REVIEW 1
Environmental Literacy Planning in the United States 2
History of the Environmental Literacy Planning Movement 2
No Child Left Inside Legislation 4
Key Elements of ELPs 11
Recommendation 1: Curriculum Standards 12
Recommendation 2: Graduation Requirements 12
Recommendation 3: Professional Development 13
Recommendation 4: Assessment of Environmental Literacy 13
Recommendation 5: Plan for Implementation 13
Development of ELPs 15
Developers 15
Reviewers 18
Promulgators 18
LITERATURE REVIEW 20
Historical Trajectory of the Environmental Movement 20
Establishing Academic Importance of Environmental Literacy 23
Environmental Literacy in K-12 Education 25
Environmental Literacy in Higher Education 34
Defining Environmental Literacy 35
Assessment of Environmental Literacy 39
The Impacts of Education Policy Reform on the Instructional Practices of K-12 Teachers 42
California Mathematics Framework Reform 43
The Effects of No Child Left Behind 46
NCLB and Science Education 48
Implications for Proposed Research 53
CHAPTER II: THEORETICAL FRAMEWORK 56
Policy Framework 57
Criteria-Based Matrix 61
CHAPTER III: METHODOLOGY 63
Creation of the Criteria-Based Matrix and Rubrics 63
Selection of Criteria and Assigning Weights 65

Data and Data Collection 81
Analysis of Matrix Data 82
Pilot Study Analysis 85
Preliminary Data Analysis 86
Trustworthiness 90
Limitations 91
CHAPTER IV: FINDINGS 93
Rating State Environmental Literacy Plans 98
Patterns in State ELP Data 105
Finding 1: Total versus Quality Scores 105
Finding 2: Perceived Effort 107
Finding 3: Political Affiliation 112
Digging Deeper: A Contextualization of a Sample of States ELP Scores 114
Oregon 115
Maryland 117
Kansas 118
Michigan 119
Washington DC 121
Comparing State Status Research 123
CHAPTER V: CONCLUSION 125
Areas of Effort 125
Politics and Policy 126
Identifying “Best” State ELPs 127
Implications of Being Boundedly Rational 128
Linking to Literature 129
Extraneous Bounds and Limitations 130
Next Generation Science Standards 130
Local Control 131
Political Culture Shift 132
Legislative Progress 134
Continued Research Efforts 136
Continued and Adapted Use of Matrix Model 137
LIST OF REFERENCES 139
VITA 149

LIST OF TABLES

Table 1: Instruments for Assessing Environmental Literacy 41

Table 2: Blank Matrix Design 65

Table 3: Plan Status Rubric 67

Table 4: Political Status Rubric 69

Table 5: Curriculum Rubric 72

Table 6: Assessment Plan Rubric 74

Table 7: Graduation Requirement Rubric 75

Table 8: Implementation Plan Rubric 76

Table 9: Professional Development Plan Rubric 79

Table 10: Process Transparency Rubric 80

Table 11: Implementation Plan Rubric with Citations of Evidence for Five States 83

Table 12: Pilot Study Data 87

Table 13: Preliminary Data Matrix 89

Table 14: Criteria-Based Matrix 94

Table 15: Top States by Total and Quality Scores 108

Table 16: Matrix with Highlighted "Perceived Effort" Criteria for Discussion 111

Table 17: Top States by Total and Quality Score including Voting Record in 2012 Election 113

LIST OF FIGURES

Figure 1: Major Environmental Education Organizations 8

Figure 2: Literacy Progressions (Roth) 29

Figure 3: Relationship Between Policy, Teacher Education, Beliefs, and Student Learning (Milner et al., 2009, pg. 139- Figure 3) 51

Figure 4: Theoretical Framing Process 58

Figure 5: Example of a Criteria-Based Matrix 64

Figure 6: Environmental Literacy for Illinois, 2010 Strategic Plan, Table of Contents- With Author Graphics Added 101

Figure 7: Oregon Environmental Literacy Plan, Table of Contents- With Author Graphics Added 102

Figure 8: Description of Relationship of Funding Opportunities for EE under ESSA 2016 135

LIST OF ATTACHMENTS

MATRIX…… ……MATRIX- ELP Criteria-Based Decision Matrix.pdf
RUBRIC 1…….....……...…RUBRIC 1- Political Status.pdf
RUBRIC 2……RUBRIC 2- Plan Status. pdf
RUBRIC 3……..…RUBRIC 3- Curriculum.pdf
RUBRIC 4……...…RUBRIC 4- Assessment Plan. pdf
RUBRIC 5……..RUBRIC 5- Graduation Requirement. pdf
RUBRIC 6……RUBRIC 6- Implementation Plan. pdf
RUBRIC 7……....RUBRIC 7- Professional Development. pdf
RUBRIC 8……...……RUBRIC 8- Process Transparency. pdf

CHAPTER I: INTRODUCTION & LITERATURE REVIEW

The current status of education in the United States is a tumultuous mixture of regulations, testing, and new standards. Within this realm of accountability, many subject areas have fallen off the educational track (Hursh, 2007; Nicholas & Berliner, 2005). One of those subject areas is that of environmental education. Environmental education, as further literature would suggest, has the potential to teach much-needed critical thinking and decision-making skills to students, as well as help inform students in making important decisions that could affect the overall health of the planet for future generations (CBF, 2014; Hollweg, Taylor, Bybee, Marcinkowski, McBeth, & Zoido, 2011; NAAEE, 2008). Situated more broadly than the definition of environmental education, this study seeks to explore one of the major pathways by which the United States plans to teach environmental literacy.

Currently forty-eight State Environmental Education Organizations (SEEOs) have or are developing policy documents called Environmental Literacy Plans (ELPs) that are intended to guide the environmental curricula on a state level (NAAEE, 2008; NAAEE, 2014). These documents are a very small piece of the educational upheaval that is currently going in the United States, but represent a large commitment from each state to value the educational resource that is environmental education and more broadly environmental literacy.

The purpose of this study is to develop a robust system of analysis of the status of state environmental literacy plans that can help identify criteria leading to success in plan development and implementation. . The research questions guiding this study are: what are the relationships and patterns amongst the criteria that are influencing the success of environmental literacy plans? How can the examination of successful state's environmental literacy plans help

less successful states in developing and implementing their ELPs? And, how can the criteria-based matrix system be used to further examine ELP and broader environmental education policies?

Environmental Literacy Planning in the United States

In order to explore the development of Environmental Literacy Planning (ELP) in the United States, it is imperative to understand the trajectory of the organizational influence and legislation directly related to the movement. The introduction of this research study will explore the history of the environmental literacy planning movement, then focus on specific elements of ELPs and conclude with a brief view of the development process from a general state level view.

History of the Environmental Literacy Planning Movement

The origins of Environmental Literacy Plans (ELPs) can be traced to the passage of the No Child Left Behind (NCLB) Act in 2001. Officially an amended iteration of the Elementary and Secondary Education Act of 1965 (ESEA), the major federal law authorized federal spending on programs to support K-12 schooling. Due to NCLBs rigorous standardized testing requirements in core subjects and continued pressure on teachers to limit exposure to environmental education amongst other topics for fear of 'loss of instructional time' on tested subjects, the legislation is credited with increasing the environmental literacy gap in the United States (CBF, 2013).

In the early 2000s, there were a combination of reports and written works that can be pointed to as contributing to the general understanding of a need for legislation that would support environmental education in K-12 schools. The proposed federal legislation that resulted from the apparent lack of support for environmental education in K-12 schools is titled the No

Child Left Inside Act (NCLI) and would set the course for the environmental literacy planning movement over the next decade.

One such article that contributed to the general understanding of the need for environmental education was the release of the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report in 2001, which concluded with robust findings of increased global temperature warming with attribution of observed warming to human activities (IPCC, 2001). Subsequent IPCC reports have strengthened these findings and have made increasingly more explicit connections to anthropogenic sources of CO_2 as the impetus of global climate change. The findings suggested that anthropogenic sources of CO_2 are a major contributor to the declining health of the global ecosystem as increasing CO_2 presents a problem for sustainability of current organisms, especially humanity as currently configured. For example, increasing CO_2 content presents the looming threat of oceanic acidification, with dire consequences for many species dependent upon calcareous organisms (IPCC, 2001). The IPPC reports suggested that changes needed to be made, including the realization by global policy makers that the future generations would need the skills to grapple with making decisions regarding complex environmental issues.

The IPCC Third Assessment Report (2001) also found that developing countries and poorer populations would likely be the most affected by climate change. This spurred initiatives by the United Nations, one of which was the adoption of the "UN Decade of Education for Sustainable Development" which emphasized that education is an essential component for achieving sustainable development and "aims to achieve an improvement in the quality of life, particularly for the most deprived and marginalized, fulfillment of human rights including gender equality, poverty reduction, democracy and active citizenship" (UNESCO Education Sector,

2006, p. 18). In the United States, the push for education for sustainable development is referenced in North American Association of Environmental Educators documents as a call for an environmentally literate citizenry and therefore a promotion of environmental education in the United States (NAAEE, 2004).

Another publication highlighting the gap in environmental literacy was *Last Child in the Woods* by Richard Louv in 2005, which sparked a national conversation and led to a highly publicized campaign to get kids outside (CBF, 2014a). The author coined the term "nature-deficit disorder", which was used to describe the loss of connection between young people and the natural world, and was described as a "disturbing phenomenon" in other environmental literacy research (p.7, Coyle, 2005). Louv made explicit links between some of the most disturbing childhood trends, such as the rises in obesity, attention disorders, and depression (CBF, 2014a). Louv reported in 2008 that a number of political and social movements towards outdoor and environmental education had taken place in response to the ideas in his book, stating that "at least ten governors—Democrats and Republicans—have launched statewide conferences or campaigns, including Connecticut's pioneering program to encourage families to visit the underused state parks. Replicable in every state, the effort was the first formal program to call itself No Child Left Inside" (Louv, 2008). Rising in part from the conversations about Louv's book, the No Child Left Inside (NCLI) Act was born.

No Child Left Inside Legislation

Largely in response to the standardization and accountability effects of the NCLB (CBF, 2014), the No Child Left Inside (NCLI) legislation was introduced in 2007 as part of the 110th Congress. The House version, H.R. 3036, was introduced by Representative John Sarbanes of

Maryland on July 13th, 2007 and the Senate bill, S.1981, was introduced by Senator Jack Reed of Rhode Island on August 2nd, 2007 (GovTrack.us, 2014).

The NCLI legislation was originally written to reauthorize and amend the National Environmental Education Act, adding to the minimum functions and activities required of grantees under the Environmental Education and Training program. The legislation also required that state grantees have peer-reviewed state environmental literacy plans (GovTrack.us, 2014). Later versions of the NCLI legislation would be written as an amendment to the Elementary and Secondary Education Act (ESEA), specifically NCLB of 2001, and would include similar provisions to the original version of the legislation. The NCLI of 2007 was drafted to include provisions, approximately $500 million over five years, for providing environmental education in public schools and ensuring all graduating seniors are environmentally literate. The federal bill proposed that appropriations be provided for states to develop environmental literacy plans which would include a plan for professional development for teachers for such instruction, provide innovative technology, and to develop measurable criteria for assessment of programs. While mainly addressing environmental literacy, this legislation also sought to promote healthy living programs encouraging outdoor recreation and sound nutrition, most likely in response to growing levels of obesity and attention disorders in children as outlined in Louv's book.

The original House legislation was sponsored by Representative Sarbanes of Maryland, a Democrat whom had just been elected for his first term starting in 2007. In a press release from co-sponsor Senator Reed's office (Sen. Reed, 2009), Representative Sarbanes said that "we must educate our youth to be environmental stewards and grow the next generation of scientists and innovators to solve our energy and environmental challenges, by preparing the next generation to meet these challenges, we will accomplish environmental, economic and national security policy

objectives in one fell swoop". This falls in line with his biography, stating that "as a Marylander, Congressman Sarbanes shares his state's strong tradition of environmentalism that is rooted in a passion for the Chesapeake Bay. He has led efforts in Congress to clean up the Chesapeake Bay with a particular focus on empowering residents of the Bay watershed to become citizen stewards of the Bay and give them an active role in restoring it" (Rep. Sarbanes, 2014). Rep. Sarbanes is also a member of the Committee on Energy and Commerce as well as the Committee on Natural Resources, committees that often pursue environmentally sustainable policies and regulations in various sectors, therefore it would align with Rep. Sarbanes other career works to support legislation that would create environmentally informed citizens and future supporters of his campaign.

The original Senate bill was sponsored by Senator Jack Reed of Rhode Island, a Democratic incumbent since 1997. In the same press release from his office, Senator Reed said "teaching children about the environment and giving them a hands-on opportunity to experience nature should be an important part of the curriculum in our schools. This legislation will free up critical funding for environmental education to inspire the next generation of scientists and conservationists, we often hear people talk about our children's future and the future of our planet, this bill backs that talk up with real investment" (Sen. Reed, 2009). As the chair of the Subcommittee on Interior and Environment, Senator Reed has had jurisdiction over several key environmental agencies such as the Environmental Protection Agency and the Department of the Interior as well as being a prominent figure and key supporter of Save The Bay, a Rhode Island based non-profit for the protection of Narragansett Bay (Sen. Reed, 2014). Similarly to Sarbanes, the sponsorship of a bill that would create environmentally informed citizens aligns with the interests and work of Senator Reed during his time in office.

Two major supporters of the NCLI Act are the Chesapeake Bay Foundation, based in Maryland, and the Association of Zoos and Aquariums (AZA). These organizations, along with supporters from Save The Bay and the Roger Williams Park Zoo, both of which are in Rhode Island and are members of the AZA, formed the No Child Left Inside Coalition. While the coalition now boasts "over 2,000 organizational members around the country—representing more than 50 million individuals" (CBF, 2014), the original roots of the coalition are tied to organizations in Maryland and Rhode Island, coincidentally the home states of both bill sponsors. In addition, because the organizations involved all offer environmental education programming in schools, all stand to receive funding for their programming should the legislation pass. Another connection that should not be overlooked is the North American Association of Environmental Educators, of which all the aforementioned organizations are members of. NAAEE is responsible for producing the guidelines by which the environmental literacy plans will be based on. The NAAEE boasts membership of all 50 states' Environmental Education Organizations on its roster, which is likely to play a role in the stance of NAAEE on policy issues that affect the states, such as NCLI. The simplified relationship of the major environmental education organizations is depicted in FIGURE 1.

The 2007 version of the Senate bill died in committee. However, the House bill, which was introduced in July of 2007, was recommended for consideration by the committee. On September 18th, 2008, the bill passed the House by a vote of 293- 109, with only dissenting vote from a Democrat coming from Rep. Brad Ellsworth of Indiana (GovTrack.us, 2014). Versions of the No Child Left Inside Act of 2007 have been reintroduced to the House and Senate almost every year since then, although all have died in committee. The most recent update to the No Child Left Inside website, sponsored by the Chesapeake Bay Foundation, states "on July 16,

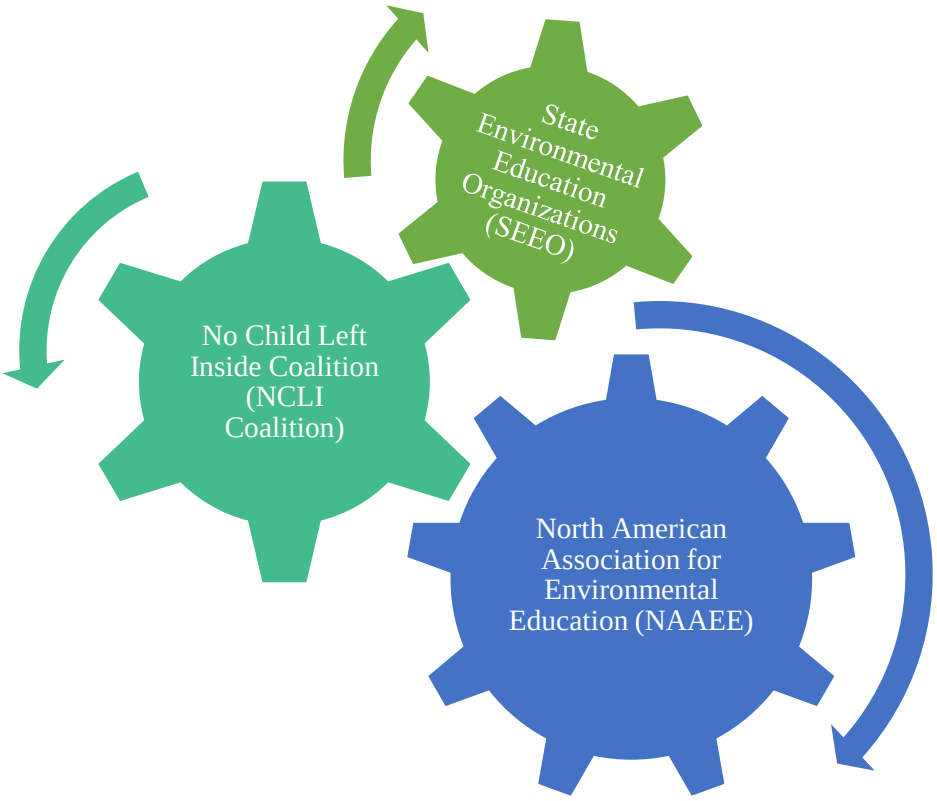

Figure 1: Major Environmental Education Organizations

2013, Senator Jack Reed (RI) and Congressman John Sarbanes (MD) reintroduced the bipartisan No Child Left Inside (NCLI) Act into the 113th Congress, with 13 Senate cosponsors and 42 in the House. CBF and partners in the NCLI Coalition worked closely with our legislative sponsors in updating the bill language to reflect the fact that many states have already developed plans for environmental literacy and now need support for effective implementation. We were pleased to have Republican co-sponsorship of the bill in both chambers in light of current partisan rancor" (CBF, 2014).

After the No Child Left Inside Act of 2007 died in committee, the key stakeholders decided to pursue an alternate route to environmental education. The NCLI Act would have mandated the development of an Environmental Literacy Plan (ELP) by each state and would have provided funding for such development. The policymakers, along with NCLI Coalition board members, made a decision to push for state action to develop ELPs without federal legislation or funding. Tom Ackerman of the Chesapeake Bay Foundation (CBF) and current NCLI Coalition member, stated that the reasoning behind this alternative route was that "the state environmental literacy plans became the most politically viable and practically implementable strategies" (Ackerman, 2014, personal communication, November 10, 2014).

In identifying the trajectory of the ELP movement and the key actors in this process, it is now possible to examine the documents which guide the states in developing their ELPs and the key elements of those plans. The crucial point moving forward is that **the failure of the NCLI Act spurred the organizations and individuals recognized in this section to push for each individual SEEO to write, develop, and implement their own ELP without either a mandate to do so and without any funding resources**. Currently, forty-eight states with ELPs have created them with minimal funding that each individual SEEO (State Environmental

Education Organization) secured or more likely with no funding at all, on a primarily volunteer basis, with vague guidelines from the North American Association of Environmental Education and with the hopeful promise of future funds if and when a version of the No Child Left Inside Act does pass.

During the writing of this dissertation, portions of the No Child Left Inside Act of 2015 passed and were enacted into law in December of 2015 as amendments to the newest iteration of the Elementary and Secondary Education Act known as the Every Student Succeeds Act (ESSA). The bipartisan legislation includes language that supports opportunities to provide students with environmental education and hands-on, field-based learning experiences. A press release from Sarah Bodor, Policy Director at NAAEE, states:

> "Under Title IV of the new bill, environmental education would be eligible for funding through grants to states for "programs and activities that support access to a well-rounded education." Environmental literacy programs are now also included among eligible programs for funding through 21st Century Community Learning Center grants. Additionally, the inclusion of Title IV funds for hands-on, field-based, or service learning to enhance understanding of science, technology, engineering and math subjects provides a potential boost for environmental science education programs. The gains for environmental education come as a result of years-long work by champions of the bipartisan No Child Left Inside (NCLI) Act, which sought to secure federal dollars to support states' efforts to implement environmental literacy plans in K-12 public schools" (Bodor, 2015).

While the current legislation does not include environmental literacy "plan" specific wording, it does provide opportunities for states to receive grant funding that may support ELP

implementation. The inclusion of environmental education language in ESSA is a large achievement for the environmental education community, however, how this legislation will affect the development and implementation of environmental literacy plans is unclear at this juncture.

Key Elements of ELPs

In exploring the key elements of ELPs, it is necessary to examine the documents produced on a national level by NAAEE. In the *State Environmental Literacy Plans: 2013 Status Report* (NAAEE, 2013), of the 48 states (including the District of Colombia) that have some level of working ELP, NAAEE reports that "approximately 88% of survey respondents cited that they are using NAAEE's "Guide to Developing a State Environmental Plan" publication as a resource to write their ELP. Additionally, 79% of states surveyed reported participation in an NAAEE workshop on developing ELPs" (p. 5). For this reason, the publications of NAAEE, primarily "Developing a State Environmental Plan" publication, will be the foundation of which this dissertation examines the key elements of an ELP and what those elements are designed to accomplish. That is, this research will examine state ELP's in accordance with what the NAAEE's guiding documents indicated should be components of such plans. Key wording from both the "Guide to Developing a State Environmental Literacy Plan" as well as text pulled directly from the No Child Left Inside legislation creates the scales by which this research examines state ELPs. The creation of these scales is discussed in further detail in the methodology section of this dissertation.

According to North American Association of Environmental Educators (NAAEE), in conjunction with the state environmental educators associations and the Association for Supervision and Curriculum Development (ASCD), the document *Developing A State*

Environmental Literacy Plan makes recommendations on what a state environmental literacy plan should at minimum include, as follows:

Recommendation 1: Curriculum Standards

According to NAAEE, "the state's content standards and other curriculum documents should include environmental literacy content standards in grades Pre-K through high school. Whether integrated within science, social studies, or other content areas; or whether they stand alone, these standards and curriculum documents should be clear and specific and be designed to ensure that high school graduates are environmentally literate" (NAAEE, 2008, p.6). The ELP development guide refers to another NAAEE published document, *Excellence in Environmental Education: Guidelines for Learning (K-12)* (revised 2010), which provides specific content standard guidelines for fourth, eighth and twelfth grades. The guidelines are broken into four strands with various sub-strands. The four strands with sub-strand components also match directly to the Competencies, Knowledge, and Dispositions listed in the NAAEE Executive Summary (Hollweg, Taylor, Bybee, Marcinkowski, McBeth, & Zoido, 2011)

Strand 1: Questioning, Analysis and Interpretation Skills
Strand 2: Knowledge of Environmental Processes and Systems
- 2.1—The Earth as a physical system
- 2.2—The living environment
- 2.3—Humans and their societies
- 2.4—Environment and society

Strand 3: Skills for Understanding and Addressing Environmental Issues
- 3.1—Skills for analyzing and investigating environmental issues
- 3.2—Decision-making and citizenship skills

Strand 4: Personal and Civic Responsibility

(NAAEE, 1999).

Recommendation 2: Graduation Requirements

"The state plan should consider if and how environmental literacy might be incorporated into the state's graduation requirements. For example, it should address how a specific high

school course, program or credit requirement is part of environmental literacy in high school" (NAAEE, 2008, p. 8).

Recommendation 3: Professional Development

"Both pre-service and in-service teachers will need to be prepared to teach their students about the environment, both in and out of the classroom. Partnerships between school systems and experiences environmental education or outdoor education providers are excellent models" (NAAEE, 2008, p.8)

Recommendation 4: Assessment of Environmental Literacy

"The plan should describe the methods that the state education agency will use annually to measure environmental literacy. This include traditional assessments, counts of student participation or performance, and other mechanisms. Progress toward achieving environmental literacy should be reported annually, possibly on a state education agency's federally mandated report card" (NAAEE, 2008, p. 9)

Recommendation 5: Plan for Implementation

"The plan needs to answer key questions about implementation. Will new or existing state laws, by-laws, or other specific requirements for environmental education be part of the implementation process? Will model programs be identified and replication supported? How will existing federal education funds such as Title II or Title V, Perkins grants, IDEA or STEM funding be integrated into an implementation plan? Is new dedicated funding required?" (NAAEE, 2008, p.9)

The set of recommendations as a whole are designed to accomplish several key goals for state and national level environmental education. The basis of the creation of an ELP is to create a framework by which states can evaluate, expand and improve on environmental education

standards within their school systems (NAAEE, 2008). The accompanying goals to this are to ensure that environmental education is fully and competently integrated into a state's formal curriculum and to ensure that teachers are receiving proper professional development opportunities to assure student achievement in environmental literacy. Both of those goals can serve as starting points to further key goals of ELPs which are to align graduate requirements which produce environmental literate graduates, to engage underserved communities, and to ensure consistent and accurate environmental content knowledge across the board (NAAEE, 2008).

In addition, the development of an ELP is crucial in securing a working relationship between classroom teachers and administrators with environmental educators, nonformal educators, community organizations as well as state natural resource agencies. The *Developing a State Environmental Literacy Plan* guide states that a main goal of the development of ELPs is to "serve as a necessary component of a comprehensive state environmental education program" (NAAEE, 2008, p.5).

Both the intended accomplishments and the corresponding key elements of the development of an ELP according to the NAAEE guide are vague, but intentionally so. NAAEE notes in the Guide to Developing a State Environmental Literacy Plan (here forward referred to as Developing a State ELP or, simply, the guidelines)that "states have great flexibility in the development of an environmental literacy plan. They can move forward with an existing plan, review and revise an older plan, or create a new plan. As described in the No Child Left Inside Act,

> "State Environmental Literacy Plans must provide a state plan to ensure students develop basic environmental literacy through:
> • Standards and courses/subjects where instruction will take place

• Graduation requirements
• Measurement of environmental literacy
• Professional development programs to improve teachers environmental literacy knowledge and field-based pedagogical skills
• Sustained implementation and funding" (NCLI, 2008)

The guidelines from NAAEE serve as a rough shell for states to start with, but allows for state autonomy in designing their plan according to specific needs and structure of their current education system, as well as the needs of educators and officials within the state. As a consequence of this design, there is also a great deal of interpretation of the guide as well as the structure and pace of the development of an ELP. The next section of this paper will give a brief outline of who may be involved in the development process of state ELP on a general state level.

Development of ELPs

To examine the development of ELPs, it is necessary to move from a view of legislation endeavors and research of environmental literacy on a national level to a more specific view of the process of creating an ELP which occurs on a state level. Since 2007, approximately 48 states are now in some stage of the process of planning, writing, adopting and implementing their ELP (NAAEE, 2013). Each state's process can vary dramatically in terms of funding, support, organization composition and coordination with state level organizations. Due to these variations, the following section of this paper seeks to identify the developers, reviewers and promulgators of a state ELP very broadly, and does not claim to be generalized to every states' process.

Developers

The developers of a state ELP are in almost all instances the state environmental education organization (SEEO). Most ELPs include at least a partial list of participants who

contributed to writing or reviewing the ELP and while the composition of members in different SEEOs varies greatly, it generally includes the following participants:

- Environmental Educators
- Science Educators
- STEM Educators
- Non-Profit Directors and Leaders
- Park Rangers
- AmeriCorps Members
- Education Directors at Museums
- Department of Education representatives
- District and State Level Education Administration (i.e. superintendents, principals, etc.)
- State and Local School Boards
- Curriculum Specialists
- NAAEE Affiliate Representative
- PTA Members
- Teachers Unions
- Home-School Networks
- State Organizations in Science or STEM Education
- Department of Environmental Protection or Quality representatives
- State Legislators
- Among others, including public input

The SEEO's have varying organizational structures, although most have a President, Vice President, and then one or more committees for particular tasks. It is possible in many cases that the ELP was written by only a handful of committee members. In the researcher's experience with the development of the Rhode Island ELP, the ELP committee was composed of approximately 22 people (Braun, McLaren & Swanberg, 2013). mostly from local non-profit education organizations and formal classroom settings, including the strong influence and contributions from a representative from the state Department of Education, a representative from the state Department of Environmental Management, and the state Commissioner of Education. The structure of the RI SEEO serves as an example of the possible structure of the

organization as well as the structure of the ELP planning committee, and is likely not representative of SEEO and ELP planning committees in general.

Reviewers

As with the writing of each state ELP, the review process also varies according to state. There are no published guidelines regarding the type or duration or any other detailing of how the review of an ELP should take place. The review of the ELP may stay within the committee, the SEEO, or be reviewed by a representative(s) from the state Department of Education. The plan may even, at one or more stages in development, be opened for public review and commentary.

Promulgators

The No Child Left Inside Coalition, which was started in 2007, is undoubtedly the biggest supporter of the movement for development of environmental literacy plans. The NCLI Coalition was started "to alert Congress and the public to the need for our schools to devote more resources and attention to environmental education" (CBF, 2011) boasts close to 2100 member organizations as of 2011 (CBF, 2011). Their website includes lists of organizations by state, as well as national and international organizations that support the efforts of the coalition. Members of the NCLI Coalition on the state level include SEEOs, members of the Association of Zoos and Aquariums, non-profit organizations with ties to education and natural resources, individual schools or school districts, state parks, and state agencies such as the Department of Natural Resources. On a national level, members include the Sierra Club, National Wildlife Federation, National Education Association, and the Children in Nature Network, amongst many others. The Coalition states that their current goal is to "support legislation sponsored by Rep. John Sarbanes

of Maryland and Sen. Jack Reed of Rhode Island to ensure that every student achieves basic environmental literacy" (CBF, 2015).

In conjunction with the NCLI Coalition, NAAEE which was started in 1970 and the Chesapeake Bay Foundation, started in 1967, have much overlapping membership and first-hand work in ELP development. NAAEE, as demonstrated earlier, is the leading environmental education organization in the United States and is responsible for the publication of all major documents guiding states in developing their plans. The Chesapeake Bay Foundation, as a well-known environmental non-profit, has been closely tied to the work of NAAEE for many years, and is the host organization for the website by which the NCLI Coalition operates.

These organizations also have strong representation at environmental and science education conferences, both practitioner and academic. The NCLI Coalition notes that while it is focused on federal level mandates, their "affiliate members are working hard in state capitals around the country to encourage state leaders to improve environmental education offerings" (CBF, 2014b).

The other substantial and obvious promulgators of ELP development are the Senators and Congressmen who sponsor and those who sign support of the NCLI legislation. As demonstrated earlier, some of the original co-sponsors of the legislation have clear ties to the major environmental education organizations involved in this process as well as clear ties to benefits for each legislator's state if the bill should pass.

The trajectory of ELP development, from the effects of NCLB, to the proposal of NCLI legislation, to 48 states in some stage of the ELP process speaks to the drive of the environmental education community and beyond to recognize growing environmental concerns and

corresponding need to produce environmentally literate citizens. While this paper demonstrates that the guidelines shaping ELP development are intentionally vague for the purpose of state autonomy and input, it also begins to lay the foundation for the need for evaluating states progress on their ELP to identify whether the strength of certain elements or the particular steps of the process have an effect on the overall success of the ELP. The following section reviews the literature pertinent to the study of environmental literacy plans, from the historical trajectory and academic importance of environmental education to a working definition of environmental literacy for this research and the status of assessing such environmental literacy in the US and abroad.

LITERATURE REVIEW

In order to evaluate the status of environmental literacy planning in the United States, it is necessary to first establish a working conception of environmental literacy. The following section will review the literature associated with the historical trajectory and academic importance of environmental literacy in the United States, establish a working definition of environmental literacy, as well as review pertinent literature in regards to instruments designed to assess environmental literacy.

Historical Trajectory of the Environmental Movement

The 1960s brought the birth of the environmental movement in the United States. The decade brought publications such as Rachel Carson's *Silent Spring,* which cataloged the impacts of spraying DDT without a full understanding of its effects (Carson, 1962). The legacy of Rachel Carson's works was the public suspicion of industry relative to the environment and even outright hostility it provoked through the nations commitment to progress despite the potential consequences (McBride, Brewer, Berkowitz, & Borrie, 2013; Rothman, 1998).

The emergence of environmental education in the 1960s (Braus & Disinger, 1998), finally led to the passage of the National Environmental Education Act of 1970. The law established the Office of Environmental Education, which provided grants for curricular materials and teacher professional development, but the Office was eliminated in the 1990 version of NEEA in order to increase the role of the states (Bearden, 2004). The 1990 version of NEEA has not been amended since that date. The NEEA re-established the Office of Environmental Education, but within the Environmental Protection Agency (EPA). The EPA's environmental education program provides small "seed" grants (Bearden, 2004). In 2013, a total of roughly $5 million a year for all grants nationwide was funded primarily to non-profit organizations to help develop local environmental education programs (EPA, 2013).

Continuing with the historical trajectory of the environmental movement from the original passage of NEEA in 1970, there were also several other groundbreaking pieces of legislation passed in the 1970s that continued a public and political push for more sound environmental choices. Such legislation included the National Environmental Protection Act (1970), the creation of the EPA (1970), the Clean Air (1963) and Water (1973) Acts, the Marine Mammal Protection Act (1972) and the State of the Union Address by President Nixon addressing his environmental conservation agenda for expanding the national park system in connection to his creation of the EPA, all taking place while Nixon, a Republican, was in office.

On the international stage, environmental literacy was defined as the goal of environmental education by the *Belgrade Charter* by the United Nations Educational, Scientific, and Cultural Organization and the United Nations Environment Programme (UNESCO-UNEP, 1976) and the *Tbilisi Declaration* (UNESCO, 1978). The *Belgrade Charter*, produced by the first international conference on environmental education, set the structure and aims of environmental

education worldwide (McBride et al., 2013). The *Tbilisi Declaration*, created at the Intergovernmental Conference on Environmental Education held in Tbilisi, Republic of Georgia, refined the *Belgrade Charter* to three main aims of environmental education (Bidenweg, Monroe & Wojcik, 2013). The Belgrade Charter and the Tbilisi Declaration, as well as Environmental Literacy for All (UNESECO-UNEP, 1989) which defined environmental literacy as a the fundamental goal of environmental education, are all referenced as being the founding documents for a united vision of environmental literacy in the United States and internationally (McBride et al., 2013; NAAEE, 2004).

In 1997, the National Environmental Education and Training Foundation (NEETF) sought to assess whether the 30 years of growth in environmental education and media coverage had influenced the members of the public in terms of basic environmental knowledge (Coyle, 2005). The NEETF paired with the Roper Center on Public Opinion Research (Roper) to assess such knowledge and reported that "Americans have low levels of knowledge on basic environmental facts, underlying science, causes of certain conditions, and important public environmental issues" (p.2) on every series of assessments from 1997 through 2001.

In the final few months of 2001, the United States passed the No Child Left Behind Act of 2001 (NCLB), which changed the face of education. The legislation limited the time and resources to spend outside of language arts and math curriculum in school, which pushed environmental education out of the classroom and into only informal, after-school, optional education (CBF, 2014). The passage of NCLB quickly affected classrooms and learning across the United States. The NCLB of 2001 was a bipartisan law that was intended to improve K-12 schools, under the premise of standards-based education reform which required all states to establish standardized testing. States were encouraged to provide choices of schools to students

so that they could change schools if their current school failed to meet the standards of NCLB's Adequate Yearly Progress (AYP), which inevitably polarized many school populations. In addition, opponents of NCLB argued that states were provided inadequate funding to implement NCLB and therefore it was an unfunded mandate on states. The No Child Left Behind Act burdened the US educational system and inflicted damage on schools, teachers, students and communities according to Diane Ravitch, an educational historian who helped in the development and implementation of NCLB but later publically denounced the legislation as ruining the American school system (Ravitch, 2011).

In combination with reports showing a lack of environmental knowledge in the general public and then major education reforms that pushed environmental education further out of reach, the publication of *Last Child in the Woods* by Richard Louv (2005) and the release of the 2001 IPCC Report, as discussed above, helped set the stage for the introduction of the No Child Left Inside legislation in 2007.

Establishing Academic Importance of Environmental Literacy

Producing students who are environmentally literate is a crucial step towards a citizenry who can analyze problems, think critically, balance needs and take informed action (Archie, 2003; McBeth & Volk, 2009; UNESCO, 2003), unfortunately the United States' current education system is not accomplishing environmental literacy in public schools (Coyle, 2005; CBF, 2010; Robelia & Murphy, 2005). The health and welfare of humanity depends upon an environmentally literate citizenry that can make informed decisions about air and water pollution mitigation, consumption of resources, impacts of climate change among issues that can threaten human health, economic development and even national security (CBF, 2010; DoD, 2014).

When integrated into curricula, environmental literacy content and skill sets, can help students use problem solving and critical thinking skills to make real-world connections to complex issues (CBF, 2010; UNESCO, 2003). A National Science Foundation report, in 2000, stated that environmental education employs and enhances critical thinking and basic life skills (NSF, 2000). Those critical-thinking and life skills combined with real-life connections to issues of ecosystem degradation, human health, economic development and sustainability has the potential to create a student who graduates from high school as a well-informed citizen and a contributing member of society. Unfortunately, in a report by a leading environmental literacy organization, the No Child Left Inside Coalition, cites the NEETF report written by Coyle in 2005 stating that approximately two-thirds of Americans fail a basic environmental quiz. The author claims that "45 million Americans think the ocean is a source of fresh water; 120 million think spray cans still have CFCs in them even though CFCs were banned starting in 1987 (due to the ozone "hole"); another 120 million people think disposable diapers are the leading problem with landfills when they actually represent about 1% of the problem; and 130 million believe that hydropower is America's top energy source, when it accounts for just 10% of the total" (p.7, Coyle, 2005). These statistics are cited by the NCLI Coalition in their argument for the importance of environmental education (CBF, 2014). Even more startling is that Coyle reports this lack of environmental understanding was widespread amongst American adults regardless of age, income, or level of education; including men and women who sit on governing bodies, town councils, and in corporate board rooms, and whose decisions often have wider ramifications on the environment.

On an international level, The International Social Survey Programme conducted a study of public understanding of broad scientific and environmental facts (Gendall, Smith, & Russell,

1995). The study found that using a 7 question quiz, the United States had one of the lowest average scores, with an overall average of 4.2 questions correct out of 7. Which put the United States tied with Germany (4.2) but lower than people from Great Britain (4.5), New Zealand (4.7), and Norway (4.6) (Gendall, Smith, Russell, 1995; Coyle, 2005).

Environmental Literacy in K-12 Education

While there is a plethora of research regarding the topic of environmental literacy and K-12 students in other countries such as Israel (Goldman, Yavetz & Pe'er, 2006), Bulgaria and Turkey (Erdogen, Kostova & Marcinkowski, 2009), Korea (Chu, Lee, Ryung Ko, Hee Sjin, Nam Lee, Mee Min & Hee Kang, 2007), and Iran (Karimzadegan & Meiboudia, 2012), the research regarding United States strictly regarding 'environmental literacy' with K-12 students can be summarized by a handful of published works which will be reviewed here in chronological order of publication. The works chosen for review in this section were selected based on applicability to the proposed research on evaluating state environmental literacy plans.

One of the seminal pieces that will inform the evaluation of state environmental literacy plans is "A Survey of the Status of State-Level Environmental Education", which uses a survey instrument created by National Environmental Education Advancement Project (NEEAP), launched by NAAEE, to examine EE in each state (Kirk, Wilke & Ruskey, 1997). The model on which the survey instrument is based was developed by Ruskey and Wilke in 1994, and examined 16 components including areas of EE programming, structure and funding. The survey was distributed to 253 people, as the authors had identified approximately 5 people in each state with state-level EE responsibilities/knowledge. The survey returned 113 responses, representing all 50 states. Of the respondents, very few had structures in place in regard to teacher training in EE and pre-service teacher requirements (Kirk et al., 1997). As of 1996, no state had

incorporated all 16 of the components of EE identified by Ruskey and Wilke, although about a dozen states reported working towards a state EE master plan and curriculum guide. The authors note that this study should be repeated every 2 years to track EE status at the state-level and that "many variables—differences among school systems, community support and awareness of EE, state agency personnel support for EE, and the state's political climate—ensure that each state will find its own way toward the creation of a strong and effective EE program" (p. 15), which speaks directly to the aspects of the current push for environmental literacy planning that this study seeks to examine.

Ruskey, Wilke and Beasley continued the research with an update to the survey of state-level EE in 1998. The study, which utilized an updated version of the survey instrument, reported increases in several key components across states including development of an EE master plan, coordinated in-service programs and EE assessments (Ruskey et al., 1998). The authors also noted an increase in structural components such as interagency committee, EE association and EE funding sources by 1998. While the report demonstrated an increased foothold of environmental education on the state-level, the authors also note that even in 1998, no state had met all 16 components of the model. The authors also made several recommendations including "provide funding to state EE associations, centers and coalitions working to develop comprehensive EE programs" (Ruskey et al., 1998, p.14), whom would eventually be tasked with the creation of a state-level environmental literacy plan.

In the early 2000s, the term "environmental literacy" was beginning to make appearances in academic research in terms of defining it (Stables & Bishop, 2001), assessing it (Morrone, Manci & Carr, 2001; Culen &Mony, 2003), and its relation to general and scientific literacy (Moseley, 2000). In "Teaching for Environmental Literacy", Moseley discusses the term

environmental literacy in contrast to general or reading literacy, and science literacy (2000). In that article, Moseley briefed the history of environmental literacy in terms of Tbilisi Declaration and then the individual acquisition progress as defined by Roth in 1991, through three cluster areas: Nominal EL, Functional EL, and Operational EL. These terms are meant to better define the continuum of environmental literacy rather than the previously held ideas of literacy being a binary term. In Roth's definition, nominal environmental literacy is a phase of development in which a person is able to roughly communicate using terms that display very little understanding of the complexities of environmental topics, however the person does show a developing concern for the environment and the ways in which the human systems impacts the natural system. According to Roth, this is a very rudimentary phase of EL (1991).

Roth then describes the next progression in the environmental literacy continuum with is defined as functional environmental literacy in which a person has a broader understanding of the interactions between human and natural systems, as well as aware and concern for the negative interactions between these systems. A person with functional environmental literacy will be able to communicate their environmental concerns drawing from sound evidence and use personal values as a motivation to make change. The highest level of environmental literacy, according to Roth (1991), is operational environmental literacy. A person who falls into this category is defined as having "both the breadth and depth of understandings and skills who routinely evaluates the impacts and consequences of actions; gathering and synthesizing pertinent information, choosing among alternatives, and advocating action positions and taking actions that work to sustain or enhance a healthy environment" (p.18). Operational EL also includes engrained habits of mind to think locally as well as globally, and to have a personal

investment in the health of the environment. FIGURE 2 is an oversimplified visual representation of the environmental literacy progression as defined by Roth.

Understanding these terms is crucial to understanding environmental literacy as a broader topic than environmental education, a topic which, if taught to the standard of operational environmental literacy, can span a lifetime. The idea of environmental literacy being conceptually broader than environmental education is an idea that is crucial to this research and is expanded upon further in later sections regarding the literature specifically defining environmental literacy. It is crucial to this literature review is to note that Moseley believes that working towards operational environmental literacy is the ultimate goal of environmental education, and that the "review of literature finds that most instructional techniques in the past have been based on environmental awareness and knowledge models" (Moseley, 2000, p.24). Moseley states that while environmental awareness and knowledge are prerequisites to taking action that problem-solving skills need to be incorporated into environmental education in order to pursue environmentally responsible behavior. "As the ultimate goal of environmental education, [responsible environmental behavior] is synonymous with environmental literacy" (p.24).

Also in 2000, Salmon summarized and discussed aspects of the Independent Commission on Environmental Education (ICEE) 1997 report in his article titled "Are We Building Environmental Literacy?" (Salmon, 2000). Salmon discusses the ICEE report in which the commission reviewed 100 K-12 environmental education teaching materials being used in classrooms in the US and presented recommendations for reform and significant support for environmental education as an important aspect of K-12 education. The ICEE report was a content evaluation of widely used K-12 environmental education resources, and was meant to

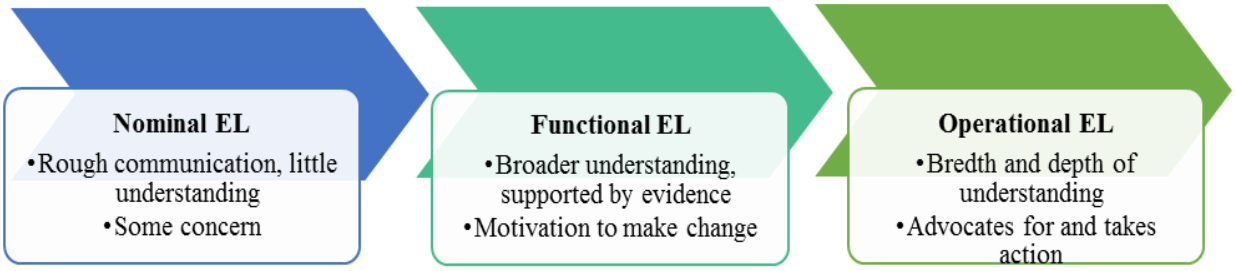

Figure 2: Literacy Progressions (Roth)

gain insight into the current states of knowledge in the fields of science and economics regarding environmental issues.

Despite this review being over 15 years old, Salmon (2000) and the ICEE report (1997), both comment on issues that are raised in environmental education and literacy today, the ability for environmental education to be an integrated concept that teaches problem-solving skills and the need for additional teacher resources to incorporate environmental education in the classroom (Stevenson, Peterson, Bondell, Mertig & Moore, 2013). The ICEE report also comments on the scientific basis of materials to prepare students for discussion of allegedly controversial topics, "The contributions of science to the solution of societal problems can be understood only when there is considerable understanding of the science itself" (p.57). This aspect of the report, Salmon believes, was misunderstood. The commission found that "environmental education has become needlessly controversial" which is to say that, the teaching of pro-environmental behavior moves away from the 'science' behind the issue and is instead viewed as teaching controversial policy stances. Salmon disagrees, noting that controversy can be a great educational tool for teaching science if handled appropriately as a learning tool. Salmon discusses several other aims of the ICEE report including the call for more environmental education materials with a strong science base, stating that "the environmental problems of the day will change over time, but the environmental literacy gained in schools will last a lifetime" (Salmon, 2000, p.9). This advocacy is of particular interest in that the ICEE was a creation of the George C Marshall Institute, a conservative think tank, of which Salmon was the executive director.

In 2003, Archie published "Advancing Education through Environmental Literacy" which is packaged with a CD that contains a module entitled "Meeting Standards Naturally", a

compendium of activities and lessons for teaching environmental literacy (Archie, 2003). The focus of Archie's work is to demonstrate how environmental education can be integrated into curricula without overburdening teachers. Quoting Susan Toth formally of the Florida's Pine Jog Environmental Education Center, "we can't expect [teachers] to add one more thing to their curriculum plates, but we can use environmental education to restructure what's already on their plates and make it more manageable" (p.6, Archie, 2003). The author also outlines how the NAAEE (2000) *Excellence in Environmental Education- A Guideline for K-12 Learning* document can guide educators to citizenship as a primary goal of public education. The main sections of the guidelines are recommendations for curriculum standards, assessment plans, professional development, implementation plan including identifying funding, and graduation requirement outline. This publication also explores the research showing a link between environmental literacy and greater academic achievement (Archie, 2003; Glenn, 2000; Lieberman & Hoody, 1998). This work can be viewed as one of the first collective resources that connected teachers with other sources of information and support that sought to help teachers continue their professional exploration of the tools and educational strategies used to advance both education and environmental literacy.

In 2005, Coyle wrote one of the most referenced studies in environmental literacy research. The study was "Environmental Literacy in America: What Ten Years of NEETF/Roper Research and Related Studies Say About Environmental Literacy in the US" and it established a clear lack of and need for environmental literacy programs in the US (Coyle, 2005). Coyle reported on the results of a Roper study using a nationwide cross-section of 1,500 adult telephone surveys. Often referenced for establishing the importance of teaching environmental literacy in K-12 classrooms (McBride et al., 2013; Small, Larson, Green & Shenk,

2012; Stelljes & Allen-Gil, 2009), Coyle reported several major findings pertinent to this study. Coyle's report was cited by several national environmental education organizations such as NAAEE, NCLI Coalition and CBF as proof of the growing environmental literacy problem amongst adults in the United States and furthermore supporting the need for environmental education in K-12 schools. Coyle found that there is a high level of overall awareness of environmental topics and a "very strong nationwide belief in the value of environmental education" (p. vii, Coyle, 2005). However, the author also found that while awareness is high, environmental knowledge and comprehension of environmental subjects is very limited. The National Environmental Education and Training Foundation (NEETF) administered three surveys, the basic environmental knowledge survey in 1997 and 2000, and the energy survey in 2001. Coyle analyzed the findings of these surveys, and reported that in comparing the two basic environmental knowledge surveys, "higher levels of public knowledge are found on simple, one-step environmental issues; a considerable drop-off in levels of public comprehension occurs with more complex, multiple-step environmental issues or processes" (p. 4, Coyle, 2005). In 2001, NEETF/Roper administered an energy survey which consisted of 10 questions based on energy topics that adults were likely to have heard in the media from home energy usage to international import. Coyle reported that only 12% of Americans could pass this simple quiz on awareness of energy topics (2005). The most pertinent finding of Coyle's research to this study is that "there is encouraging evidence that the public can learn about the environment" and "we are far from succeeding in making this a reality due to the absence of comprehensive coordinated approach to environmental education" (p. vii, Coyle, 2005). This finding supports the need for state environmental literacy plans to shape and guide environmental education programming in the United States.

Another relevant study was conducted by Joshua Stithem entitled, "Between 'Back to Basics' and 'Back to Nature': Exploring the Relationship Between California's Content Standards and Non-Formal Outdoor Environmental Education" (2010). While this thesis did not invoke environmental literacy per se, it "explores tensions that practitioners of non-formal outdoor environmental education (EE) encounter when designing curricula in the current climate of standards based education reform" (Stithem, 2010, p.1), which are relevant to this study in terms of understanding tensions between members of environmental education organizations whom develop their state environmental literacy plan. The findings of the thesis reported that informal environmental educators deal with a divide in dominant paradigms of the field, "back to the basics" which is referred to as paradigm of standards-based reform movement and "back to nature" which is the paradigm of traditional non-formal environmental education. The findings illuminated foundational differences in the ways in which environmental education curricula and standards are developed, suggesting that environmental educators should play a key role in the development of EE standards in order to maintain the fidelity of some core EE principles (Stithem, 2010), which can be seen in the development of environmental literacy plans through state EEOs and should be valued for as an educator-created curriculum.

The most recent and likely most important research to inform this study is the NAAEE State Environmental Literacy Plan Report for 2014 (NAAEE, 2014). Beginning in 2012, NAAEE staff interviewed the presidents or leaders of each state's environmental education organization regarding the development of their state ELP. The most recent progress report, 2014, states that all but four states (AZ, CA, MT, and ND) are at some stage of ELP development, adoption or implementation. The report explains that the development of ELPs is a preemptive move by states prior to the anticipated passage of the No Child Left Inside Act which

would fund EE, develop rigorous EE standards, provide professional development for teachers, and implement the state ELP (NAAEE, 2014).

The 2014 State ELP report outlined the roles of SEEOs, NCLI Coalitions, and NAAEE Affiliates as strong aspects of ELP development. It also reported that 63% of states have no funding at all to draft their ELP, however while most states are not waiting for NCLI legislation, the states did report that funding will be crucial to ensuring successful implementation (NAAEE, 2014). The status report also provided highlights of several states that NAAEE staff felt demonstrated one or more of the key factors to successful development and implementation of the plans. These highlights focused on the "unique attributes of each ELP that have resulted in exceptional plans" (p.11). While these narratives do provide a unique, but brief, contextual view of a state ELP, the methodology used in reporting these narratives is not nearly rigorous enough to provide recommendations for states struggling with their ELP development. This study sought to use NAAEE documents, such as the 2014 SELP Report, to identify a variety of key factors in which to provide a rigorous valid measure of aspects of each state ELP.

Environmental Literacy in Higher Education

While this research focuses on the impacts of environmental literacy planning on K-12 education, an important aspect of ELPs are the development and implementation of an environmental literacy graduation requirement, therefore it seems important to briefly describe the related research efforts in higher education to gain a sense of the continued environmental literacy standards and requirements after K-12 education. The following articles are reviewed due to the similarity in evaluation structure of EL requirements/programs.

In 2008, Moody, Alkaff, Garrison, and Golley, assessed the environmental literacy requirement (ELR) at the University of Georgia, one of the first universities in the United States

to require all undergraduates to complete an ELR (Moody et al., 2005). The authors explained that while students were interested in learning about the environment, faculty thought the ELR was useful but that environmental literacy criteria was not clearly defined. The paper suggested minor changes to the ELR and states that "The experiences of UGA will be of value to other academic institutions contemplating a broad environmental requirement" (Moody et al., 2005, p. 3). Confirmed on the University of Georgia's website, the ELR is still in place for all undergraduate students as of the time of writing (UGA, 2014).

Debra Rowe, a senior fellow of University Leaders for a Sustainable Future, also published similar research looking at collegiate environmental literacy requirements (2002). Rowe's article, *Environmental Literacy and Sustainability as Core Requirements: Success Stories and Models*, examined collegiate programs across the US that were "integrating environmental literacy, social responsibility and sustainability course materials into existing liberal arts and specialty courses" (Rowe, 2002, p.1). The article shared a similar structure as this study in the examination of programs based on degree requirements, infusion of environmental literacy standards in and across curricula, as well as the development of interdepartmental programs.

Defining Environmental Literacy

There has been debate amongst researchers since the early 1990s regarding defining environmental literacy (Disinger & Roth, 1992). Charles Roth explained in *Environmental Literacy: Its Roots, Evolution and Directions in the 1990s*, that "environmental literacy involves human discourse about inter-relationships with the environment. It is essentially the degree of our capacity to perceive and interpret the relative health of environmental systems and to take appropriate action to maintain, restore, or improve the health of those systems" (Roth, 1992,

p.14). Roth described the need to operationalize environmental literacy and the paradigm shift that occurred starting in 1990 as the United Nations declared it International "Environmental Literacy Year" and the world of environmental literacy moved from a vague conception of literacy as a binary term to the idea of 'environmental literacy for all' as a form of functional environmental literacy representing a continuum of ability (Roth, 1991). Often referenced with Disinger, Roth is predominately quoted as defining the term, as well as working towards a definition of environmental literacy in relation to environmental education.

For the purposes of this research, it is important to parse a separation in the definitions of environmental literacy and environmental education in order to establish appropriate guidelines for assessing environmental literacy plans. Providing a definition of environmental literacy holds value for conducting reliable, valid and rigorous research within the field. According to Roth, "to assess and evaluate the potential value and effectiveness of any environmental education program, that program should state, with considerable precision, the degree of environmental literacy competency it aspires to and the degree of environmental literacy that is assumed of those entering the program" (Roth, 1992, p.17).

Continuing to identify boundaries between environmental education and environmental literacy, Stables and Bishop (2001) produced a seminal work in the field that defined strong and weak conceptions of environmental literacy. According to Stables and Bishop, a strong view of environmental literacy was defined as a broad view of literacy as semiotic engagement, a broad view of what could be defined as text, and possibly most importantly, defined environmental literacy as broader then environmental education.

Stables and Bishop explained that the multiplicity of understandings and use of the word 'literacy' has diluted the field and been "degraded as a result of its indiscriminate application"

(p.90). In contrast to the strong conception of environmental literacy, Stables and Bishop argued that the narrow or weak view of environmental literacy is a simpler view of literacy as reading and writing, simply decoding written text, and environmental literacy as a subset of environmental education (Stables & Bishop, 2001). In addition to defining the literacy aspect of environmental literacy, the stronger conception of environmental literacy also allows for a more interdisciplinary approach to environmental education which would encapsulate environmental sensitivity, ecological knowledge, environmental attitudes, action skills, willingness to act and actual commitment (Stables & Bishop, 2001).

Acknowledging the ways in which we define environmental literacy and what that means for environmental education is a crucial idea for this study. As Stables and Bishop argued, a broader view of environmental literacy as a "semiotic relationship with the biophysical world" (p.91) is too broad to be considered a part of environmental education. In applying Stables and Bishop's definition of environmental literacy to this study, it becomes critical to see environmental literacy planning as broader and encompassing of environmental education.

While the definition of environmental literacy provided by Stables and Bishop (2001) will be the foundation for this study, it is imperative to review other definitions and distinctions in the field. In 2005, Coyle of the National Environmental Education &Training Foundation (NEETF), using public data from the Roper Center, defined learning about the environment in three tiers: 1) 'environmental awareness'; which is categorized by a simple recognition of environmental subjects 2) 'environmental knowledge'; which relies on a limited combination of awareness and action when there is personal contact to the issue and 3) 'environmental literacy'; which involves a depth of knowledge as well as action and awareness of the impacts of issue outside of personal contact which develops over time (Coyle, 2005). In assuming environmental

knowledge is synonymous with environmental education, Coyle's work demonstrates agreement with Stables and Bishop as environmental literacy is the top tier, therefore a higher level of cognitive achievement in terms of environmental learning.

In 2011, a group of researchers working for the North American Association of Environmental Education (NAAEE) published an executive summary for *Developing a Framework for Assessing Environmental Literacy* (Hollweg, Taylor, Bybee, Marcinkowski, McBeth, & Zoido, 2011). The authors defined the characteristics of environmental literacy as, "the knowledge and understanding of a wide range of environmental concepts, problems, and issues; a set of cognitive and affective dispositions; a set of cognitive skills and abilities; and the appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts" (Hollweg et al, 2011, p.3). Hollweg et al. assert that environmental literacy is not a question of literate or illiterate but rather a continuum of literacy over time that is both interactive and developmental in nature.

By relying on Stables and Bishop's (2001) definition of strong environmental literacy conceptions, supported by the more recent works of Coyle (2005) and Hollweg et al (2011), this study is able to make an argument for the broader research of environmental literacy work rather than the more narrow conception of environmental education research, which would limit the view of environmental literacy to one that would be perceived as a "weak conception" (Stables & Bishop, 2001). The aspects of the literature review, therefore, focus on studies that are strictly defined by the term environmental literacy rather than environmental education in order to review the importance of and the assessment of environmental literacy in published works.

Assessment of Environmental Literacy[1]

Teaching and learning are complementary activities, and assessment plays a crucial role in those activities (Stefani, 2004). If assessment is to be seen as an instantiation of learning (Stefani, 1998), then it is fundamental aspect of effective teaching (Stefani, 2004). The creation of an appropriate assessment, the facilitation of the assessment, the preparation of materials, ways to improve assessment skills, and the conclusions about the results of the assessment are all aspects of the pedagogy of education (Brookhart, 1999) and thus central to effective implementation of environmental literacy in the classroom.

Ruggiero and Aydeniz (2016) reviewed the use of assessment scales created and validated in academic research to assessment plans in state environmental literacy plans. The following section, TABLE 1, describes eight scales created and reviewed in academic research in the United States.

Just as the definition of environmental literacy has evolved over the years, so too has the ways in which we assess students conceptions of environmental literacy. Leeming, Dwyer and Bracken (1995) developed the CHEAKS scale to psychometrically evaluate children's global environmental attitudes and knowledge. In 2001, Morrone, Manci and Carr, argued that previous attempts had measured knowledge about pollution or attitudes towards the environment rather than decision-making and problem-solving skills (Morrone et al, 2001). Building upon the idea of responsible citizen behavior, Culen and Mony (2003), use a modified version of the Middle School Environmental Literacy Instrument (MSELI) (Wilke, Hungerford, Volk, & Bluhm, 1995) with 4H students in Florida.

[1] The "Assessment of Environmental Literacy" section of this dissertation contains portions of an article written by the author that may be submitted in whole or in part for publication in the future.

In 2007, Manoli, Johnson and Dunlap revised the New Ecological Paradigm (NEP) Scale (Dunlap et al, 2000) for use with children (Manoli el al, 2007). The revision of the scale for use with children was developed to understand children's environmental views and the change of such views with environmental programming, and based on socio-cultural backgrounds. In a major national study published in 2009, McBeth & Volk used the Middle School Environmental Literacy Survey (MSELS) (Hungerford, Volk, McBeth and Bluhm, 2006) which was refined from MSELI.

The authors surveyed over 2,000 students in sixth and eighth grade with the hope of creating a national environmental literacy baseline. Most recently, Stevenson, Peterson, Bondell, Mertig and Moore (2013) used MSELS with 6th and 8th grade students in North Carolina, and found that the use of published EE curricula materials, time outdoors and having teachers with advanced degrees were all positively related to increasing environmental literacy.

The findings of Ruggiero and Aydeniz were that there was little use of common EL assessment and that little research had been conducted to develop and expand upon a baseline for EL in the United States. Using the matrix data from this dissertation research, Ruggiero and Aydeniz found that five of the 36 states that have digital environmental literacy plans make mention of any one of the scales described in the study. Three of the five states note the possibility of using the "NELA" study which refers to the National Environmental Literacy Assessment conducted by NAAEE in conjunction with the National Oceanic and Atmospheric Administration and the Environmental Protection Agency. However, even if the mention of NELA, it is clear that there is a disconnect between state ELP writers and academic research on environmental literacy because the NELA report uses the MSELS scale but that is not mentioned

Table 1: Instruments for Assessing Environmental Literacy

Authors	Study	Year	Instrument Used	Participants
LEEMING, F., DWYER, W., BRACKEN, B.	Children's Environmental Attitude and Knowledge Scale: Construction and Validation	1995	CHEAKS	1st-7th grade students from Tennessee
MORRONE, M., MANCI, K., CARR, K.	Development of a Metric to Test Group Differences in Ecological Knowledge as One Component of Environmental Literacy	2001	Ecological Principles Under Investigation	Adult participants in Ohio and adult students from an introductory environmental health class
CULEN, G., MONY, P	Assessing Environmental Literacy in a Nonformal Youth Program	2003	MSELI	4H participants, ages 11-17 from Florida
MANOLI, C., JOHNSON, B., DUNLAP, R.	Assessing Children's Environmental Worldviews: Modifying and Validating the New Ecological Paradigm Scale for Use With Children	2007	NEP Scale for Children	5th grade students from Pennsylvania (Year 1), 4th-6th grade students from Pennsylvania and Louisiana (Year 2)
BARTOSH,O., TUDOR, M., FERGUSON, L.,	Impact of Environment-Based Teaching on Student Achievement: A Study of Washington State Middle Schools	2009	Integrated-EE based assessments and standardized assessments	8th grade students, Washington State
MCBETH, W., VOLK, T.	The National Environmental Literacy Project: A Baseline Study of Middle Grade Students in the United States	2010	MSELS	6th and 8th grade students in 48 counties across the US
JOHNSON, B., MANOLI, C.	The 2-MEV Scale in the United States: a Measure of Children's Environmental Attitudes Based on the Theory of Ecological Attitude	2011	2- MEV Scale	4th-6th grade students in Arizona, Pennsylvania and Louisiana
STEVENSON, K., PETERSON, M.,BONDELL, H., METRIG, A., MOORE, S.	Environmental, Institutional and Demographic Predictors of Environmental Literacy among Middle School Children	2013	MSELS	6th and 8th grade students in North Carolina

in a single state ELP. Ruggiero and Aydeniz made a recommendation for further testing of the Middle School Environmental Literacy Survey (MSELS) instrument (Hungerford, Volk, McBeth and Bluhm, 2006) due to its longer-standing use than other comparable instruments and consistent revisions over time (Ruggiero & Aydeniz, 2016). The authors also recommended that national organizations such as NAAEE help to make state ELP writers and reviewers aware of the tested environmental literacy scales that already in existence. The implications of this research on the study proposed is in evaluating the measurable assessments included within state environmental literacy plans and evaluating the potential for a common environmental literacy assessment.

The Impacts of Education Policy Reform on the Instructional Practices of K-12 Teachers

The influence of education policies on teacher practice is a topic that can be defined a variety of ways. The term "education policies" can refer to federal, state or local laws, regulations, by-laws, executive orders, or plans. The term "teacher practice" can be examined in reference to assessment, instruction, tenure, pedagogy or curriculum as standalone topics or in any combination. In order to provide a critical review of education policy articles that speak to the influence of policy on teacher practice, we first must narrow the scope of the topic. This paper will specifically explore, first, the groundbreaking change to California's Mathematics Framework (California State Department of Education, 1985) through the lens of three well-known education researchers, Linda Darling- Hammond (1990) as well as David Cohen and Deborah Ball (1990). Then this paper will broaden the view of policy to the federal level by examining an article on the effects of No Child Left Behind on general education and more two articles looking more specifically on the effects of NCLB testing requirements on instructional practice in science education. This paper seeks to apply to criteria review of the five articles

mentioned to outline the possible implications on teacher practice of the future passage of the No Child Left Inside Act, and the consequent adoption and implementation of state level environmental literacy plans.

California Mathematics Framework Reform

While the first two articles that this study will examine here are more than 20 years old, each article is still very relevant to the conversation of education policy and practice for two distinct reasons. First, each article discusses one of the first groundbreaking cases of educational policy reform on instructional practice, and second, because the articles were each written by highly influential researchers in the field of education research. The first article, *Instructional Policy into Practice: "The Power of the Bottom over the Top"* (Darling-Hammond, 1990) discusses the California Mathematics Framework as "manifestations of an important policy change where it matters most- in the classroom" (p.339). Darling- Hammond discusses the ambitious goals of the policy as well as the likely substantial ripple effects of a progressive top down policy reform. In calling for improved policy reform, Darling-Hammond says that in the 1990s, that the idea of using teacher input for research on policy impacts was viewed as analytically irrelevant and possibly even methodically unsound, as teachers were rarely viewed as part of the policy process (1990). Due to this oversight, education reform research examined only the effects of policy which typically meant student test scores. The outcome of this was "no effect" findings which led to more regulation, leading to dilution of resources and then to enactment of other policies based on different theories (Darling- Hammond, 1990). The author accurately predicts that "the tremendous growth over the past decade in the scale, scope and intrusiveness of state-level instructional policy seems likely to continue throughout the next" (p. 341).

Darling- Hammond points out that, in 1990, the transmission of policy change was essentially a 'statement' to teachers regarding new instructional practices and typically, a change in textbooks. The consequences of such were that most teachers were unsure of what the policy really consisted of and what the implications for their teaching was. Receiving this "message through a filter" (p. 342) meant that teachers had too little information and too little opportunity to discuss these changes in order to fully engage its implications intellectually. In other words, Darling- Hammond explains, "they are not expected to interpret the policy by constructing meaning for themselves, but only to implement the simplified version of it that reaches them" (p.342) and implementation is not a simple term. In examining California as a context for educational reform and implications on practice, Darling- Hammond makes several suggestions for more effective policy-change. These include bottom-up curricular change, teacher education reform, and increased support for professional development regarding policy change. Darling-Hammond makes a case of bottom up curricular change in that top down change often fails due to little consideration of local policy context. The author also explains that successful curriculum reform requires teacher education reform, as she says that "one wonders how policy makers imagine the kinds of sophisticated pedagogical understandings required by this type of curriculum will be developed if teachers are denied the opportunity to learn them" (p. 345). Finally, Darling- Hammond states that policy reform needs to be tied to greater support and professional development for teachers in order for them to fully understand the implications of reform policies for the classroom. This type of support should include "meaningful discussion and extensive professional development" because "directives are not enough" (p. 346). The context of this article, being state-level education policy reform, as well as the recommendations

given by the author can be useful in examining the implications of the project proposed in this study, which will be discussed in further detail in the concluding section.

The second article, *Policy and Practice: An Overview* (Cohen & Ball, 1990), also examines the impacts of the California Mathematics Framework, but on elementary teachers practice. The authors ask, "How can teachers teach a mathematics that they never learned, in ways they never experienced?" (p. 233). Cohen and Ball discuss the shift in the state policy from memorization instruction to reasoning and problem-solving instruction, with the idea that students would do more of the teaching, working together and coming up with ideas to on how to solve problems and how and why that approach made sense. The authors point out that this idyllic vision of teaching and learning "are quite remote from current practice" (Cohen & Ball, 1990, p. 235). In the early stages of implementation of the framework in California, there were major changes to the content of the state adopted textbooks as well as corresponding assessment criteria. The authors note that the underlying notion was that if instructional guidance is more consistent then teaching and learning will improve, however what this really implies is that "instruction is too important to be left entirely to schools and teachers: it must be closely and carefully managed by higher level agencies" (p. 236). Similarly to Darling- Hammond's comments, these two articles are published in a time of increasing state-level policies designed to change instructional practice, with little to no research being conducted or applied in terms of the impacts of teacher instructional practice.

In terms of the implications of the case studies used for this article, the authors note that the teacher's response to policy was quite varied, but they also are clear to note that changes depended partly on what they looked for. The main tenets of the classroom analyzed by the authors were the particular topics taught, the content they sought to convey, teacher pedagogy

and classroom organization, and the relationships amongst these aspects (Cohen & Ball, 1990). In a similar vein to comments by Darling- Hammond, the authors note that "policies like this are made in order to change practice, but they can only work through the practice they seek to change. Teachers are at once the targets and the agents of change" (p. 237). The case studies presented in Cohen and Ball's research suggest "enormous complexity of the changes that many instructional policies imply" (p. 238) and once again, focus on the need for teacher understanding of policy implications, time to intellectually develop changes for practice, and supportive resources such as professional development in order for policy changes to take root in the classroom.

The Effects of No Child Left Behind

The next section of this paper moves into more recent literature on the influence of education policy on teacher practice by examining the effects of an infamous federal education reform policy, the No Child Left Behind Act of 2001. In 2009, Olsen and Sexton explored how the NCLB Act affected one reforming high school and in turn how those reforms influence teachers' work. Their article provides unique insight in that the school of which the authors gathered data from was in Southern California, allowing this study to have examined both the ways in which teacher's responded in the early 90s to state-level education reform (i.e. California Mathematics Frameworks) and then how California teachers' responded to federal level education policy reform 15 years later.

Starting with *A Nation at Risk* (National Commission on Excellence in Education, 1983), there has been a growing movement toward standardization, school accountability and federal control of education policy (Olsen & Sexton, 2009). The subsequent enactment of the No Child Left Behind Act of 2001 (NCLB) had a ripple effect across states, districts, and local level school

policy-makers across the country, including such aspects as defining a measuring 'highly qualified teachers', alternative licensure to teaching, increased public scrutiny of teaching as profession, concerns for job security, purchased curricula, and mandated textbooks (Olsen & Sexton, 2009). Olsen and Sexton sought to explore such reforms on one California high school that was deemed as 'failing'. The authors conducted an intensive qualitative research study with six teachers, of even distribution of early- mid- and late-career, to understand how NCLB had affected their work in the classroom and outside. The authors employed two theoretical frames, organizational behavior which holds that an organization's survival becomes the primary task for those involved which may overshadow the stated goals by the need to sustain itself (Sexton & Olson, 2009; Scott, 2003). The second framework applied was threat rigidity which was used to examine how actors respond to multi-level threats to their legitimacy (Staw et al, 1981).

The analysis of data in this study, applying the Threat Rigidity theory, produced a graphic of the multi-level threats to school culture produced by NCLB. The model depicted four threats, "Society/government views a crisis on education" which lead to "No Child Left Behind and accompanying policy culture". These two treats on the federal/national level then impacted the school level at which the authors studied by "state, district, community view of a crisis at the school" which lead to "the collected data" (Olsen & Sexton, 2009, p. 17). The collected data, as the authors labelled it in the graphic, refers to the findings of their qualitative study. These findings were that the ripple-effect impact of NCLB on the school or classroom level was: "centralizing and restricting the flow of information, constricting control. Emphasizing routine and simplified instructional practices, applying strong pressure for school personnel to conform" (p. 14). These responses to the policy reforms created situations in the school of psychological

stress, inter- and intra-group tensions, defensiveness/resentment, a "desire to hide one's practice" (p.14), and moves to replace leadership (Olsen & Sexton, 2009).

The authors suggested several steps to avoid these threat rigidity situations, first being an acknowledgement of current education realities by teacher education programs. Olsen & Sexton stated that if teachers entering the profession are predisposed and primed for conformity, this "would lower the quality of and innovations in learning and democracy in the United States" (p. 39). In other words, it is on the teacher education programs to prepare pre-service teachers with an understanding of education policy reform and the ways in which to negotiate through it. The authors also noted that teacher education programs need to lessen the "exaggerated and erroneous" (p.39) split between theory of teaching and learning held in the university settings and the practice realities in K-12 education. Olsen and Sexton closed with the recommendation that teacher education programs "consider introducing effects of the policy climate in explicit, honest ways that seek to prepare beginning teachers for what it means to work in 'underperforming' or 'high priority' schools" (p. 40).

The research and findings of Olsen and Sexton's study (2009), while published 19 years later and regarding federal level policy reform, bear striking resemblance to the findings of both Darling- Hammond (1990) and Cohen & Ball (1990) in the idea of policy change bringing about 'restricted' or 'too little' information to teachers as well as the idea of 'simplified' instructional practice.

NCLB and Science Education

In *Elementary Teachers' Beliefs About Teaching Science and Classroom Practice: An Examination of Pre/Post NCLB Testing in Science* (Milner, Sondergeld, Demir, Johnson, & Czerniak, 2012), the authors examined the effects of NCLB on teacher beliefs and instructional

shifts in elementary classroom science education. Milner et al. examines elementary teacher's beliefs about teaching science specific to an addendum to NCLB, which added science and social as tested subjects in 2007, however were still not considered as part of the Adequate Yearly Progress (AYP). The restructuring of science as a tested subject lead to consequences for science curriculum development and instructional delivery (Milner et al., 2012). The authors noted that "despite good intentions on reforming science education at the national level, the success of reforms is dependent on changes that occur at the classroom level (Milner et al., 2009, p. 113). Similar to a comment by Darling-Hammond in a previously reviewed article, Milner et al. wrote that "effective change and program implementation depended more upon local factors than 'top down' methods" (p. 113). While the authors were clear that classroom level or 'bottom-up' reform is the best alternative for education policy, there are still crucial lessons to be learned by the change of testing of science under NCLB and the applications of 'top-down' or 'bottom-up' reform in the specific case of environmental literacy planning and the No Child Left Inside legislation.

The relationship between the beliefs of teachers regarding the implementation of reforms and their instructional decisions is crucial, and well-documented within education research (Crawley and Salyer, 1995; Johnson, 2006; Milner et al., 2012). In the mixed methods study conducted with 44 elementary teachers, applying the Theory of Planned Behavior, the authors found a lack of science instruction time despite the mandated testing. The study found that some impediments to teaching science were lack of time, resources, and materials as well as lack of professional development, similar to the findings of the previously reviewed studies. Milner et al. found that teacher's beliefs were influenced most by their administration and peer group than by federally mandated policy (2009). This finding, similar to Olsen & Sexton (2009), has implications for the

type of and quality of professional development available to teachers may have an impact on their beliefs regarding policy reform and the influence it has on their instructional practice. The authors suggested a "more holistic program including the larger picture of the link between science performance nationally and our future competiveness in the global arena" (p.127).

The main findings of Milner et al. (2009) were that NCLB caused a reduction in science instructional time and despite being added as a tested subject, the time dedicated to science teaching has not increased for two overall reasons. First, science is being "tested for the sake of testing" (p. 128), if it does not contribute to the AYP, and second, teacher beliefs and political barriers such as perceived administrative support are influential on science teacher practice (Milner et al., 2009; Johnson, 2006). The authors also recommended changes to teacher education programs in the preparation of elementary teachers to teach science effectively as well as help teachers consider themselves as important variables in whether science is being taught in schools. The authors concluded with a figure that depicts the way in which they view the relationship between policy, teacher education, beliefs and student learning. FIGURE 3, below, may be useful in further examination of policy impacts on instructional practice. Continuing to examine the effect of NCLB testing requirements on science education instructional practice, a final article of interest is *A National Survey of Middle and High School Science Teachers' Responses to Standardized Testing: Is Science Being Devalued in Schools?* (Aydeniz & Southerland, 2012).

While the authors examined the impacts of standardized testing on instructional and assessment practices with a large sample of secondary school science teachers, this review focuses more specifically on the authors' discussion of implicit and explicit influences of NCLB on science curriculum and teaching, and how "NCLB driven polices undermine the goals of

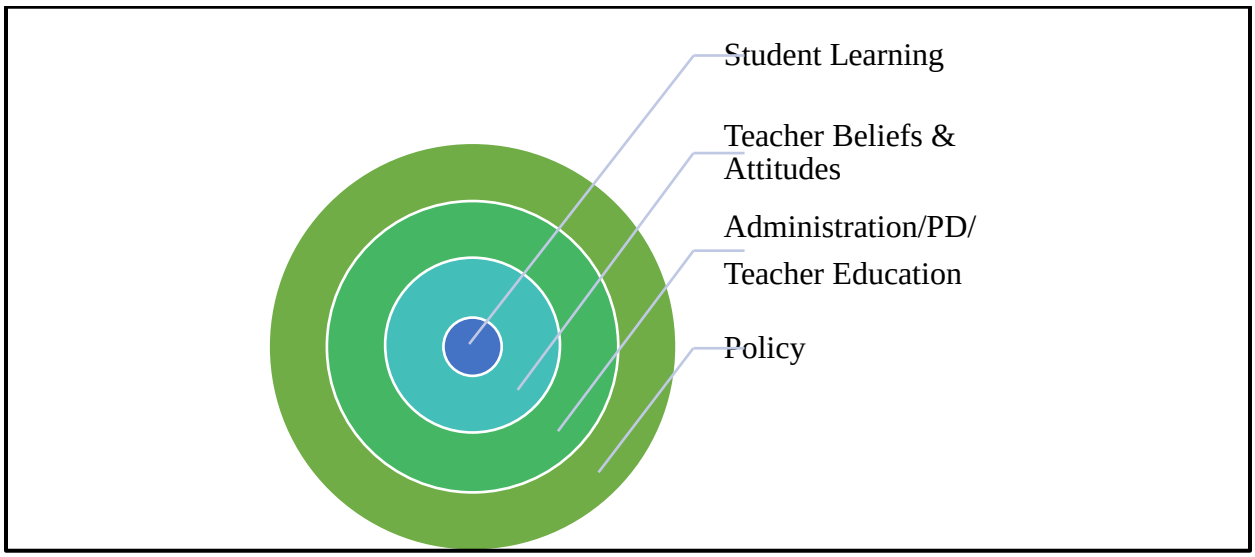

Figure 3: Relationship Between Policy, Teacher Education, Beliefs, and Student Learning (Milner et al., 2009, pg. 139- Figure 3)

science education reform" (p.233). Similar to previously reviewed articles, the authors noted the effects of NCLB, particularly the growing use of standardized testing as an accountability measure, has had measurable impact on curriculum, teaching, instructional time, and student learning (Aydeniz & Southerland, 2012; Milner et al., 2012).

The findings of this study, specific to the impact on teachers practice, show that 51% of teachers surveyed felt that standardized testing, mandated under NCLB policies, dictate how the teacher teaches their students. Approximately 37% of the participants recognized due to testing requirements, they had made changes in their instructional practice which contradicted what they believed science teaching and learning should look like (Aydeniz & Southerland, 2012). Similarly to Milner et al. (2009), the authors stated that science teachers' attitudes toward standardized testing, which is mandated under policy so therefore their attitudes toward education policy, impacts in science instruction in the classroom. This finding would fit well within the graphic provided by Milner et al. in the circle of "teacher beliefs and attitudes". Research in both articles would support the idea that policy and conversely the effects of policy such as standardized testing requirements do impact teacher beliefs and attitudes which has an impact on student learning.

The findings of the study also show that there are a number of other factors that influence teachers' instructional practices when it comes to education reform. First, Aydeniz and Southerland (2012) noted that "how the expectations are being communicated to the stakeholders and how the teachers are being supported" (p. 254) both play important roles, very similar to the findings of both Darling- Hammond (1990) and Cohen & Ball (1990) in the idea of policy change bringing about 'restricted' or 'too little' information to teachers as well as the stated need for administrative support including professional development for teachers. In addition, Aydeniz

and Southerland (2012) stated that "the current system of accountability without full understanding of NCLB policies encourages science teachers to teach lower level content" (p. 253), which compliments Olsen and Sexton's assertion that passive acceptance of policy will "lower the quality of and innovation in learning" (Olsen & Sexton, 2009, p. 39).

Implications for Proposed Research

The research examined in this paper all have one common finding, that education policies affect teachers in many dimensions at the classroom level. However the structures are rarely in place in policy reform to allow of teachers to fully engage in the intellectual implications of such education policies. The research shows a pattern in restricted flow of information to teachers, oversimplified 'statements' of instrumental practice, and lack of support such as professional development for teachers to make meaning of policy for the classroom.

One of the potentially positive implications for the implementation of ELPs are that they are essentially 'bottom-up' policies in that they were created by educators at the state level. The implications of this are implied in Darling-Hammonds statements about the failures of top-down curricular changes in their inability to consider local policy context (Darling- Hammond, 1990). While this does not imply success of bottom-up approaches, it does point to the possibility to success of ELPs. The nature of ELPs being bottom-up policies, including community ideas and resources, as well as the consideration of pre-existing policy constraints and formatting to contextualized local issues, may increase the ease in which ELPs are implemented on a state level.

While the articles all identify common themes, Milner et al. (2012) and Aydeniz & Southerland (2012) show the most relatable implications of the passage of NCLI or the implementation of ELP. While each set of research focuses focus on different grade level teacher

groups, they also focus on science educators, which would likely be the group of teachers that are most impacted by the policy reform study in this project. The passage of NCLI would mandate states to develop and implement their ELP. As many states have already recognized, in terms of curriculum content and skill sets, environmental literacy is most at home as an integrated subject in science education. Aydeniz and Southerland stated that "science educators working toward the reform of teaching practice suggest that endorsing policies that will encourage science teachers to teach meaningful, inquiry-based instructional activities is more like to ensure equity" which "is more likely to allow all students to construct meaningful understandings of essential scientific concept and processes" (p.237). Since the basis of environmental literacy plans are inquiry-based instructional activities, the implementation of ELPs should help students to construct meaningful understandings of scientific concepts when integrating into science curricula, and by the authors logic, should also be endorsed by science educators.

Taking the figure provided in the Milner et al article, the implications of the passage of NCLI and the subsequent development and implementation of ELPs would have drastic implications for the administration in terms of navigating teacher resistance to reform (Olsen & Sexton, 2009; Milner et al., 2012), professional development to prepare teachers for making meaning of policy changes and applying that to instructional practice (Darling- Hammond, 1990; Cohen & Ball, 1990; Milner et al., 2012; Olsen & Sexton, 2009), and teacher education programs to prepare teachers to encounter newly arrived policies (Darling-Hammond, 1990; Milner et al., 2009). The implementation of state-level ELPs into state curriculum would then, according to the model, also impact teacher beliefs and attitudes (Milner et al., 2009) which would have a direct impact on student learning.

The literature reviewed in this section sets a foundation for the importance of and defines environmental literacy, as well as provides a base for the way in which policy can effect classroom practice. The next section of this dissertation will describe the particular theories that provide a base for exploring environmental literacy planning in the United States and how these theories contribute to the methodology used in the resulting data analysis.

CHAPTER II: THEORETICAL FRAMEWORK

There is a multitude of research that supports the teaching of certain content areas in environmental education (Armstrong & Impara, 1991; Hungerford, Peyton & Wilke, 1980; Stevenson, 2007); the benefits of teaching particular skill sets (Ballantyne & Packer, 1996; Jensen, 2002); certain pedagogical approaches, professional development and teacher education programs (Cole, 2007; McKeown-Ice, 2000; Powers, 2004); and the need for (Ramsey, Hungerford &Volk, 1992) and barriers against (Ham & Sewing, 1988) a variety of other aspects of environmental education to be a critical part of a plan to improve environmental literacy and teaching. This study does not seek to challenge this research which defines concepts and theories of environmental literacy and learning, but rather to examine a policy document that has the potential to implement the research of which it is based upon.

This dissertation research is an investigation of a co-constructed policy document intended to guide a particular subset of education on a state level. Therefore the theoretical framework invoked to shape this study is reasonably pulled from policy and political science research. While the study is in the context of education, the researcher is not focused upon the theoretical and epistemological stances of those whom created these policies, but rather the content and progress of the physical documents themselves. For these reasons, the importance of this research is expected to be found in the findings and recommendations to those who can make adjustments to their state ELP and policymakers, as well as in the concluding section on the implications for educators which will draw from research on the impacts of policy on instructional practice.

The topic of research for this study does beg the question, “why not invoke education policy theories”? There are two justifications for that decision. First, the foundation of education theory

work is in guiding the development of educational theory while simultaneously improving professional practice (Carr, 2005). The applied theory aspect of education policy theory that seeks to provide practitioners with an understanding of their educational role is where this research separates itself in that the study is contextually educational but practically political. The second reason is the divide in education policy theory, as "politicians and policy-makers denigrate educational theory as incomprehensible jargon; teachers regard educational theorizing as an esoteric 'ivory tower' enterprise unrelated to their professional needs; and academia refuses to grant educational theory the intellectual status it so desperately seeks" (Carr, 2005, p.334). It seems logical then to draw from another field, political science, in both substantive content and development in research methods, which has been reported as an increasing trend in the field of education, particularly in the under-developed realm of environmental education research (Meyers, 2006). While there are countless arguments in academia regarding defining and delineating the elements of the social research, Crotty (1998) created a figure with the foundations of the social research process which is used in this study to create a simplified visual of the social research foundations employed in this study. FIGURE 4 depicts the theoretical perspective, methodology and methods, as defined by Crotty, with the specific elements used to define the research process in this study. The following sections will detail how each element supports and informs the next.

Policy Framework

The process of examining the environmental literacy plans in this study is guided by the overarching Theory of Bounded Rationality pulled from classic political science theory. The use of a political science theory is essential to framing the study of environmental literacy plans as policy-based documents.

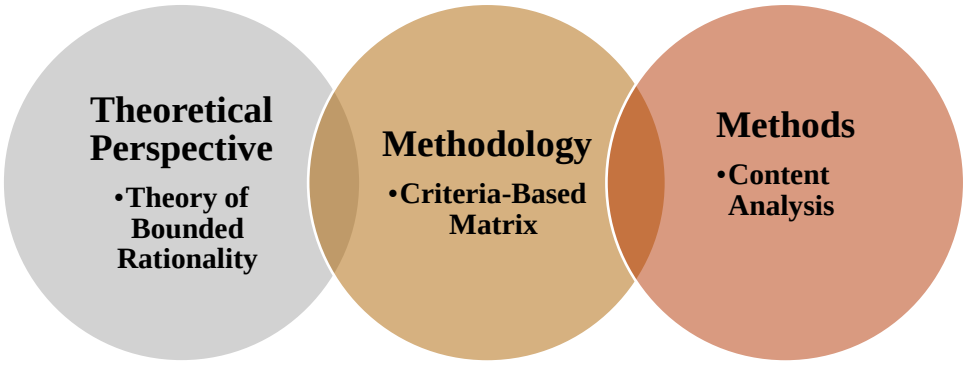

Figure 4: Theoretical Framing Process

Simon (1976), the father of rational models, describes rationality as "a style of behavior that is appropriate to the achievement of given goals, within the limits imposed by given conditions and constraints" (p.405). The Theory of Bounded Rationality, in other words, posits that we, as humans, have a tendency for goal-oriented behavior which is often intendedly rational. However, the Theory of Bounded Rationality, as opposed to Rational Choice Theory, takes into consideration the limitations on the human as the decision –maker, such as cognitive limitations, limited information, and the possibility of a limit on time to make a decision (Jones, 1999).

As it applies to this research, the Theory of Bounded Rationality speaks to the orientations of the researcher as the decision-maker, the SEEO as the creator of the document in their collective need to produce a policy plan for funding/achievement of given goals, as well as informs the need for inductive decision- making as data is in collection. While Simon's work is often linked with economic reasoning, Arthur states how the Theory of Bounded Rationality is applied to other contexts "in problems of complication then, we look for patterns; and we simplify the problem by using these to construct temporary internal models or hypotheses or schemata to work with" (p. 406, Arthur, 1994). This type of reasoning is inductive, Arthur argues, because we use models to fill gaps in our understanding. The use of the Theory of Bounded Rationality fits within the role of human behavior in the decision-making process, but also influences the specific methodology, the use of a criteria-based matrix. The criteria-based matrix, which will be described in detail in further sections, is an example of Arthur's definition of the need to construct temporary models or schemata to work with (Arthur, 1994). While the Theory of Bounded Rationality is certainly not the only theoretical perspective that could be invoked in this research, it may the best fit based on the view of environmental literacy plans as

the products of decision-making towards a single goal of increased environmental literacy. The theoretical prospective employed in this study is used to frame both the examination of the environmental literacy plans but also the lens by which the researcher views the data.

In applying Simon's definition to this dissertation, "in order to meet the given goal.." (environmental literacy), "..we must evaluate the alternatives.." (directions and decisions available when writing the plan) "..within the limits.." (NAAEE guidelines. NCLI Act funding requirements, time, effort, external funding, group decision-making, state political culture, etc.). The findings of this research seek to identify 'best practice' states whom score very well on the matrix by which other states can model their plans. These 'best practice' states have successful ELPs in spite of the "limits", which will be contextualized in later sections to better understand the possible interactions of the goals, alternatives and limits imposed by having bounded rationality in the creation of a state environmental literacy plan. For example, Kansas may have the goal of statewide functional environmental literacy, the alternatives the Kansas SEEO chooses are reflected in their state ELP in terms of curriculum, graduation requirement, etc. which are measured in the matrix, and are ultimately guided by the limits imposed such as funding, effort of volunteer writers, time limitations, and the state political culture. **The Theory of Bounded Rationality is invoked in the findings to contextualize the data in the matrix for a particular state by examining the goals, alternatives and limits that resulted in a successful or unsuccessful ELP**.

The Theory of Bounded Rationality also influences the use of the criteria-based matrix as an instrument to explain the differences in ELP progress with the underlying caveat that humans are limited to bounded information. The researcher is unable to completely explain all the factors and conditions affecting the status of an ELP, due to the bounds of human rationality, however

the matrix data can assist the researcher in viewing the goals and alternatives of ELPs despite the limits. Within the scope of the Theory of Bounded Rationality, this study uses the matrix within the given constraints (criteria) to measure the achievement of a goal (success of an ELP) within the bounded information of the exoteric conditions/limits (time, effort, political culture, etc.). Keeping Simon's theory in mind, this study utilizes the researcher-designed criteria-based matrix tool to further specify the analysis of environmental literacy planning in the US. The Theory of Bounded Rationality, in keeping the bounds of information in mind, influences the need for a qualitative analysis of the matrix data in terms of the contextualization of findings and of outliers to generalized findings. The theoretical framework of this dissertation influences the need for quantitative analysis for the goal-oriented human need to establish one example of the best decision (or several best practice models) as well as the need for a qualitative contextualization of the data in understanding the bounds of limited information.

Criteria-Based Matrix

In order to understand the qualities of an environmental literacy plan that have influence on the status of the plan, this study uses a matrix to evaluate each state on a set of criteria. The Criteria-Based Matrix used in this study, or decision-making matrix, is based on a tool created by Pugh (1981). A decision-matrix or criteria-based matrix is a common technique used by policymakers and planners to evaluate different alternatives, usually with a strong economic focus. The literature on specific adaptations of these matrices can be found in research on Multiple-Criteria Decision-Making (MCDM). The traditional use of MCDM research does not fit with this study because of the lack of economic focus. Therefore the use of a criteria-based matrix approach is a novel methodology in its application to a social policy. The influence of the Theory of Bounded Rationality is in the development and definition of criteria, as well as the

process of assigning weights for criterion because it applies the idea of measuring an achievement against a set of limits or constraints (Simon, 1976). The matrix will also allow the researcher to examine which states are further along in the process politically which will assist in analyzing the quality scores of the various plan criteria with the criteria that contribute to the overall plan status. The assignment of scores is determined by content analysis of each ELP, and the analysis of the data collected in the matrix will employ a summary of patterns and contextualized examples of state data, which will be detailed further in later sections.

The use of rationality theories in the social sciences has grown with major innovations to the theoretical side, "in fact, causal analysis, based upon regression analysis" (p. 32) were used extensively after the 1960 by political scientists and sociologists (Simon, 2000). Simon notes that it is urgent for new tools for "conducting empirical inquiry and constructing models be incorporated in social science graduate education" (2000, p. 25). While there is a dearth in the literature regarding bounded rationality and the field of education, both the criteria-based matrix as a policy decision-making tool and the use of content analysis techniques as discussed further in the methodology section, are complementary elements under the overarching theory of bounded rationality for this study.

CHAPTER III: METHODOLOGY

Environmental literacy planning is an extremely under-studied topic in published research, therefore to study this unique issue requires a unique methodology. Previous reports published by NAAEE have claimed to give a status report of the environmental literacy planning progress in the US, however, these reports are a mere compilation of interviews conducted with the leaders of each states EEO, which is inherently biased. The methodology used in this study flows naturally from the theoretical framework discussed previously. Therefore, the purpose of this study is to develop a robust system of analysis of environmental literacy plans which provides a unique view of the content and context of plan success.

Beyond the theoretical and empirical challenges involved, there is a sobering conceptual reality: the absence of an obvious procedure for deciding how much weight to give to the competing normative criteria. As a result, selecting the "best" instrument involves art as well as science" (Goulder & Parry, 2008, p. 152). The process created to identify variables that impact the quality and status of environmental literacy plans in the United States is far from an objective procedure, but as Goulder and Parry (2008) state, involves art as well as science. The following section details the methodological process to be employed in the study of the status of ELPs.

Creation of the Criteria-Based Matrix and Rubrics

The creation of a unique criteria-based matrix for the measurement of ELPs was a process started in a course on environmental policy decision-making. The matrix allows the researcher to assign a score to each variable or criteria measured by the matrix by examining discrete linguistic or textual choices through a discrete set of numbers (Triantaphyllou, Kovalerchuk, Mann, & Knapp, 1997). FIGURE 5 illustrates a generic criteria-based matrix from which the matrix and rubrics system for this research was adapted.

	C_1	C_2	C_3	…	C_N
Alt.	W_1	W_2	W_3	…	W_N
A_1	a_{11}	a_{12}	a_{13}	…	a_{1N}
A_2	a_{21}	a_{22}	a_{23}	…	a_{2N}
A_3	a_{31}	a_{32}	a_{33}	…	a_{3N}
⋮	⋮	⋮	⋮	⋮	⋮
A_M	a_{M1}	a_{M2}	a_{M3}	…	a_{MN}

Figure 5: Example of a Criteria-Based Matrix

The matrix example shown in FIGURE 5 is a generic matrix which consists of Alternatives (A), Criteria (C), Weights (W), and then the weighted-score each alternative received for each criterion (a). The total (a) scores are added for a composite (a_n) score. This basic design was adapted for the purpose of examining environmental literacy plans by using the guiding documents from NAAEE and NCLI legislation text to identify the criteria and the environmental literacy plans as the 'alternatives'. To further clarify the scoring procedure, each criterion has a corresponding rubric. The process for developing the matrix and rubrics is detailed in the following section.

This matrix structure was modified to be used with environmental literacy plans, not to pick the best plan, but rather to determine which criterion have a correlative link to "successful" plans. The following sections will detail the thought process behind the selection of each criteria as well as the justification for the weight of each criteria.

Selection of Criteria and Assigning Weights

The first question then was how to define a "successful" plan. In order to measure the perceived effort in ELP development, the intention of the matrix is to hold states accountable to the guiding document, "Guidelines for Developing a State Environmental Literacy Plan" (NAAEE, 2008), which NAAEE has reported that 88% of states are using to develop their ELP (NAAEE, 2014). These guidelines, here forward referred to as 'the guidelines' or 'guiding document', are the foundation of measurement for which states ELP are being held in comparison too. The use of exact wording from the guidelines to assist in the rating of ELP development is a crucial aspect of establishing the trustworthiness of the data. Full rubrics with scoring and citations of evidence can be referenced as PDF attachments using the LIST OF ATTACHMENTS. TABLE 2 illustrates the matrix design for this research.

Table 2: Blank Matrix Design

Environmental Literacy Plan Criteria- Based Matrix (Ruggiero, 2016)			**Political Status**	**Plan Status**	**Curriculum**	**Assessment Plan**	**Graduation Requirement**	**Implementation Plan**	**Professional Development**	**Process Transparency**	
		Criteria ->									**Total**
		Weight ->	**0.2**	**0.2**	**0.1**	**0.1**	**0.15**	**0.1**	**0.1**	**0.05**	**1.0000**
1											
2											
3											
4											
5											
6											

In order to further delineate the scoring procedure for state ELP criteria, a corresponding rubric was created for each criterion. The rubrics each exist on a 0-4 scale, and primarily include language pulled directly from NAAEE guiding documentation. As stated in the introductory section on ELPs, the NAAEE reports that as of 2014 approximately 88% of states report using the guiding documents created by NAAEE to guide the development of their state plan. Thus creating a fair and justified standard by which to rate an ELP.

Each of the criteria rubrics are on separate pages of the spreadsheet for data collection, allowing space for a justification of scoring. For example, when examining the Political Status of the Oregon ELP, the rubric contains a justification for Oregon to receive a score of 4. In this particular case, a score of 4 based on the rubric would indicate that a state has a statutory requirement in place such as an executive order, law or state statute supporting the implementation of an ELP. The justification for Oregon is listed as "House Bill 2544 signed into law to create ELP" which would give Oregon full points on the rubric for the political status of their ELP. The following section outlines the creation and scale of each criteria rubric prior to visiting the details of the matrix, which provides a broader picture of the analysis of ELPs.

The first criteria developed in the matrix were the political status and plan status criteria. The Plan Status criterion, TABLE 3 wording is pulled directly from the way in which NAAEE defines the status of a plan, as either non-existent, in the writing or drafting phase, completed but not adopted, adopted but not implemented, or in the implementation phase. The Plan Status criterion was created to group states by the development phase of their plan, which is arguably an important aspect of the overall success of the plan, therefore is weighted heavily at 0.2 or 20% of the overall score. The definitions of each score level in the rubric is pulled directly from the way in which NAAEE has distinguished between the statuses of ELPs in their most recent state

Table 3: Plan Status Rubric

Rubric: Plan Status	
Score	**Definition**
0	Planning Stage
1	Writing Stage
2	Complete But Not Adopted by DOE
3	Adopted by DOE and Implementation Planned
4	Implementation in Progress

ELP report (NAAEE, 2014).

The other aspect of measuring the "success" of a plan was to examine where the plan stood in the political arena in each state. The Political Status of the plan is not an aspect that NAAEE reports upon, however, with the push for the passage of No Child Left Inside Act which would provide funding for states with ELPs, it would seem that understanding each states' EEO's involvement with legislative officials could illuminate the ways in which state politics plays a role in education policy. TABLE 4 depicts the rubric for Political Status.

This research seeks to provide a better understanding of the ways in which state and federal level officials will use the progress of states as leverage to increase capacity and license to advance towards a goal (Manna, 2006). It is predicted that states scoring highest on the measurement of Political Status in the matrix will also be the states whom have applied to most effort to developing and furthering their plan, therefore plans with strong curriculum components and a required graduation requirement specific to environmental literacy. Because this criterion measures effort, the Political Status criterion shares an equally heavy weight of 0.20 or 20% of the total score.

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Table 4: Political Status Rubric

Rubric: Political Status	
Score	**Definition**
0	No political progress
1	In talks with legislature
2	Political progress documented
3	By-Laws in place specific to ELP
4	Statutory Requirements (including Executive Orders, Laws, and State Statutes) in place specific to ELP

The next set of criteria developed for the matrix are based on the five recommendations of NAAEE in the "Developing a State Environmental Literacy Plan" document (see Key Elements of an ELP section in the Introduction of this dissertation). The five recommendations are curriculum standards, assessment plan, graduation requirement, implementation plan and professional development.

The criterion for Curriculum Standards is based upon the recommendation listed in "Developing a State Environmental Literacy Plan" document to explicit link environmental literacy key areas, as described below, with academic state standards. This rubric was modified significantly from the rubric that was used for the pilot study, based upon the preliminary data analysis as well as peer input at the NAAEE 44th Annual Conference in October of 2015. Details about the reasoning behind the modification of this rubric as detailed in the preliminary data analysis section. The guiding document references another NAAEE publication, "Excellence in Environmental Education: Guidelines for Learning (K-12)" (NAAEE, 1999), which offers learner expectations in Environmental Literacy for grades 4, 8 and 12. Simmons (2010) notes that these guidelines for learning are "*provides a widely accepted framework for environmental literacy achievement" (p.1).* The guidelines for learning are benchmarked at 4th, 8th and 12th grade levels and are broken into four strands for environmental learning:

Strand 1: Questioning, Analysis and Interpretation Skills
Strand 2: Knowledge of Environmental Processes and Systems
- 2.1—The Earth as a physical system
- 2.2—The living environment
- 2.3—Humans and their societies
- 2.4—Environment and society

Strand 3: Skills for Understanding and Addressing Environmental Issues
- 3.1—Skills for analyzing and investigating environmental issues
- 3.2—Decision-making and citizenship skills

Strand 4: Personal and Civic Responsibility

(p. 5-6, NAAEE, 1999). Both documents are referenced and included in consideration when creating the matrix and rubrics system.

The Curriculum Rubric, TABLE 5, is designed based on the recommendations of NAAEE and Bora Simmons, contributing author of "Excellence in Environmental Education: Guidelines for Learning K-12", that a state ELP contain a crosswalk to environmental literacy standards to state academic standards. Simmons reports (2010) the wide acceptance of the guidelines for learning, therefore most states should develop a crosswalk between the guidelines for learning and their state academic standards.

States with other adopted environmental literacy standards, such as California's Environmental Principles and Concepts (EP&Cs) (2004), should crosswalk adopted environmental literacy standards to state academic standards. The *Developing a State Environmental Literacy Plan* document states that "whether integrated within science, social studies, or other content areas; or whether they stand alone, these standards and curriculum documents should be clear and specific and be designed to ensure that high school graduates are environmentally literate" (p. 6, NAAEE, 2008). Therefore, the overarching goal of the measurement of the curriculum section of an ELP is the perceived effort that a SEEO invested in creating a crosswalk resource for promoting environmental literacy in their state.

The next criterion for which a rubric was developed was the Assessment Plan. The guiding document recommends that "The plan should describe the methods that the state education agency will use annually to measure environmental literacy. This could include traditional assessments, counts of student participation or performance, or other mechanisms. Progress toward achieving environmental literacy should be reported annually, possibly on a state education agency's federally mandated annual report card" (NAAEE, 2008).

Table 5: Curriculum Rubric

Rubric- Curriculum	
Score	**Definition**
0	Does not specifically link environmental literacy key areas with state academic standards
1	----------
2	Addresses example of areas in which specific environmental literacy instruction could take place within current state academic standards
3	----------
4	"Set of specific content standards, content areas, and courses or subjects where instruction will take place." (NAAEE 2009) "Links explicit use to *Excellence in Environmental Education: Guidelines for Learning (K-12)* as the framework and to create a crosswalk with your state academic standards" (Simmons, 2010; NAAEE, 2010)

TABLE 6 depicts the Assessment Plan rubric. As noted, the Assessment Plan rubric draws wording from the guiding document to hold states accountable to recommendations by NAAEE.

The criterion for Graduation Requirement also draws directly from the guidelines for developing a state ELP that NAAEE produced. The Developing a State ELP guidelines note that a state ELP "should address how a specific high school course, program, or credit requirement is part of environmental literacy in high school" (p. 8, NAAEE, 2008). At this early stages of this research, the rubric only reflected whether a state ELP had a specific course, program, or credit requirement, or not. Further development of this rubric was necessary as states progressed with the implementation of their graduation requirement. In order to parse different score values from states that have a specific environmental literacy graduation requirement plan, versus an elective course, the following final rubric was developed. This version of the rubric allowed the researcher to differentiate between a state with a specific required course for environmental literacy, an elective course for environmental literacy, or, if the state cited a required course such as biology having 'environmental literacy components'. TABLE 7 is the rubric for Graduation Requirement.

The recommendation to include an Implementation Plan in the state ELP is also directly noted in the Developing a State ELP guidelines. The included information in an Implementation Plan is defined on page 8 of the guidelines as well as in the definition of a score of 4 in the rubric. Failure to answer all the of the implementation plan questions would result in a score of 2, and answering none of the questions would result in a score of 0. The questions should be addressed explicitly in order to count towards a full score. TABLE 8 is the rubric for Implementation Plan.

Table 6: Assessment Plan Rubric

Rubric- Assessment Plan	
Score	**Definition**
0	No assessment plan is described
1	X
2	Describes only some of the methods; or does not outline reporting of measurements
3	X
4	Describes the methods that the state education agency will use annually to measure environmental literacy: traditional assessments, counts of student participation or performance, and other mechanisms. Should be reported annually, possibly on a state education agency's federally mandated report card (NAAEE, 2008).

Table 7: Graduation Requirement Rubric

Rubric- Graduation Requirement	
Score	**Definition**
0	No specific course, program or credit graduation requirement is described in plan
1	X
2	Addresses how a specific high school course, program or credit requirement is an **ELECTIVE** graduation requirement (including, if EL concepts are present in other HS grad req. but no explicit EL grad req is in place)
3	X
4	Addresses how a specific high school course, program or credit requirement is a **REQUIRED** part of environmental literacy in high school

Table 8: Implementation Plan Rubric

Rubric- Implementation Plan	
Score	**Definition**
0	The plan does not address any of the key questions
1	X
2	The plan answers SOME of the key questions
3	X
4	The plan answers ALL key questions about implementation. "Will new or existing state laws, by-laws, or other specific requirements for environmental education be part of the implementation process? Will model programs be identified and replication supported? How will existing federal education funds such as Title II or Title V, Perkins grants, IDEA or STEM funding be integrated into an implementation plan? Is new dedicated funding required?" (NAAEE, 2008, p.8).

The final of the explicitly recommended criteria in the "Developing a State ELP" guidelines in the inclusion of a detailed plan for Professional Development. The guidelines provide very little detail in the way of professional development, therefore the rubric simply measures whether the ELP has a plan for professional development or not, resulting in a corresponding score of 4 or 0. TABLE 9 shows the rubric for Professional Development.

Each of the five recommendations that are pulled directly from the "Developing a State ELP Guidelines (NAAEE, 2008), which include curriculum, assessment plan, graduation requirement, implementation plan, and professional development, form what will be referred to as the "Quality Score" of the plan, or the criteria that measure the actual content of the plan. The original composition of the matrix had each of these five quality criteria weighted equally. However after some initial data analysis, it seemed pertinent to further delineate the scoring of the graduation requirement criterion rubric to reflect the status of certain states with implemented graduation requirements. This led to the need for an increase in the weight of the graduation requirement criterion in the total score of matrix due to the *perceived effort* that an SEEO would have put in to get a graduation requirement passed and implemented on the state level. It is also a measurable criterion of success of the plan, therefore the graduation requirement is weighted at 0.15 or 15% of the total score, while the other four quality criteria are each weighted at 0.10 or 10% of the total score.

The original matrix had two additional criteria that were created based upon the professional and academic experience of the researcher as well as based upon conversations with formal and informal educators. The two additional criteria were Advocacy Involvement and Process Transparency. Advocacy Involvement was designed to be a measurement of the SEEO's level of involvement in national level EE advocacy campaigns such as being an NAAEE affiliate

and being a member of the NCLI coalition. In the examination of all 50 states ELPs, it was crucial to examine data collected throughout the early stages of the process to determine if the matrix was meeting the needs of the research. Because of this, a preliminary data analysis of approximately eight states was conducted and precipitated the need to make some changes to the matrix. The analysis of data will continue as data is collected, not upon data completion.

The preliminary analysis of eight states ELPs, of a varied mix of geographic location and political affiliations, revealed that all states were listed as affiliates of NAAEE and members of the NCLI coalition, and this did not necessary speak to the SEEO involvement in advocacy for EE. Therefore, the Advocacy Involvement criterion was deemed inappropriate for the matrix and was removed. The weight of that criterion was redistributed to Graduation Requirement for reasons detailed above.

The final criterion is Process Transparency which documents input from the public on ELPs. The need for review is cited as an important aspect of ELP development in the NCLI Act text. TABLE 10 depicts the Process Transparency rubric.

This criterion reflects whether a state has opened one or multiple levels of their ELP to review from invited guests or stakeholders, or if one or more drafts of their ELP was open to public review. It has been well documented in environmental education research that a sense of place and local community ties is as crucial aspect of EE, therefore it seems important to understand whether an SEEO has included the input of the local community in the drafting of their state plan. This criterion does often require research efforts outside of the content analysis of the ELP to determine the steps an SEEO took to review their ELP, and it may be difficult to find this information at times, therefore Process Transparency holds the least amount of weight in the matrix at 0.05 or 5% of the total weight.

Table 9: Professional Development Plan Rubric

Rubric- Professional Development	
Score	**Definition**
0	Does not address professional development
1	X
2	x
3	X
4	"A description of programs for professional development for teachers to improve the teachers'— (A)environmental subject matter knowledge; and (B)pedagogical skills in teaching about environmental issues, including the use of— (i)interdisciplinary, field-based, and research-based learning; and (ii)innovative technology in the classroom" (NCLI 2011)

Table 10: Process Transparency Rubric

Rubric: Process Transparency	
Score	**Definition**
0	No Review of ELP
1	At least one stage of review by invited guests
2	All stages of review by invited guests
3	At least one stage of review is open to public comment
4	All stages of review open to public comments (NCLI 2015 Bill, states that ELP should include 'input from the public')

The criteria selected for this research project were a combination of the required elements in an ELP for support by NCLI as well as the status of the plans as reported by NAAEE. The other two criteria, Political Status and Process Transparency will allow the researcher to question the role of policy-makers in ELP success as well as the role of public review and opinion. The following section will examine the preliminary data collection and on-going data analysis.

Data and Data Collection

Each state ELP was examined by the researcher and rated within the matrix based on the rubric scales as part of a content analysis of the text of the plan. In designing research, it is imperative to scaffold the methods, methodology and theoretical prospective of the research to create a process that is capable of fulfilling the purpose and answers the questions of the research (Crotty, 2006). The use of content analysis is the method for gathering data and allows for flexibility with the analysis of text as data (Cavanagh, 1997; Hsieh & Shannon, 2005). "The specific type of content analysis approach chosen by a researcher varies with the theoretical and substantive interests of the researcher and the problem being studied" (Weber, 1990). In this case, the specific approach is a content analysis to make measurable interpretations of the text in each document but limited within the confines of the rubrics of the criteria-based matrix system and bounded by the inclusion of a citation of evidence for each score assigned. For the purpose of this paper, "qualitative content analysis is defined as a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh & Shannon, 2005). The study then continues with turning the text into data through the use of a matrix and then analyzing the data.

Each rubric contains a separate column for each state, followed by a row for the score and for a citation of evidence which supports the assignment of a particular score. The citation of

evidence is provided to show where the information to support the score came from and why each state received that score for that criterion; it also provides further support of the scoring system. TABLE 11 shows the citations of evidence, or lack thereof, for rubric scores for Implementation Plan.

The inclusion of citations of evidence supports the validity of the matrix and the replicability of the study by providing a detail description of scoring for each state. The evidence for scoring will be referenced in the findings to add context to the overall scores of states highlighted within the matrix as states with successful or unsuccessful ELPs. The other rubrics, including each states citation of evidence and corresponding score, can be found in each pdf attachment in the LIST OF ATTACHMENTS.

Analysis of Matrix Data

The qualitative nature of this study influences the use of a content analysis to collect the data. The findings of the data are identified by describing the patterns in the matrix as well as by a qualitative contextualization of specific findings to add depth to the findings in the matrix and to better understand the external bounds and limits on a SEEO in the development of an ELP, all influenced by the Theory of Bounded Rationality.

Content analysis is based on the use of the matrix as an a priori set of codes, therefore the interpretation of ELP text using the rubric system is the process whereby the data were collected and populated into the matrix. The specific use of a content analysis is considered a research method for making valid and replicable inferences from data while considering their context. The purpose of a content analysis is to provide new insights and knowledge, as well as a practical guide to action (Krippendorff, 1980). In a study conducted on environmental impact

Table 11: Implementation Plan Rubric with Citations of Evidence for Five States

Rubric- Implementation Plan		Alabama	Alaska	Arizona	Arkansas	California
Score	**Definition**	**2**	**4**	**0**	**0**	**2**
0	The plan does not address any of the key questions	p. 3- Implementation Plan, p. 10- Funding plan, addresses possible funding sources and some model programs, but does not address new or existing laws or bylaws	pgs. 40-41 address all key questions regarding funding and laws, (model programs are listed in separate objectives). Specific details are listed in Implementation Timeline on pgs. 42-57 including a timeline for each objective listed in ELP	No ELP	ELP in writing phase	Strategy 5 &6 describe implementation and funding plan, implementation plan does not mention model schools. Funding plan does not address any of the funding opportunities listed in criteria, but does address funding sources within CA.
1	X					
2	The plan answers SOME of the key questions					
3	X					
4	The plan answers ALL key questions about implementation. "Will new or existing state laws, by-laws, or other specific requirements for environmental education be part of the implementation process? Will model programs be identified and replication supported? How will existing federal education funds such as Title II or Title V, Perkins grants, IDEA or STEM funding be integrated into an implementation plan? Is new dedicated funding required?" (NAAEE, 2008, p.8).					

assessments, Ginger also uses an interpretive content analysis and states that "irrespective of intentions and statutory justifications, the organizational structure of the document exists as part of their content and frames their subject matter {…}, the structure of technical documents {…} frames policy issues.

Potential sources of policy content for such framing include laws, agency guidance, and individuals who generate the documents. Whether changes occur or not, we can examine the structure of technical documents as narratives or story lines to identify how they frame policy issues" (p.340, Ginger, 2006). While Ginger examined environmental impact assessments, her research methods support the use of interpretative content analysis for examining technical documents to frame policy issues.

Ginger also reports that using an interpretive analysis takes into account the shifting narrative of draft and finals versions of technical documents due to the negotiation of shifting political agendas (Ginger, 2006). This supports to use of an interpretative content analysis in examining environmental literacy plan as the constantly shifting political atmospheres from state to state has been a constant concern from the environmental education community. "[An interpretive] approach to analyzing technical documents illustrates how seemingly 'apolitical' documents are very political, in that seemingly subtle shifts in frame can fundamentally affect the storyline and information reported in the documents" (p. 347, Ginger, 2006). The new insights provided by this research is a fresh look at environmental literacy planning differing from the ways in which NAAEE collects and reports of ELP statuses strictly through an interview process, while the practical guide to action is the dissemination of findings of what makes a successful ELP.

While the matrix data was examined by identifying patterns, the patterns and findings are of a qualitative nature and often require contextual information. Qualitative analyses can be inductive or deductive in nature, dependent on the structure of the question being explored. The use of a criteria-based matrix with categories and codes that are predefined, as well as anticipated findings detailed in later sections, lends itself to the need for a qualitative analysis in terms of the contextualization of the findings of the quantitative data in matrix as well as taking into account various factors that the matrix may not consider. This is a crucial aspect influenced by the Theory of Bounded Rationality, which explains the human need to make an objective decision despite the bounded or limited information that is inherent in human decision-making processes. The need for a qualitative contextualization of the data in the matrix is the recognition that the matrix is as objective as possible considering the bounded information, and also the researcher to consider contextual situations in which the matrix intentionally or unintentionally does not measure. Particular methodological approaches, including qualitative analyses of these data will be discussed in detail in the next chapter.

Pilot Study Analysis

An initial pilot study of the ELPs of Tennessee and North Carolina was conducted to inform the status of the planning progress in each state and to evaluate the design of the matrix. The pilot study was presented at the National Association for Research in Science Teaching (NARST) International Conference in April 2015, with tremendous support from colleagues in the field of environmental education through informal interactions and conversations. The preliminary findings of the study (Ruggiero & Golden, 2015) show that while both states have less than ideal political support and limited ELP process transparency, the NC ELP lacks detail in regard to curricular integration of content and skill sets, as well as lack of detail in terms of

implementation plan. The NAAEE 2014 SELP Status Report highlights NC as an 'exemplary state' which problematizes the measurement of the quality of ELPs as it is contradicted in this study. TABLE 12 shows the former matrix and pilot study data.

The implications of the pilot study points to a strong need for further development of the assessment instrument (matrix) and further data gathering.

Preliminary Data Analysis

After the pilot study data was collected and initial interpretations were presented at conferences, the need for further data to test the matrix became necessary. The preliminary data analysis for this study includes the data collection of 8 randomly selected state ELPs. TABLE 13 displays the matrix in the process of completing the preliminary data analysis.

The findings of the preliminary data analysis were not findings in the traditional sense, but questions of the appropriate scale and measurement of the matrix. As described in earlier sections, after the preliminary data was reviewed, the criteria for Advocacy Involvement was removed, and the weight of Graduation Requirement was increased.

Following the preliminary data analysis, the interpretations were presented at the NAAEE 44th Annual Conference in October of 2015. Questions and conversations that arose as part of the conference influenced a number of changes in the matrix as well as in other aspects of the study. The rubric for Curriculum was modified based on significant conversations with ELP developers. The rubric was modified because its original form was open to too much interpretation. The Curriculum rubric was then modified to contain exact wording from the NAAEE guidelines in which an ELP must contain specific state standards or areas in which environmental literacy content areas and skill sets would be addressed. In other words, an ELP

Table 12: Pilot Study Data

ELP Criteria-Based Matrix		**Political Status**	**Plan Status**	**Curriculum**		**Assessment Plan**	**Graduation Requirement**	**Implementation Plan**	**Professional Development**	**Process Transparency**	**Advocacy Involvement**	
State	**Criterion**			**Content**	**Skill Sets**							**Total**
	Weight	**0.2**	**0.2**	**0.05**	**0.05**	**0.1**	**0.1**	**0.1**	**0.1**	**0.05**	**0.05**	**1.00**
Tennessee		0.15	0.2	0.05	0.05	0.1	0.1	0.05	0.1	0.0375	0.05	**0.8875**
North Carolina		0.15	0.15	0	0	0.1	0.1	0	0.1	0.0375	0.05	**0.6875**

must contain a specific crosswalk of standards. After the preliminary data review and modification of the matrix based on peer input, the scores for several states were added to the matrix and continued to support the design of the matrix as it now stands. The exception to this was Maryland's ELP.

The Special Case for Maryland

Another interesting finding in the preliminary data collection and analysis was the lack of a formalized ELP in the state of Maryland. In environmental education, Maryland is often thought of as the leader in EE especially with champions such as Representative Sarbanes and organizations like the Chesapeake Bay Foundation on their side. The NAAEE State ELP Status Report (NAAEE, 2014) commends Maryland as an exemplary state for their "well-informed and comprehensives plan" (p.14) when Maryland does not have a state ELP as defined by NAAEE or NCLI. Maryland has an environmental literacy graduation requirement in place as well as state standards for integrating environmental education; however Maryland does not have a cohesive state plan that addresses the recommendations of in the NAAEE guidelines. This situation continues to illuminate problems with the way in which NAAEE is evaluating the status of state ELPs through interview data only. It also problematizes the measurement and scoring of states in the matrix system when a formalized ELP does not exist. In following the methodological design of this study then, Maryland will receive all zeros on the matrix. The overall goal of this research is to find what criteria are contributing to the success of an ELP and if that success is born out of following the guidelines for ELP development. With that in mind, it is anticipated that Maryland's environmental literacy efforts are described in the findings of this research as an outlier to the data collected and worth further investigation.

Table 13: Preliminary Data Matrix

Environmental Literacy Plan Criteria- Based Matrix: Preliminary Analysis (Ruggiero, 2016)	Political Status	Plan Status	Curriculum	Assessment Plan	Graduation Requirement	Implementation Plan	Professional Development	Process Transparency		
Criteria ->									Total	
Weight ->	**0.2**	**0.2**	**0.1**	**0.1**	**0.15**	**0.1**	**0.1**	**0.05**	**1.0000**	# Pages
Tennessee	0.1	0.15	0.1	0.1	0.075	0.05	0.1	0.0375	**0.7125**	114
North Carolina	0.15	0.1	0	0.1	0.15	0	0.1	0.0375	**0.6375**	40
Oregon	0.2	0.2	0.1	0.1	0.15	0.1	0.1	0.0375	**0.9875**	48
Nebraska	0.05	0.1	0	0.05	0	0.05	0.1	0.025	**0.3750**	32
Texas	0.1	0.15	0	0.05	0	0	0.1	0	**0.4000**	13
Maine	0	0.15	0.1	0.05	0	0.05	0.1	0.0125	**0.4625**	16
Maryland	0.1	0	0	0	0	0	0	0	**0.1000**	**
Colorado	0.2	0.2	0.1	0.05	0	0.05	0.1	0.0375	**0.7375**	46

**Maryland does not have a comprehensive state ELP according to guidelines

Trustworthiness

There were two main strategies used to establish trustworthiness of data for this study. The first, as described in detail in previous sections, is that each rubric is designed explicitly from NAAEE or NCLI documentation. Many of the SEEOs, either in the ELP or on their websites, state that their ELP was created based on the guidelines of NAAEE and/or to have a document in development should the NCLI Act pass for potential funding opportunities. Therefore, this research seeks to hold states accountable to the guidelines by which they claim to have shaped their documents. The second main source of trustworthiness is from triangulation of data sources for this research was established by using multiple data sources to ensure capturing the larger picture of a complex document and development process (Rossman & Rallis, 2003). The basis of the matrix, and corresponding rubrics, is text pulled directly from the NAAEE "Developing a State Environmental Literacy Plan" guidelines document as well as from the No Child Left Inside legislation text from 2008-2015. In 2014, NAAEE reported through interviews with SEEO presidents, that 88% of states were using NAAEE guidelines in the development of their ELP (NAAEE, 2014), therefore seems fair to hold states to the standards in the guidelines of which they report using.

In addition to this matrix being created from a public document, the triangulation of data sources continues through the collection of data from the physical state environmental literacy plan which is generally in a PDF format and is available via web search. In collecting data or establishing a score for each criterion, the researcher also cross-references the SEEO website, supplemental publications of the SEEO, and press releases from reputable sources regarding the political or plan status of the ELP. This strategy is intended to add support for findings through several independent sources of data that confirm it, or at least do not contradict it (Creswell,

2007). This strategy reduces the risk that the conclusions reflect only the limitations of a specific source. The following sections of this research will describe in detail the processes the research employed to rate states and the how the data was collected during the process which will further support the use of triangulation of data sources as a main source of trustworthiness in this research.

Limitations

The measurement of certain criteria prove more difficult than others which is a limitation of the study. The Process Transparency critierion often requires research outside of the text of an ELP to determine how a state EEO conducted a review of stages of their ELP. The criterion measures the involvement of stakeholders and/or the public input in the review of draft and/or final stages of the ELP. The scoring of this criterion is based upon published information either in the ELP, on the SEEO website, or in a press release or other website that can be found via an internet search engine. For this reason, documentation of justification of scoring is particulary important for this critierion.

The focus and purpose of this dissertation research was to develop a robust system of analysis for ELPs that was unique from any other current system in place. Due to resources and time available during the research process, it was not feasible to use outside sources to validate the matrix. A recommendation for further research and application using the criteria-based matrix include an expert panel review as well as member-checking to increase the trustworthiness of the matrix. The concluding chapter of this dissertation will also include a discussion on outside factors that are or may in the future impact the success of an ELP. These factors include, but are not limited to, the impacts of Next Generation Science Standards, the role

of ‘local contol’ policies, and the influence of political culture shifts in the development and implementation of ELPs.

CHAPTER IV: FINDINGS

During the writing of this dissertation, a portion of the No Child Left Inside legislation passed and was enacted into law as part of the Every Student Succeeds Act of 2015. While the legislation does not, at this juncture, contain environmental literacy "plan" specific wording, it does support increased environmental literacy education in K-12 schools. It is anticipated that funds will be available to states to continue environmental literacy education and planning in the coming years. A more detailed discussion of the legislative changes is provided in the concluding chapter.

The findings of this research are now even more critical to provide states with a view of successful environmental literacy planning across the US and which states should be emulated as other state leaders re-visit their ELPs and implementation procedures. The following section will describe the process by which state data was collected including some of the general impressions and issues faced during data collection, continue with the overall patterns found amongst the data, and conclude with a contextualization of several states that will provide a snapshot of the overall status of environmental literacy planning in the US. While this section does unpack some of the patterns of the data, the most important findings of this research are in the matrix itself and in the ways in which state environmental education organizations chose to interpret the results for the continue development, revision, and implementation of their environmental literacy plan. The complete matrix and rubrics along with corresponding citations of evidence is found in the pdf documents attached in the LIST OF ATTACHMENTS.

TABLE 14 is the entire matrix including last election voting results and relevant notes. The qualitative analysis of patterns in the matrix will be discussed further in this section.

Table 14: Criteria-Based Matrix

Environmental Literacy Plan Criteria- Based Matrix (Ruggiero, 2016)		Political Status	Plan Status	Curriculum	Assessment Plan	Graduation Requirement	Implementation Plan	Professional Development	Process Transparency	
	Criteria ->									**Total**
	Weight ->	**0.2**	**0.2**	**0.1**	**0.1**	**0.15**	**0.1**	**0.1**	**0.05**	**1.0000**
1	**Oregon**	0.2	0.2	0.1	0.1	0.15	0.1	0.1	0.0375	**0.9875**
2	**DC**	0.2	0.2	0.1	0.1	0.075	0.05	0.1	0	**0.8250**
3	**Kansas**	0.2	0.2	0.05	0.1	0.075	0.05	0.1	0.025	**0.8000**
4	**Illinois**	0.2	0.2	0.1	0.05	0	0.05	0.1	0.05	**0.7500**
5	**Colorado**	0.2	0.2	0.1	0.05	0	0.05	0.1	0.0375	**0.7375**
6	**Washington**	0.1	0.2	0.1	0.05	0.075	0.05	0.1	0.0375	**0.7125**
6	**Tennessee**	0.1	0.15	0.1	0.1	0.075	0.05	0.1	0.0375	**0.7125**
7	**Connecticut**	0.1	0.2	0.1	0.05	0	0.1	0.1	0.05	**0.7000**
7	**Kentucky**	0.1	0.2	0.1	0.05	0	0.1	0.1	0.05	**0.7000**
8	**Hawaii**	0.05	0.1	0.1	0.1	0.075	0.1	0.1	0.0375	**0.6625**
9	**North Carolina**	0.15	0.1	0	0.1	0.15	0	0.1	0.0375	**0.6375**
10	**New Hampshire**	0	0.2	0.1	0.05	0.075	0.05	0.1	0.05	**0.6250**
13	**Rhode Island**	0.1	0.2	0.1	0.05	0	0.05	0.1	0.0125	**0.6125**
14	**Wisconsin**	0.05	0.2	0	0.1	0.075	0.05	0.1	0.025	**0.6000**
15	**Alaska**	0.1	0.1	0	0.05	0.075	0.1	0.1	0.0375	**0.5625**

Table 14: Continued.

Environmental Literacy Plan Criteria- Based Matrix (Ruggiero, 2016)		Political Status	Plan Status	Curriculum	Assessment Plan	Graduation Requirement	Implementation Plan	Professional Development	Process Transparency	
	Criteria ->									**Total**
	Weight ->	**0.2**	**0.2**	**0.1**	**0.1**	**0.15**	**0.1**	**0.1**	**0.05**	**1.0000**
16	**Alabama**	0	0.15	0.1	0.1	0	0.05	0.1	0.025	**0.5250**
17	**Pennsylvania**	0.1	0.1	0.05	0.05	0	0.1	0.1	0.0125	**0.5125**
18	**Ohio**	0	0.1	0.1	0.1	0	0.05	0.1	0.05	**0.5000**
19	**Nevada**	0	0.1	0.05	0.1	0.075	0.05	0.1	0.025	**0.5000**
20	**New Mexico**	0.05	0.1	0.05	0.05	0	0.1	0.1	0.05	**0.5000**
21	**Florida**	0	0.1	0	0.1	0.075	0.05	0.1	0.05	**0.4750**
22	**Iowa**	0	0.15	0.1	0.05	0	0.05	0.1	0.025	**0.4750**
23	**Maine**	0	0.15	0.1	0.05	0	0.05	0.1	0.0125	**0.4625**
24	**California**	0.05	0.1	0.05	0.05	0	0.05	0.1	0.0375	**0.4375**
25	**Louisiana**	0.05	0.1	0	0.05	0.075	0	0.1	0.0375	**0.4125**
26	**Texas**	0.1	0.15	0	0.05	0	0	0.1	0	**0.4000**
27	**Nebraska**	0.05	0.1	0	0.05	0	0.05	0.1	0.025	**0.3750**
28	**New York**	0.05	0.1	0	0.05	0	0	0.1	0.0375	**0.3375**
29	**Missouri**	0	0.05	0	0.05	0	0.05	0.1	0.05	**0.3000**
30	**South Dakota**	0	0.1	0	0.05	0	0	0.1	0.05	**0.3000**
31	**Idaho**	0	0.1	0	0.05	0	0	0.1	0.0375	**0.2875**

Table 14: Continued.

Environmental Literacy Plan Criteria- Based Matrix (Ruggiero, 2016)		Political Status	Plan Status	Curriculum	Assessment Plan	Graduation Requirement	Implementation Plan	Professional Development	Process Transparency	
	Criteria ->									**Total**
	Weight ->	**0.2**	**0.2**	**0.1**	**0.1**	**0.15**	**0.1**	**0.1**	**0.05**	**1.0000**
32	**Michigan**	0	0.1	0	0.05	0	0	0.1	0.0375	**0.2875**
33	**Vermont**	0.05	0.1	0	0	0	0.05	0	0.05	**0.2500**
34	**New Jersey**	0.1	0.05	0	0	0	0.05	0	0.0375	**0.2375**
35	**Virginia**	0.1	0.05	0	0	0	0	0	0	**0.1500**
36	**Oklahoma**	0	0.1	0	0	0	0	0	0.0375	**0.1375**
37	**Indiana**	0	0.1	0	0	0	0	0	0.0125	**0.1125**
38	**Maryland**	0.1	0	0	0	0	0	0	0	**0.1000**
39	**Arkansas**	0	0.05	0	0	0	0	0	0	**0.0500**
40	**Delaware**	0	0.05	0	0	0	0	0	0	**0.0500**
41	**Georgia**	0	0.05	0	0	0	0	0	0	**0.0500**

Table 14: Continued.

Environmental Literacy Plan Criteria- Based Matrix (Ruggiero, 2016)		Political Status	Plan Status	Curriculum	Assessment Plan	Graduation Requirement	Implementation Plan	Professional Development	Process Transparency	
	Criteria ->									**Total**
	Weight ->	**0.2**	**0.2**	**0.1**	**0.1**	**0.15**	**0.1**	**0.1**	**0.05**	**1.0000**
42	**Massachusetts**	0	0.05	0	0	0	0	0	0	**0.0500**
43	**Minnesota**	0	0.05	0	0	0	0	0	0	**0.0500**
44	**Mississippi**	0	0.05	0	0	0	0	0	0	**0.0500**
45	**South Carolina**	0	0.05	0	0	0	0	0	0	**0.0500**
46	**Utah**	0	0.05	0	0	0	0	0	0	**0.0500**
47	**West Virginia**	0	0.05	0	0	0	0	0	0	**0.0500**
48	**Wyoming**	0	0.05	0	0	0	0	0	0	**0.0500**
49	**Arizona**	0	0	0	0	0	0	0	0	**0.0000**
50	**Montana**	0	0	0	0	0	0	0	0	**0.0000**
51	**North Dakota**	0	0	0	0	0	0	0	0	**0.0000**

Rating State Environmental Literacy Plans

The process of rating environmental literacy plans could be very straightforward at times but also very convoluted at others. The total scores states received ranged from Oregon with 0.9875 out of a possible 1.00 to more than 10 states that scored less than 0.2000. Even amongst the top ten states in the matrix by total score, the range was 0.9875 to 0.6250. To help the reader understand some of the contextual variance in this regard, the following section will give examples of two states, one which the process of rating the state was straightforward and clear, the other being more difficult.

The first example will be the rating of the Kentucky Environmental Literacy Plan (KELP). An internet search resulted immediately in the KELP pdf being the first entry without any additional searching. The KELP pdf was clearly titled and within the first few pages addressed that the plan was approved the Kentucky Board of Education, which was then cited in the rubric for Plan Status as and was written to comply with the funding requirements under the No Child Left Inside legislation as well as the suggested guidelines for development from NAAEE. The table of contents in the document was clearly designed to have the "Goals" of the KELP align specifically with the goals of NAAEE in developing a state ELP, such that curriculum, graduation requirement, professional development, assessment and implementation were all goals explicitly addressed. In each goal, the researcher examined and interpreted the text using the rubric for each criteria. For example, the Curriculum criterion specifically looks for a crosswalk to exist. The rubric from Curriculum, under Kentucky's score of a 4 states that "In 2013, Kentucky adopted NGSS, and helped to create an NGSS/ environmental literacy crosswalk. http://resources.spaces3.com/06128fff-596d-4700-a4ce-ed8517feb9c5.pdf". This is an example of a citation of evidence, and includes a link to the crosswalk which gives Kentucky

a score of 4 on curriculum. This process was repeated for the main "quality" criteria, which includes curriculum, graduation requirement, assessment, implementation plan, and professional development.

The other three criteria, Political Status, Plan Status and Process Transparency often require a degree of research and/or fact checking outside of the ELP. Using Kentucky as the continued example, the plan status for Kentucky was noted directly in their plan however because the plan is a PDF document and therefore is not a 'working document' the researcher looked on both the Kentucky SEEO website and the NAAEE State ELP Status websites, which are more frequently updated, to verify that there had not been an changes in status. Similarly, the KEP document cites state legislation charging KEEC with the development of an environmental education master plan. This information supports the political status category, but also requires verification that no new legislation has been passed in regards to environmental literacy on the state level. After broad internet searches, a review of the KEEC website and of NAAEE State ELP status websites were conducted, the rubric for political status was filled in to reflect that legislation existed to support KEEC but not directly addressing environmental literacy planning. This system is an example of the trustworthiness of the data collection based on the design of the matrix system as well as the verification of data from multiple sources.

The second example of data collection in this section is the rating of a state that was more difficult to evaluate based on a number of factors. This section will use Illinois as an example. When searching for the "Illinois Environmental Literacy Plan", the file that is found is titled "Environmental Literacy for Illinois: A Strategic Plan". It is then necessary to confirm that this document, due to the variation in title, is what the Illinois SEEO is considering their environmental literacy plan in the eyes of NAAEE and for purposes of NCLI funding. This is

verified by checking the NAAEE State ELP status website as well as additional searches for other documentation.

Rating the Environmental Literacy for Illinois Plan was a more time-consuming and difficult process because the plan (here forward, Illinois ELP) does not follow a similar structure to many other ELPs. While it is not stated anywhere in the document, it is clear that the Illinois ELP was not created to follow the guidelines of NAAEE. The structure of the document is, as the title states, a strategic plan with goals, organizational responsibilities, and timelines but very little in term of implementable action plans. Rating of a state like Illinois took considerably more time because the matrix was designed to rate states based on their compliance to NAAEE guidelines and NCLI Act funding requirements, therefore if a state has a document that they consider their ELP but was not designed to follow the above documents, then it makes the rating process a little more difficult but not entirely impossible. The graphic below, FIGURE 5, illustrates how the Table of Contents of an ELP can be revealing in how complicated or relatively uncomplicated the process can be to find the information needed to each rubric.

Using the Environmental Literacy for Illinois, 2010 Strategic Plan as an example, the Table of Contents illustrates how multiple sections in the document may include information that could contribute to a state's score. Conversely, FIGURE 6, below shows how a state ELP that is formed to the guidelines of NAAEE and NCLI Act makes finding information in the plan for the rubrics much easier.

The Table of Contents from the Oregon Environmental Literacy Plan demonstrates that the ELP was formed to fit the guidelines of NAAEE in that the five major recommendations of NAAEE are easily identifiable sections in the Table of Contents. This makes the process of

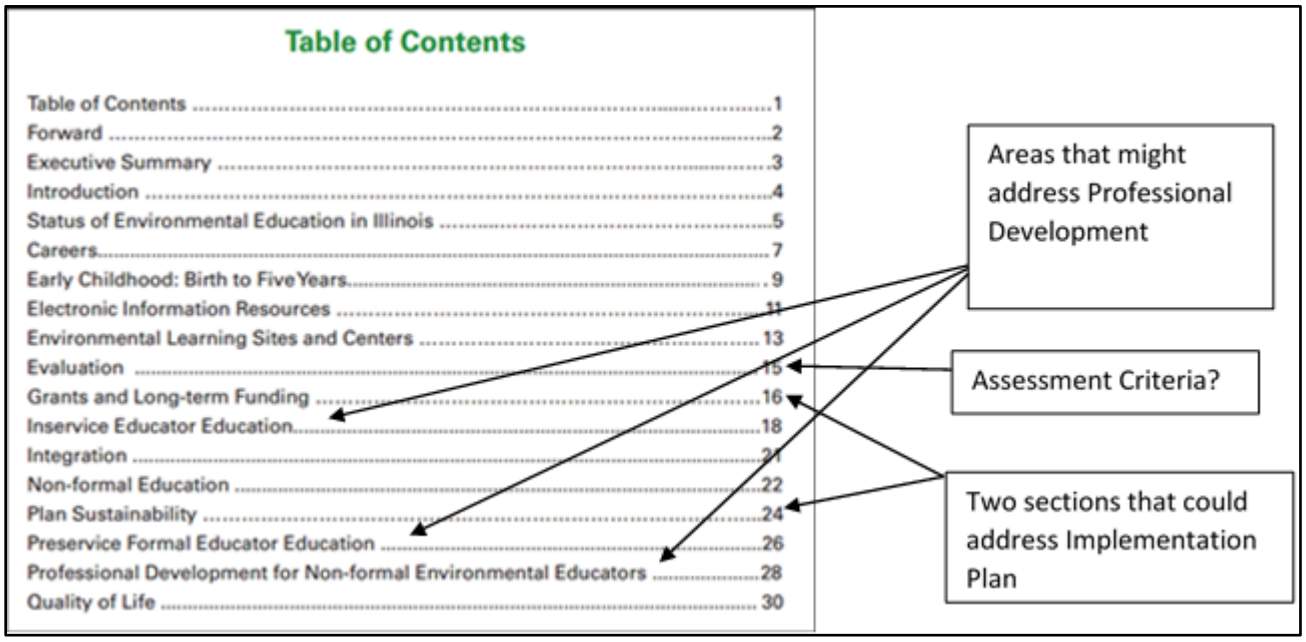

Figure 6: Environmental Literacy for Illinois, 2010 Strategic Plan, Table of Contents- With Author Graphics Added

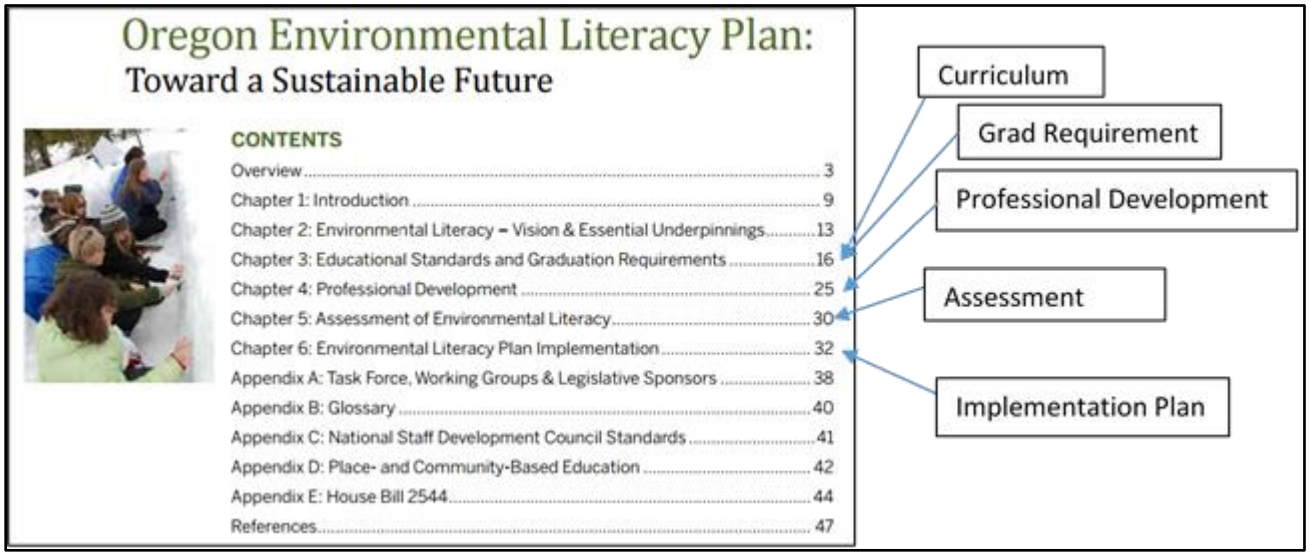

Figure 7: Oregon Environmental Literacy Plan, Table of Contents- With Author Graphics Added

identifying the citations of evidence for each rubric, and ensuring data is not overlooked, a much simpler process. In this case, Illinois did score fairly well on the matrix because of the collaborative nature of their strategic plan assisted in the plan and political status scores, however Illinois lost points in most of the quality criteria because the strategic plan was not developed to meet the recommendations of NAAEE and therefore did not score well on many on the quality rubrics.

In addition to giving examples of the rating process, it is also important to highlight some issues and general impressions in this data collection process including the re-designing of the graduation requirement criterion after the initial data analysis and the impressions regarding the professional development criterion.

During the data collection, the "graduation requirement" criterion was becoming increasingly harder to use as the rubric was initially written. The GR (Graduation Requirement) criterion was originally based upon the NAAEE guidelines which stated that a state ELP "should address how a specific high school course, program, or credit requirement is part of environmental literacy in high school" (pg.8, NAAEE, 2008). However, as the data collection continued, it became harder to differentiate between states that had a required versus elective environmental literacy GR. The former rubric also made it difficult to assign a score to states that had a required course such as Biology, and claimed that it contained environmental literacy components based on the an analysis of the curriculum or a crosswalk, therefore making biology a GR but not explicitly an environmental literacy GR. The GR rubric then was changed about mid-way through the data collection process to reflect the variation in GR across states and to give a clearer scoring system. The final GR rubric is listed in the methodology section of this

dissertation. States that were already scored in the matrix were re-visited to ensure proper scoring with the new GR rubric.

The other impression that arose as part of the data collection is the rating of the professional development criterion. Similarly to the GR criterion, the NAAEE guiding documents do not provide robust detail on what should be included in the professional development section of the ELP. NAAEE states "Both pre-service and in-service teachers will need to be prepared to teach their students about the environment, both in and out of the classroom" (pg. 8, NAAEE, 2008). For the purpose of providing a more clear definition of professional development for the rubric, the definition of professional development to be included in an ELP from the NCLI Act text was used instead. The PD rubric then quotes the NCLI Act in that an ELP should include "A description of programs for professional development for teachers to improve the teachers'— (A) environmental subject matter knowledge; and (B) pedagogical skills in teaching about environmental issues, including the use of— (i) interdisciplinary, field-based, and research-based learning; and (ii) innovative technology in the classroom" (webpage, NCLI 2011). Unlike the GR rubric which was adjusted to vary points, the PD rubric proved more difficult to make adjustments to because the evaluation of the professional development section of each ELP according the specifications listed under NCLI Act would be a rigorous undertaking beyond the scope of this research. Therefore the professional development sections of each state ELP were scored on whether the section existed in the document or not. Because of this, the PD criterion contains very little deviation and is unlikely to contribute significantly to any differentiation in the overall scores of state ELPs. The robustness of the professional development section on an ELP and its effect on the status of the

ELP and/or its effects on environmental literacy across states is an area that will not be addressed in this dissertation work, but it recommended for further research.

Patterns in State ELP Data

The findings of this study primarily consist of a qualitative analysis of the data in the matrix and rubrics system from all 51 states environmental literacy plans. The qualitative nature of this study allows for patterns to be identified in the data but also for the contextualization of patterns through evidence in the rubrics. This section will discuss the main findings identified in the data and the implications of these relationships to continued ELP development and implementation. The patterns identified are broadly grouped into three sections; Total versus Quality Scores, Perceived Effort, and Political Affiliation.

Finding 1: Total versus Quality Scores

The first finding of this research is that the quality of an ELP is an important factor, but there are outside factors that influence the success of an ELP which are evident in the total score. This finding is the foundation to explore other patterns in the data. As discussed in the methodology chapter, the scores of states are primarily being examined in two different ways, the first being the idea of a total score which is the composite score of all 8 criteria weighted and summed to total 1.00. The second way in which states scores are examined is by the idea of "quality scores". The term "quality score" refers to the five criteria that are explicitly listed in the NAAEE guiding documents and the NCLI Act text, being Curriculum, Graduation Requirement, Assessment, Professional Development and Implementation. The highest quality score a state can receive is 0.55 based on the weighted sum of the above mentioned five criteria. The term "quality score" refers to the criteria that can be solely scored on the text of the environmental literacy plan, as opposed to the Political Status, Plan Status and Process Transparency scores

which can be scored based on information on from other data sources such as NAAEE or SEEO websites.

The information provided in TABLE 15 demonstrates some of the relationships that can be found amongst the data by total score and quality score. As noted in preceding sections, the total score is the composite of all 8 criteria while the quality score consists of the sum of 5 of the 8 criteria. The top score a state can receive for quality is 0.55. In both total and quality score, Oregon ranks the highest.

The majority of states near the top of both rankings are the same, however, there are some notable exceptions such as Nevada, Alabama and Ohio. All of whom break into the top five quality rankings but are not listed among the top ten total rankings. The other state to note is Hawaii, which is listed in both rankings but has a much higher score for quality than total. These exceptions, Nevada, Alabama, Ohio and the movement of Hawaii, make a case for the value of the external criteria in the overall success of the plan. In other words, while many of the states stayed in a similar rank in both lists, the states that were exceptions had great quality plans but did not have great political support, movement of their plan within the educational system of the state, and/or did not include public opinion as part of the ELP drafting process. These external factors are part of the total score, but not counted towards the quality score. This pattern points to the assumption that the political support (political status) and educational system support (plan status) play a large role in the overall success of the plan, and may overshadow the quality of the plan. The political support of the plan was anticipated to play a large role in the overall success of the plan as a category under “perceived effort” which will be discussed further in the next section.

The critical aspect of examining to the total and quality scores of plans is in identifying, not only the 'best' states, but also the states that would be better emulated in certain situations. The implications of this idea are discussed in more detail in the concluding chapter.

Finding 2: Perceived Effort

The second finding is that there are two criteria, Curriculum and Political Status, which appear to be critical in the success of an ELP. These criteria are also linked with a larger amount of time, effort and work by the SEEO to rate highly on the rubric and therefore fall under the category of *perceived effort*. The idea of *perceived effort* is that the criteria which require the most amount of time and work, or effort, are the criteria in which there will be the largest differences and therefore will separate the higher ranked states from the lower ones. The *perceived effort* criteria are Political Status, Curriculum and Graduation Requirement. Political Status is in the *perceived effort* category because it requires effort and persistence to contact local legislators and pursue legislation/funding that is specific to environmental literacy. The second *perceived effort* criteria is Curriculum, which requires states to make the effort to crosswalk their state academic standards with environmental literacy concepts in some form. This is a large undertaking for most states have completely volunteer SEEOs, however if a crosswalk is created it becomes a valuable resource for teachers and educators across the state. The final *perceived effort* category is Graduation Requirement because it requires that a state has a required environmental literacy specific course. The GR requirement ties into the Curriculum criteria in that many states claim if they have cross-walked their state academic standards with environmental literacy concepts, then a high school course such as biology should is their required environmental literacy GR. However, several states, such as North Carolina have been

Table 15: Top States by Total and Quality Scores

Rank	State	Total Score	Rank	State	Quality Score
1	Oregon	0.9875	1	Oregon	0.5500
2	DC	0.8250	2	Hawaii	0.4750
3	Kansas	0.8000	3	DC	0.4250
4	Illinois	0.7500	3	Tennessee	0.4250
5	Colorado	0.7375	4	Kansas	0.3750
6	Washington	0.7125	4	Washington	0.3750
6	Tennessee	0.7125	4	New Hampshire	0.3750
7	Kentucky	0.7000	4	Nevada	0.3750
7	Connecticut	0.7000	5	Kentucky	0.3500
8	Hawaii	0.6625	5	Connecticut	0.3500
9	North Carolina	0.6375	5	North Carolina	0.3500
10	New Hampshire	0.6250	5	Alabama	0.3500
			5	Ohio	0.3500

able to have a dedicated environmental literacy course approved as a requirement for all high school students.

The discussion of findings on *perceived effort* will be focused around the top ten states in total score ranked order, which includes 12 states including ties for 6th and 7th. The following table shows the matrix scores for the top ten states. The criteria that will be discussed in this section are highlighted in TABLE 16 for easier reference.

The first *perceived effort* criteria is Political Status. As discussed above, there appears to be a relationship between the top total score and top quality score states, owing some of that difference to the political support of the plan. In examining the top ten states in overall matrix, it is clear that the states that rank the highest in the matrix have political support. Unlike other criteria which have variations in the scores of the top ten states, Political Status shows a clear pattern of documented political support in terms of laws, executive orders or statutory requirements specific to environmental literacy planning are in place for the top 5 states ranked. The 6th and 7th places states have documented political support in terms of by-laws related specifically to environmental literacy planning. In understanding this relationship, it is reasonable then to say that there is a relationship between the political support of the ELP or of the process of environmental literacy planning, and the overall success of the plan. This relationship could be an influential factor for states moving forward in the drafting or implementation steps of their ELP.

The second *perceived effort* criterion is Curriculum, which requires that a state have a crosswalk between state academic standards and environmental literacy concepts. The matrix shows that the states that have put in the effort to create the crosswalk resource not only score highly in the criterion for Curriculum but score highly on the overall matrix. The criterion does

appear to be highly polarized in that very few states score partial points in this category. Within the top ten states, Kansas is the only state that scores partial points which is because they have the Environmental Education Standards for Kansas which were adopted as non-assessed standards for the state of Kansas by the Kansas State Board of Education in 2000, therefore a document exists of state environmental education standards but is not a crosswalk. This is a different approach to state environmental education/literacy standards than most state ELPs take. The other exception to the top ten is North Carolina, who does not have a curriculum guide or other resource, rather depends on environmental education program providers to make links to current academic standards and therefore receives no points for the Curriculum category but scores very well in most other categories. Examples of state ELP that excel in terms of cross-walking state academic standards and environmental literacy concepts are Oregon, DC, Colorado, Washington, and Tennessee.

The third *perceived effort* category is the Graduation Requirement (GR) criterion. As described in previous sections, receiving full points in the GR criterion depends on the state having a dedicated environmental course or program that is required for all high school students. This takes a substantial amount of effort and therefore, it was anticipated that the GR criterion would play a large role in a state's success in the matrix with their ELP. However, upon further investigation of the matrix data, it appears that there is not a discernable pattern between states having an environmental literacy graduation requirement and having an overall high total score on the matrix. The only states in the top ten to have a dedicated environmental literacy GR are Oregon, 1st, and North Carolina, 9th, while the rest of the top ten ranked states either have elective courses for their GR or do not have a GR at all. The implications of this are discussed further in the concluding chapter.

Table 16: Matrix with Highlighted "Perceived Effort" Criteria for Discussion

Environmental Literacy Plan Criteria- Based Matrix (Ruggiero, 2016)			Political Status	Plan Status	Curriculum	Assessment Plan	Graduation Requirement	Implementation Plan	Professional Development	Process Transparency	Total
	Election 2012	Criteria ->									
		Weight ->	0.2	0.2	0.1	0.1	0.15	0.1	0.1	0.05	1.0000
1	D	Oregon	0.2	0.2	0.1	0.1	0.15	0.1	0.1	0.0375	0.9875
2	D	DC	0.2	0.2	0.1	0.1	0.075	0.05	0.1	0	0.8250
3	R	Kansas	0.2	0.2	0.05	0.1	0.075	0.05	0.1	0.025	0.8000
4	D	Illinois	0.2	0.2	0.1	0.05	0	0.05	0.1	0.05	0.7500
5	D	Colorado	0.2	0.2	0.1	0.05	0	0.05	0.1	0.0375	0.7375
6	D	Washington	0.1	0.2	0.1	0.05	0.075	0.05	0.1	0.0375	0.7125
6	R	Tennessee	0.1	0.15	0.1	0.1	0.075	0.05	0.1	0.0375	0.7125
7	D	Connecticut	0.1	0.2	0.1	0.05	0	0.1	0.1	0.05	0.7000
7	R	Kentucky	0.1	0.2	0.1	0.05	0	0.1	0.1	0.05	0.7000
8	D	Hawaii	0.05	0.1	0.1	0.1	0.075	0.1	0.1	0.0375	0.6625
9	R	North Carolina	0.15	0.1	0	0.1	0.15	0	0.1	0.0375	0.6375
10	D	New Hampshire	0	0.2	0.1	0.05	0.075	0.05	0.1	0.05	0.6250

Finding 3: Political Affiliation

The third finding of this research is that the political status of the plan does have an effect on the success of the ELP, but it does not appear that the political affiliation of the state plays a large role. In examining the relationships of state ELPs to the total versus quality score, as well as to the perceived effort criteria, it becomes clear that there is a relationship between the success of an ELP in the matrix and the policy world. The next relationship that should be discussed then is the role of the political affiliation of the state. To determine this, the states voting record in the 2012 Presidential Election was used and corroborated between several major news websites. It is important to note that the voting record of a single presidential election does not reflect the political affiliation of a state over time. It also may not be reflective of the state's political affiliation in terms of state and local offices. However, for the purposes of this research, using the voting record for the last presidential election allows for a snapshot into the role of political affiliation and the success of environmental literacy plans. The concluding sections of the dissertation will discuss ways in which political affiliation effect environmental literacy planning and how political affiliation can better be measured in future research.

The entire matrix contains the 2012 election results of all 50 states plus Washington D.C. however for the purpose of examining the relationship between ELP success in the matrix and political affiliation this section uses the top ten states by total score and the top five by quality score (noting again, with ties this equals 12 and 13 states respectively) as shown in TABLE 17. It just also be noted that the findings of the data in terms of the influence of political affiliation on success of an ELP are based on the patterns identified within the top states of the matrix, as to speak to the success of the matrix by those top states. Currently, with only 36 states having physical ELPs, the inclusion of the political affiliation of all 50 states or even 36 states would

Table 17: Top States by Total and Quality Score including Voting Record in 2012 Election

Rank	Last Election	State	Total Score	Rank	Last Election	State	Quality Score
1	D	Oregon	0.9875	1	D	Oregon	0.5500
2	D	DC	0.8250	2	D	Hawaii	0.4750
3	**R**	Kansas	0.8000	3	D	DC	0.4250
4	D	Illinois	0.7500	3	**R**	Tennessee	0.4250
5	D	Colorado	0.7375	4	**R**	Kansas	0.3750
6	D	Washington	0.7125	4	D	Washington	0.3750
6	**R**	Tennessee	0.7125	4	D	New Hampshire	0.3750
7	**R**	Kentucky	0.7000	4	D	Nevada	0.3750
7	D	Connecticut	0.7000	5	**R**	Kentucky	0.3500
8	D	Hawaii	0.6625	5	D	Connecticut	0.3500
9	**R**	North Carolina	0.6375	5	**R**	North Carolina	0.3500
10	D	New Hampshire	0.6250	5	**R**	Alabama	0.3500
				5	D	Ohio	0.3500

R- Indicates the state had a majority Republican voting record in 2012 Election, according to public record.
D- Indicates the state had a majority Democrat voting recording in 2012 Election, according to public record.

likely skew the findings since some are incomplete ELPs as well as not be a measurement of success of an ELP if all of the ELPS were included in the analysis.

Further investigation of the data in the table reveals that one third of the top scoring states in total scores on the matrix voted Republican in the last election and just a little over one third of the top states in quality score voted Republican in the last election (38%). Although a single year voting record does not account for changes in political affiliation over time, these numbers do speak to a potential minimal correlation between the scores and the importance of political support in the state. This finding does not, however, point to a relationship between the political affiliation of the state and the total or quality score of the plan. Similar percentages of historically conservative states scored highly in the matrix when political support was counted in the total and when it was not (quality score), which implies that the effort of a state to secure political support is important to the success of the plan but the affiliation of the state being Republican or Democratic is not necessarily a strong factor identified by this research.

Digging Deeper: A Contextualization of a Sample of States ELP Scores

Viewing the full matrix of scores speaks volumes about the status and progress of state ELPs in the United States, however it is crucial to understand the context behind the numbers. However, this section is not meant to detail the reasoning behind state scores because that information is easily accessible in the rubrics, it is meant to give context to policy, politics, and culture of the state that may have influenced their scores. The 5 states chosen for this section represent a cross-section of the data for the following reasons, Oregon as the highest rated state in the matrix, Maryland as a state that does not score any points in the matrix but is often considered a leader in environmental education, Kansas as a traditionally conservative state that scores very well in the matrix, conversely, Michigan as a traditionally liberal state that does not

score well, and finally, Washington, DC as a city acting as a state with tremendous political support.

Oregon

Oregon stands out as a substantial leader in the matrix, with a total score of 0.9875. In examining the Oregon state ELP, there are several areas of the ELP that show extensive thought was put in to the development of the plan. Some of these areas include the Chapter 3 which focuses on Curriculum and Graduation Requirements. Oregon has their own environmental literacy standards which are cross-walked with state academic standards and 'essential skills' for grades 3, 5, 8 and High School. The crosswalk is referenced in the ELP as a way to "identify where the learning content for cultivating environmentally literate citizens is supported" (p. 16, Oregon No Child Left Inside, 2013). The other area discussed in Chapter 3 of the Oregon ELP is the graduation requirement which was adopted by the Oregon State Board of Education in 2007, and includes essential skills proficiency as a requirement supported by environmental literacy learning.

The Oregon ELP also provides a robust professional development plan in Chapter 4, which details guiding principles and best practice identification for environmental literacy programming, educator competencies which foster learning and professional responsibilities, as well as general key characteristics of professional development. This section is unique in that it also ties professional development to assessment of environmental literacy, which leads into the next section of the Oregon ELP. The assessment section of Oregon's ELP highlights the use of Oregon Assessment of Knowledge and Skills (OAKS) statewide online system as well as the collection of work samples. Oregon's assessment section briefly mentions the possibility of using the National Environmental Literacy Assessment (NELA) as a "reliable and valid

instrument could be adapted for use in Oregon" (p. 31, Oregon No Child Left Inside, 2013) to establish a baseline of environmental literacy in the state. Oregon is one of a very small group of states to mention the use of a previously established environmental literacy scale for us in the state. The final quality criteria is Implementation Plan, which Oregon also scores full points for their robust plan that not only includes all the key questions regarding funding, laws/by-laws, and model program replication, but also includes a detailed timeline broken into quarters through 2011 and then yearly following with stakeholders assigned to specific tasks. In terms of quality, Oregon scores the highest on both the total and quality scores, and it is evident within the robust and well-developed details of the plan.

While several other states score very highly on the quality score in the matrix, what likely sets Oregon apart in the total score category is the progress of their plan in terms of political support and backing from the Oregon Department of Education. Politically, Oregon has had substantial support for state legislators with the passage of the Oregon No Child Left Inside Act (HB 2544) which was signed into law by Governor Ted Kulongoski in July 2009 (Oregon No Child Left Inside, 2013). In terms of plan status, Oregon's ELP is currently in implementation and data gathering stages, being one of the first states to have progressed to this point. It also appears, in reviewing the list of task force members and stakeholders in the ELP development and implementation, that the various universities across the state have played a large role. Finally, to round out Oregon's high total score, is the Process Transparency criteria which was the only area that Oregon did not score full points. The NCLI Act requires that ELPs are developed with public opinion included in all steps of the process. The Oregon ELP does not explicitly state when public opinion was sought and used during ELP development, however a report titled "working draft of ELP" from the Oregon No Child Left Inside group does state that

"the general public convening working groups and providing feedback were essential to the success of this report" but without further detail of the public commentary process it is not possible for Oregon to receive full points in this category.

It will likely come as no surprise to the environmental education community that Oregon's Environmental Literacy Plan is the gold star of ELPs according to the matrix system. The plan is well-developed and meticulously detailed, with support from the Oregon Department of Education and from state legislators. Even the Oregon ELP states that "Oregon is a world leader in cutting-edge environmental practices" (p. 9, Oregon No Child Left Inside, 2013).

Maryland

Maryland is often thought of among the environmental education community as a leader in the field, therefore Maryland's score on the ELP matrix will likely surprise many educators and researchers as Maryland receives a 0. This is because Maryland does not have a formalized state ELP, however they do lead the country in several environmental literacy key areas that should not go unmentioned.

As stated earlier, the NAAEE State ELP Status Report (NAAEE, 2014) commends Maryland as an exemplary state for their "well-informed and comprehensives plan" (p.14) when Maryland does not have a state ELP as defined by NAAEE or NCLI. This situation continues to illuminate problems with the way in which NAAEE is evaluating the status of state ELPs through interview data only. It also problematizes the measurement and scoring of states in the matrix system when a formalized ELP does not exist. In following the methodological design of this study then, Maryland will receive all zeros on the matrix. The overall goal of this research is to find what criteria are contributing to the success of an ELP and if that success is born out of following the guidelines for ELP development.

However, in attempting to recognize states that are excelling in environmental literacy, other contributions by the state of Maryland should be recognized. Maryland has an environmental literacy graduation requirement in place as well as state standards for integrating environmental education. Maryland was the first state to pass a "strong, clear environmental literacy graduation requirement mandating that public school systems provide all students with a comprehensive, multi-disciplinary EE program infused with the curriculum" (CBF, 2013). Maryland's connection to Representative Sarbanes, one of the co-sponsors of the federal No Child Left Inside Act legislation, as well as to the Chesapeake Bay Foundation, a well-known environmental non-profit, likely have an effect of the success and support that Maryland receives in pursuing environmental literacy education in K-12 schools.

Maryland's score in the matrix represents the methodological design of the study, however their contribution to environmental literacy should not be overlooked. Maryland continues to be a leader in the field of environmental literacy and education, and should they release a state ELP in the future, it would be expected to rate among the top plans in the matrix both in quality and total score.

Kansas

Kansas stands out among the list of the top states in both the total and quality scores. Kansas is a land-locked state with high oil and natural gas production comparatively and is also historically conservative, all factors that were anticipated to be characteristics of low scoring states.

By applying context to the Kansas ELP, there are some factors which may have contributed to the success of the Kansas ELP such as the involvement of Linda Rhoads, formerly of the Environmental Education Association of Oregon. Linda Rhoads is noted as having

contributed significantly to the leadership and vision of the Kansas ELP. Also, despite its high oil and natural gas production, Kansas also ranks among the highest agriculture producers in the country which implies a higher value on education for the future sustainability of the land as an economic resource.

In 2008, Governor Kathleen Sebelius vetoed permits for the construction of new coal-fired energy plants in Kansas and was quoted by Newswire stating that "We know that greenhouse gases contribute to climate change. As an agricultural state, Kansas is particularly vulnerable. Therefore, reducing pollutants benefits our state not only in the short term – but also for generations of Kansans to come" (“Kansas Governor Rejects Two Coal-Fired Power Plants”, Newswire, 2008). Governor Sebelius also issued an Executive Order creating the Kansans for Children in Nature and called for the creation of the Kansas Environmental Literacy Plan (KACEE, 2010). The succeeding state governor, Parkinson, did support the executive order for environmental education in the state but allowed a plan to build coal-fired power plants in the state. The timing of the development of the Kansas ELP appears to be a strong example of a political culture shift that the state was able to use to its advantage by leveraging support from Governor Sebelius.

Michigan

Michigan’s ELP did not score well on the matrix, which may come as a surprise to many who work in the field of EE. Michigan is a popular vacation destination for nature enthusiasts and is one of the leading states in recreational boating, with a high intrinsic value placed on natural resource protection in the state. However, when it comes to a deeper analysis of the Michigan ELP, it appears that the plan is merely a “plan to plan”.

The preface, executive summary and introduction of the Michigan ELP all detailed the robust research, planning and collaboration that went into the writing of the first draft. It is clear that substantial effort went into defining environmental literacy as well as the vision and mission that would guide the development of the Michigan ELP. It is in the plan itself, that Michigan falls short.

The Michigan ELP, as stated earlier, is a prime example of a "plan to plan", which is an ELP that consists of goal statements that are actionable but not implementable. The NCLI Act was written to provide funding for the implementation of the ELPs, therefore goal statements in an ELP such as "Identify the Michigan content standards that have connections to environmental literacy and utilize new or existing classroom assessments to provide evidence of student learning related to environmental literacy, field experiences and service learning opportunities" (pg. 10, MI ELP Task Force, 2014) is an actionable but not implementable statement because it requires work/research prior to being able to be used in the classroom or of use to educators. An implementable statement or section, for comparison, would consist of a curriculum crosswalk and a plan to distribute the crosswalk to educators for their reference. In this sense, the majority of Michigan's ELP consists of goals that require more work or effort prior to being implementable.

Other areas where the Michigan ELP failed to offer substantive goals were in Assessment and Graduation Requirement. For the Assessment section, Action 5.4.1 and 5.4.2 state that Michigan will examine existing frameworks and identify best assessment practices. This section, again, demonstrates a lack of effort in the development of the ELP in that Michigan has yet to conduct research of best assessment practices and plans to snowball off the assessment efforts of other states. Michigan is, however, one of very few states that mentions the possible use of

existing national environmental literacy frameworks. The topic of national environmental literacy frameworks in ELPs is underexplored and as mentioned in above sections, will be explored in further research. Michigan also fails to mention any specific details regarding an environmental literacy graduation requirement, except to say "Outcome 5.1. Educators and administrators are aware of options that allow students to meet existing state-mandated graduation requirements through courses that focus on or include environmental literacy" (p. 18, MI ELP Task Force, 2014), but without a curriculum crosswalk, that statement is meaningless.

The matrix consists of many states that fall into the "plan to plan" category. The "plan to plan" ELPs could be a reflection of the collaborative writing process of ELPs, in that there are many decisions to be made in terms of content of a state ELP, so the SEEO or writing team must choose the best alternatives within their limitations. For Michigan, it may have been lack of funding or time/expertise of the writing group that limited their ability to produce substantive implementable goals in their plan. It could also have been a result of the vague guidance in the NAAEE 'developing a state ELP' documents that Michigan developed a less than robust ELP.

The Michigan ELP is not to be considered an example of a "bad" ELP, but rather an example of an ELP that could use more attention and work. The Michigan ELP, in terms of its measurement on the matrix, is an example of a 'framework' or a "plan to plan" that would likely require additional detail in order to receive grant funding through the NCLI Act.

Washington DC

Washington, D.C. is an example of a unique ELP due to its status as a city acting a state, with substantial political backing. The DC ELP is a robust, well-written plan that addresses almost all of the NAAEE guidelines and NCLI Act requirements. What makes the DC ELP

special is not necessarily the plan itself, although well-developed, but the political support and policy action.

The DC ELP is supported by legislation that is an untraditional way of approaching environmental education but appears to be effective regardless. The Council of the District of Columbia instituted legislation in 2010 called the Healthy Schools Act which supported better nutrition and physical activity for students. It also called for learning about the environment as an important facet of maintaining healthy behaviors. This created an opportunity for the development of a DC ELP to be a policy-supported mandate, and in 2011, the Healthy Schools Act was amended to include environmental literacy plan specific working and required a draft by 2012 (DC ELP Workgroup, 2012). In addition to legislation support by former Mayors and the Council of the District of Columbia, DC also has the backing of the environmental advocacy power-house the Chesapeake Bay Foundation.

The NAAEE ELP status report of 2014 highlights all of the political support and policy action that has allowed for a favorable political arena for the DC ELP. However, the NAAEE status report does not mention the strength of the plan itself. The DC ELP scores extremely well on both the total and quality scores in the matrix. The DC ELP should serve as an example of a well-designed ELP with strength in curriculum, professional development and assessment, as well as strong plans for graduation requirements and implementation. Considering the structure of the DC education system and the number of agencies/organizations involved in the support and development, the DC ELP should be viewed as a strong example of a well-written collaborative plan that has excelled as a result of the proximity to the capital and advantageous political support action.

Comparing State Status Research

The findings of this research are a combination of empirical patterns identified in the matrix data through the rubric system and citations of evidence, and from the contextualization of state data through external research. While the NAAEE state ELP status reports uses primarily interviews to understand the status and this dissertation uses empirical evidence based on the plans as policy-documents, the status of research on environmental literacy planning can best be summarized by the following from the DC ELP; **"**Although each state's environmental literacy plan includes a section for implementation, it is too early to determine the success of each individual state's plan. Early successes, such as Maryland being the first state with an environmental literacy plan (in 2009) and subsequently being the first in the nation to adopt an environmental literacy graduation requirement in 2011, are news stories rather than empirical research; however, various environmental education associations throughout the country have anecdotally noted the increased shared efforts between state education agencies, local education agencies, natural resource agencies, university researchers, and environmental educators" (pg. 31, DC ELP Workgroup, 2012). This statement highlights both inconsistencies and the need for further research.

The DC ELP notes Maryland as an 'early success' as does the NAAEE state ELP status report, which is contradicted in the findings of this paper. This speaks to the second point which is the need for further research. The statement above gives an example of the need for both empirical evidence and interview data to obtain a more complete view of the status of environmental literacy planning in the US.

The concluding chapter addresses the implications of the findings of this research for the continued development and implementation of Environmental Literacy Plans. The final chapter

also discusses other limitations that should be considered when addressing the topic of environmental literacy plans including Next Generation Science Standards, the role of ‘local control’ states, and the influence of political culture shifts.

CHAPTER V: CONCLUSION

The final chapter of this dissertation aims to understand the findings of the matrix data in terms of the implications for the continued development and implementation of environmental literacy plan. The implications of the three main findings can provide some insight into the success of an ELP and can also be summarized into a few broader recommendations including which criteria are likely worth the effort in making improvements to and the overall value of the matrix to SEEOs.

Areas of Effort

In terms of effort of an SEEO to make changes or to focus current efforts on certain criteria, two stand out, Curriculum and Political. Creating a curriculum crosswalk does appear to be worth the effort involved in terms of the success of a plan. The data shows that states that scored highly on the matrix did take the time and effort to create that a curriculum crosswalk. As stated in earlier section, Simmons (2010) and NAAEE (2010) do recommend that a state ELP should links explicit use to Excellence in Environmental Education: Guidelines for Learning (K-12) as the framework and create a crosswalk with your state academic standards. However, the effort to pursue a mandatory environmental literacy graduation requirement does not appear to have an effect on the overall success of the plan.

The lack of a pattern in the Graduation Requirement criterion, unlike Curriculum or Political Status, would imply that the effort to create and pursue an explicit environmental literacy graduation requirement does not have a large impact on the overall success of the plan. It should be noted however, that the ELP must have an elective course, or at least address a plan for a GR in order to be eligible for funding under NCLI Act. Therefore, the identification of this

particular lack of pattern indicates that it terms of success of the plan to fit NAAEE guidelines and NCLI funding requirements, there is little reason to justify the effort it may require for a state to pursue a dedicated environmental literacy graduation requirement as opposed to an elective course. According to the matrix data, it appears to be a better course of action to spend the effort linking state academic standards with environmental literacy curriculum, and it turn identifying a high school course which contains identified components of EL rather than creating and getting approval for a dedicated EL course as a requirement for graduation.

While strictly in terms of success of an ELP, a mandatory environmental literacy graduation requirement may not contribute heavily to the overall success of the plan, however, that does not mean that graduation requirements should not be advocated for. This criterion is one that illustrates contradictions within the field. A mandatory environmental literacy GR would be a mechanism for helping move students on the literacy progression scale from Nominal to Functional to Operational, and are therefore pertinent to increasing environmental literacy on a broader level than just examining ELPs. The implications of this section then, may point to a lack of necessary focus by the NAAEE guidelines or the NCLI Act which undermines the potential importance of creating a mandatory environmental literacy requirement for all students.

Politics and Policy

The second implication of the findings of this research is simply, politics and policy matter. Pursuing political backing for state ELP does appear to play a role in the overall success of the plan, as discussed earlier. However, tying to the third finding, while the political status or backing of the plan matters, the political affiliation of the state does not. There are highly successful ELP in both historically liberal and conservative states (based solely off the last election voting record, which is discussed in detail in earlier sections). The importance of this

information may be identifying historically conservative states that have a well-developed and well- received environmental literacy plan, whom could act as an example of success for states with similar demographic patterns.

The matrix identifies Kansas, Tennessee, Kentucky and North Carolina as historically conservative states that have demonstrated success both in quality and support for their state ELP. This information contradicts a larger point of contention in the environmental education and even more generally, the entire education community. It is not uncommon to hear that only "liberal tree-hugging" states can gain political and social momentum for environmental education. The findings show that 30% of the top ELPs come from historically conservative states. While this number is not exceptionally high, it does give examples of conservative states that have become leaders in environmental literacy and provides evidence of a hopeful situation for environmental educators in conservative states. This information, also, hopefully points to a changing dynamic in regards to politics, policy, and the misconceptions of environmental education as a bipartisan topic.

Identifying "Best" State ELPs

In an effort to identify the "best" state ELPs, this dissertation research aims to clarify that ***the "best" states may not be the ones in which score the highest on the matrix***. One of the most crucial findings of the matrix is the identification of states that that rank well in the matrix but also can provide a better model ELP for another state. While Oregon scores the highest on the matrix, it does not make sense for every state to model their ELP off of Oregon because not many states have a similar culture to Oregon. The matrix allows for the opportunity for states to see who has one of the 'best' ELPs that is comparable for their state or SEEO. For example, Arizona has yet to start their ELP. The Arizona SEEO may want to identify several of the top

states in the matrix that have similar demographic, socio-economic, political and/or geographic cultures to model their plan off of. In addition, there are considerations for the understanding of the current level of environmental literacy in the state. While Oregon's plan may be designed to move their state from Functional to Operational Environmental Literacy according to Roth's scale defined earlier, a state such as Texas may need to design a plan that can first move from Nominal to Functional and later be revised for movement towards Operational. In other words, just because Oregon's plan scores nearly perfect on the matrix does not mean it is an appropriate model of a "best" plan for all states to mimic.

Implications of Being Boundedly Rational

The Theory of Bounded Rationality frames the findings of this research as a whole by applying the lens in which the limitations of both the research process and of an individual ELP can be examined. The research process is bounded by the criteria as well as by the cognitive and time limitations of the researcher. The examination of an individual ELP is bounded by the cognitive and time limitations of the SEEO that created it, but more importantly by the limitations of or lack of guidance from the NAAEE guidelines for developing a state ELP. An individual ELP, in its creation, was also often bounded by the NCLI Act recommendations and the lack of funding. All of these factors, or limitations, should be considered when reviewing the findings on environmental literacy planning. However, still influenced by the Theory of Bounded Rationality and the human need for goal-oriented behavior, the 'best practice' states with the most ELP success can still be identified as exemplary states, if, one also keeps in mind the bounds of the research process and bounds of the development process of an ELP.

In applying TBR, it is also necessary to recognize that there are other bounds on a SEEO in the development of their ELP which may be individual to the state. The following sections

attempts to identify and contextualize several bounds that were identified in the research process that may have had an impact on the success of a state ELP but were either unmeasurable in the process or did not apply to the major of states. These additional limitations include the influence of Next Generation Science Standards, 'local control', and political culture shifts.

Linking to Literature

The findings and conclusions of this study have several clear ties to the literature presented in earlier chapters. Most prominently is Roth's (1991) work on environmental literacy progressions and the work of Coyle (2005) on the lack of environmental education and understanding in the US. The combination of those two works show the current status of US environmental education is Nominal in terms of literacy progressions but considering the development of 48 state ELPs, it would seem as though educators are trying to move students and the general public from Nominal to a move sophisticated level of environmental understanding and action. There is much more to be explored in terms of Roth's definitions of environmental literacy progressions in comparison to the working definitions in state ELPs. The progression of state ELPs and, more broadly, the progression of communities to Functional or even Operational EL would require the influence of action for change. While content knowledge should proceed action, the idea of teaching students to act on environmental issues may have other consequences for the political world of environmental education as states move forward with the implementation of their ELPs.

The second tie to the literature is also in the combined implications of several works from Darling-Hammond (1990) and Cohen and Ball (1990) who stated that policy reform has substantial ripple effects in the classroom. Combining that with the idea that 'top-down' policy reform often fails due to lack of local policy context (Darling- Hammond, 1990) would help

explain the strong curriculum crosswalk sections of the environmental literacy plans. The curriculum criterion would arguably have the most effect on classroom teachers, therefore, in keeping with the literature, these 'bottom-up' or grassroots policy documents in being written by educators have strong local contexts.

Extraneous Bounds and Limitations

In addition to the bounds addressed in earlier sections, there are other limitations to the success of an ELP that should be addressed however the research data does not support these additional bounds as being large inhibitors of success at this point. Such bounds are the influence of Next Generation Science Standards, the role of 'local-control' in state education policy, and the inevitability of political culture shifts in the state.

Next Generation Science Standards

As summarized well in the Nevada ELP executive summary, "As Nevada transitions to a new vision for science education with its adoption of new Nevada Academic Content Standards for Science, it is significant to note that Environmental Literacy both supports these efforts and compliments them" (p. 1, Nevada ELP, 2015), the role of Next Generation Science Standards in the United States will likely compliment efforts of increased environmental literacy. One of the states that recognized this very early was Kentucky, who created a crosswalk of NGSS and the NAAEE Guidelines for Excellence in EE. This crosswalk has the potential to be very useful for states progress with their ELP. If a state adopts NGSS and recognizes NAAEE Guidelines for Excellence in EE, then a crosswalk of standards already exists. Based on the matrix data which shows the presence of a crosswalk has a relationship to the overall success of an ELP, states which adopt NGSS and recognize NAAEE Guidelines for Excellence in EE could see more

success with their ELP if the state incorporates or recognizes the existence of the Kentucky NGSS/EE crosswalk in their ELP.

Local Control

In conversations with EE professionals during presentations of the pilot study and preliminary data analysis for this research, the topic of 'local control' was mentioned several times. The idea of local control is broadly that school districts or LEA (local education agency) has control over certain educational decisions, such as curriculum. The term local control however, is very ambiguous and is defined differently in both official legal contexts on a state by state basis as well as casually by educators and education professionals.

As the idea of local control relates to environmental literacy planning, the Colorado ELP will be used as an example. The Colorado ELP states, "As a local control state, the 178 Colorado school districts and their school boards make public education decisions such as setting local curriculum and local graduation requirements" (p. 12, Colorado ELP, 2012). Colorado, despite being a "local control state", still scores highly in the matrix and receives full points for having a curriculum crosswalk. Colorado does not score any points for graduation requirement as it is not even mentioned in the text of their ELP. As discussed in above sections, having at minimum a graduation requirement elective that ties to environmental literacy will suffice for both NAAEE guidelines and NCLI Act funding requirements. Even if districts or LEAs are able to define their own graduation requirements, if the Colorado ELP detailed a possible elective that districts could use as an environmental literacy component, then Colorado would have scored full points on the GR criteria. Therefore, Colorado's use of being a local control state as the reason for not including a graduation requirement is essentially an unfounded justification for lack of effort in the plan.

Another example of a state that uses the term local control in their ELP is California, but with an entirely different context. In California, districts are subject to Local Control Funding Formula (LCFF) under law (California ELP, 2015). "Under the LCFF, each school district must adopt a Local Control and Accountability Plan (LCAP) that demonstrates how actions and services are provided to improve the performance of all pupils in the state priority areas" (p. 22, California ELP, 2015). The idea of local control in California is heavily influenced by funding, which in comparison to Colorado, does not affect their curriculum or graduation requirement criteria but may have an effect on the implementation section of the plan because a substantial portion of the implementation criteria is addressing funding.

Both Colorado and California's ELPs score well on the matrix, however it seems as if both states use the term 'local control' as a mitigating circumstance for the lack of attention to detail in certain portions of their plan. The term local control is exceedingly arbitrary and, in the study of environmental literacy plans, does not limit the plans themselves but rather is used as the justification for limited plans.

Political Culture Shift

The findings of this research, as discussed above, show that political support of an ELP may have a relationship to the overall success of the plan. While the 2012 election voting record of the states allow for some context of the political affiliation of the state, it is not necessarily an indicator of the political affiliation over time. A limitation of the states in the creation and implementation of their ELP that should be addressed is a political culture shift. The following section gives three examples of a political culture shift, the Kansas ELP that benefited from a shift, the Florida ELP which did not fare well in a political culture shift, and a discussion of the undetermined effects of a current political culture shift on the Kentucky ELP.

The success of the Kansas ELP may, in part, be due to good fortune or the identified opportunity related to the political culture of the state at the time. As described in the findings section, the Kansas SEEO identified Governor Kathleen Sebelius as an environmental literacy champion and was able to use her capacity to leverage license for the development of their ELP. Shifts in the political climate of the state that support pro-environmental behavior and planning may not happen frequently, but Kansas is a key example of recognizing and leveraging a political shift that could be useful to the SEEO.

Florida, however, provides an example of a political culture shift that was detrimental to the ELP development. The Florida ELP states that in July of 2015, the "dissolution of Florida Office of EE results in halt to continued implementation" of the ELP and any other progress related to the Florida Environmental Literacy Plan. In spite of this, LEEF (League of Environmental Educators in Florida) continues the Florida ELP in relation to professional development and classroom activities with educators with help with the Florida Department of Education. As political cultures in the state shift, policies and plans that are unfunded and un-mandated are often disregarded first. However, new federal legislation changes may create an opportunity for Florida to continue with their ELP development and implementation. These federal legislation changes will be discussed in further detail in the next section.

Currently the status of the Kentucky ELP in relation to political culture shifts in the states is an area of interest. The last eight years, Kentucky has been led by Executives offices that were all Democrats, including Governor Beshear who was in office from 2008-2015 and has provided documented support for both the Kentucky ELP and the Kentucky Environmental Education Council. In 2016, for the first time in eight years, Kentucky will have an almost entirely Republican affiliated Executive Office including a newly elected Governor. While the findings

of this research conclude that political affiliation may not be correlated with success of an ELP, it does find a potential correlation to political support of an ELP. Therefore, the continued success of the Kentucky ELP may be dependent on the KEEC being able to leverage support with the new administration in the state.

State political culture appears to have played a role in the support, funding, development, and implementation of state ELPs in the last few years. However, with recent changes to federal legislation, the role of state support may no longer have a strong impact on the overall success of environmental literacy planning on the state level.

Legislative Progress

In December of 2015, President Obama signed legislation titled the "Every Student Succeeds Act" (ESSA) into law, which is a reauthorization of the Elementary and Secondary Education Act (ESEA). The ESSA legislation includes wording, for the first time, which directly addresses the need for environmental education and hands-on learning in K-12 classrooms. The legislation also allows environmental education programs to now be eligible for grant funding as part of the Title IV for a "well-rounded education" as well as 21st Century Community Learning Center grants.

The visual description, FIGURE 7, shows the relationship of potential funding opportunities for environmental education under ESSA. The Title IV grants are specific to hands-on, field-based, or service learning to enhance understanding of science, technology, engineering and math subjects provides a potential boost for environmental science education programs. While the 21st Century Community Learning Center grants provide funding for the creation or continuation of community learning centers, which can now include environmental education centers and programs. Under both of these funding opportunities are the possibility of

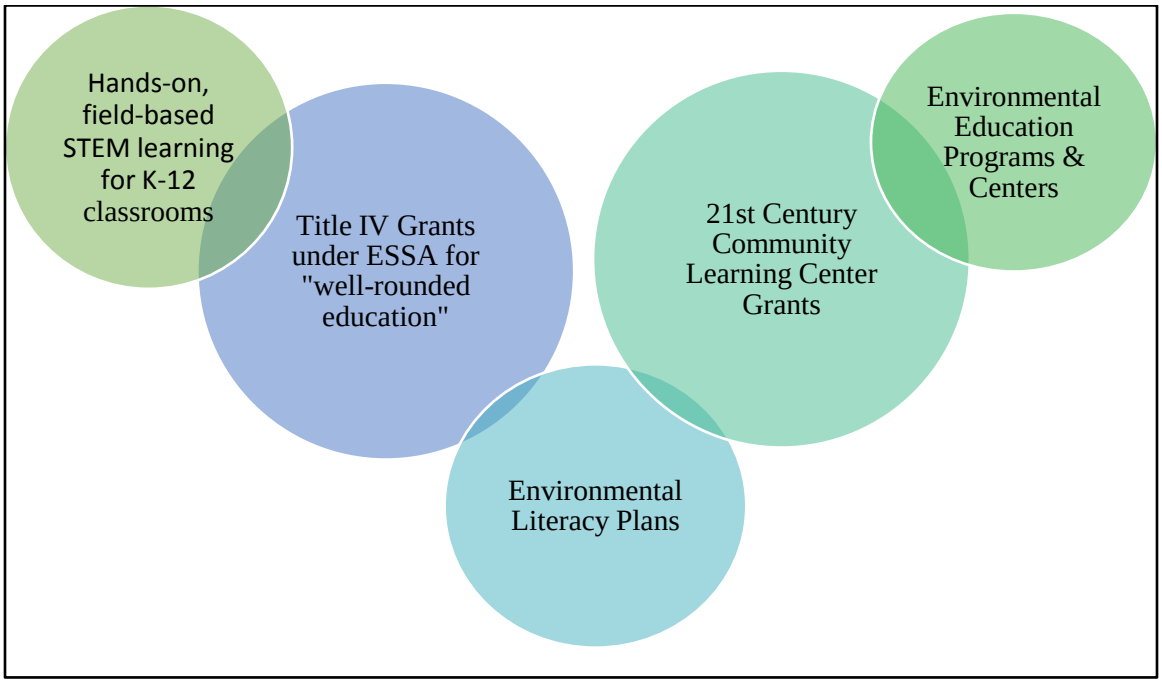

Figure 8: Description of Relationship of Funding Opportunities for EE under ESSA 2016

funding for environmental literacy plans where there was not federal education funding before, however there is not any language specific to the development, funding or implementation of environmental literacy plans. At this juncture, it is unclear how environmental literacy plans will specifically fit into this legislation and edibility for grant-funding. However is a monumental step for environmental education and opens doors for possible federal funding of environmental literacy plan development and progress. The findings of this research aim to inform states of their progress in terms of NAAEE guidelines and NCLI Act requirements with the hope that states will make necessary changes to be in the best possible position should grant funding explicitly earmarked for ELPs become available.

Continued Research Efforts

With any research topic, but particularly one as under-studied and timely as environmental literacy, there are further research that needs to be addressed. The following section describes some of the research efforts currently underway by the researcher as well as some questions open for continued research in this field.

Current Efforts

As described in above sections of the role of assessments of environmental literacy, Ruggiero and Aydeniz (TBD) are using the matrix data specific to assessment sections of environmental literacy plans to gain a better understand of the state use of research test scales. The research examines several scales such as MSELI, MSELS (including its roles in NELA), CHEAKS, and others. Preliminary reports show that the majority of state ELPs do not mention the use of any of the scales reviewed. The preliminary findings suggest a disconnect between academic- researched validated scales for assessing environmental literacy and the information available to SEEOs in the assessment planning workshops for their ELP. It is anticipated that a

panel of environmental literacy assessment experts will convene as a panel in mid-2016 to discuss the matter further. The conversations and recommendations of this panel will be included in the report of findings by Ruggiero and Aydeniz.

Another question that is currently under investigation is the role of ELPs in addressing global climate change education, particularly in considering the adoption of Next Generation Science Standards (Golden &Ruggiero, TBD). An examination of the crosswalk of NGSS and NAAEE Guidelines for Excellence in EE, created by the Kentucky Environmental Education Council will likely be a pertinent resource in this ongoing research.

Finally, the researcher is also investigating the political culture shift on a federal level with NCLI Act by using Borrowing Strength Model to understand license and capacity shifts by major actors (Ruggiero, 2016). The Borrowing Strength Model is helpful in examining the influence of state actors on federal legislation that will fund state action. The examination of license and capacity focuses on two main policy champions in this field, Representative Sarbanes of Maryland and Senator Reed of Rhode Island, the original co-sponsors of the No Child Left Inside legislation. The preliminary findings of this research are currently being adjusted to reflect the passage of ESSA, and in turn the effects on environmental education/literacy in K-12 education.

Continued and Adapted Use of Matrix Model

The findings of this research are critical to the environmental literacy community in the continued development and implementation of their plans. Further analysis of the data is recommended, including an expert-panel review of the matrix data and a member-checking protocol with members of each SEEO. Functionally, this may include ELP creators, academic researchers in EE, and environmental educators. The updating and review of the matrix should

take place on a yearly basis as ELP development is happening continually and will likely increase with the possibility of federal funds for environmental education in the near future. The matrix data should also be supplemented with strong qualitative research to provide context for the scores of each state as well as the steps the SEEO took to ensure success of their ELP. A narrative study of the progress of several ELPs in terms of political support, of varying political affiliations, could be a useful report for states struggling to gain political footing.

Finally, the matrix system itself is unique to the field of education and has several possible applications, including an adapted model for an international comparison of environmental education/literacy.

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