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A WATERSHED MOMENT: IMPLEMENTING STATE ENVIRONMENTAL LITERACY
POLICY INTO A CENTRAL VIRGINIA SCHOOL DISTRICT

A dissertation submitted in partial fulfillment of the requirements for the
degree of Doctor of Philosophy at Virginia Commonwealth University

by

Melinda J. VanDevelder, Ph.D.

Master of Science, University of Arkansas at Pine Bluff, 2001
Bachelor of Science, Tennessee Technological University, 1999

Director: Charol Shakeshaft, Ph.D.

Professor, Department of Educational Leadership
Virginia Commonwealth University
Richmond, Virginia
April, 2018

Dedication

There are many people who contributed support, encouragement, and love to this dissertation. Starting at the very beginning, many thanks to my parents who always made sure I had my feet in some form of puddle, creek, lake, or ocean, and who have championed me at every level of educational pursuit, even when they knew I would end up being overworked and underpaid. I would like to send sincere thanks to the thousands of students who have allowed me to teach them science; thank you for making me walk the talk. Lastly, my favorite, David, is my “base,” who has put in as much work into supporting me through this degree as I have put into it myself. Thank you for the countless conversations, feedback, edits, pep-talks, and late-night coffee sessions. You are my partner in all things, and I look forward to our next adventure. It is official, you won the bet!

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Abstract

A WATERSHED MOMENT: IMPLEMENTING STATE ENVIRONMENTAL LITERACY POLICY INTO A CENTRAL VIRGINIA SCHOOL DISTRICT

By Melinda J. VanDevelder, Ph.D.

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

Virginia Commonwealth University, 2018

Director: Charol Shakeshaft, Ph.D., Professor, Department of Educational Leadership

Policy goals may be impossible to achieve at the classroom level (Ravitch, 2014), as policy depends on those who implement it (Lipsky, 1980). The purpose of this research was to investigate how the voluntary environmental educational executive order, EO42, was implemented and executed in a Central Virginia Public School district. The requirements of EO42 were former Virginia Governor MacAuliffe's response to a multi-state policy he signed called the 2014 Chesapeake Bay Watershed Agreement, which called for all Virginia public education schools to implement Meaningful Watershed Educational Experiences (MWEEs) with students at the elementary, middle, and high school levels. Interviews of state educational and environmental policy-makers indicated EO42 was a hurried process that came without funding and which was done, in large part, to make a political statement. An interview of the Central County Public School's science specialist portrays the practices used with local environmental outreach educators in order to prepare 64 middle and high school science teachers to implement MWEE lessons required by EO42 for the 2015-2016 school year. A 2 x 2 Chi-squared analysis done on data collected from teacher surveys indicated a statistically significant difference [Chi-

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squared (1 d.f.) = 4.17, $p < 0.05$] between teachers' professional development attendance and teachers' perceived ability to complete a MWEE lesson with their students. Analyzed teacher survey data also indicates that teachers who had attempted MWEEs in prior years were more likely to attempt a MWEE with their students [$t(61) = -2.846$, $p = 0.006$] than were teachers who had not. Though 83% of teachers reported completing a MWEE with the majority of their students, analysis of teacher-reported lessons indicated that only 22% of teachers completed the four components required of a MWEE (environmental issue definition, an outdoor field experience, an action project, and project synthesis and conclusion). Results indicate that there is much work to be done when introducing new policy into secondary schools (Ball, Maguire, & Braun, 2012).

Chapter 1: Introduction

There are many goals of public education. In addition to academics, schools provide services intended to benefit the collective goals of the community, one of which is to prepare students to be competent, community-oriented workers (Darling-Hammond, 2010). Other goals, according to Dianne Ravitch (2014), are to “prepare children for the duties and responsibilities of citizenship...and to make wise decisions about the future of our society” (pg. 12). One of these duties is to become more aware of society’s impact on the environment and to prepare future citizens to understand the scope of these issues with greater clarity, as there is an ever-increasing need for the public to become more literate. This importance is long since validated (Coyle, 2005).

Policy that does not get implemented as planned will be ineffective (Fullan, 1979), and there is tremendous need for sound environmental education policy in public schools. During the past three years, temperatures peaked at historic highs (National Center for Environmental Information, 2018) and our nation has witnessed the catastrophic effects of failed social and environmental policy when residents of Flint, Michigan learned their drinking water was toxic. Given an ever-growing list of environmental problems, coupled with a general lack of adequate public knowledge about them, there is a need for solid, sound environmental education in public schools. The need for this push for environmental literacy was evidenced by the National Report Card on Environmental Knowledge, Attitudes, and Behaviors (Coyle, 2005; NEETF/Roper

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1999), which showed a tremendous lack of public knowledge about the most common water, air, and land pollutants (NEEF, 2015).

When implementing new education policy, there are many different levels of implementation and translation that must occur (Ball, Maguire, & Braun, 2012). The forming and implementing of education policy is a complicated dialectic that occurs at multiple levels by stakeholders within the public education system (Mansfield, 2013). Recently, both federal and Virginia education policy expanded to include the teaching of environmental literacy as part of the duties and responsibilities of public schools. Virginia's former Governor, Terry McAuliffe, issued an Executive Order (2015) concerning environmental literacy in Virginia's public schools:

The ultimate goal is to develop and nurture a future environmentally literate citizenry who will make informed decisions concerning the environment, and will develop the propensity to act on those decisions to improve the well-being of other individuals, societies, and the global environment. (p. 1)

Much literature is dedicated to the positive effects of environmental education on students (Louv, 2005; No Child Left Inside Coalition, 2009; Riordan & Klein, 2010; Zint, Kraemer, & Kolenic, 2014). Successful outcomes of this new political endeavor will primarily rest on the shoulders of classroom teachers. Education systems lacking proper supports for their teachers will struggle to provide students with meaningful learning (Ball, Maguire, & Braun 2012; Darling-Hammond 2010) and may not succeed in meeting the new environmental literacy requirements.

Virginia's public education system is a complex web of federal, state, and local government influences and requirements, which regulate schools and teachers that provide educational services to students with varying abilities. Federal education policy affects state,

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district, and local school policy. At the state level, the governor has power to introduce and execute policy. The governor also has the power to appoint the nine members of the Virginia Board of Education. According to the Virginia Constitution, the state Board of Education has general supervision of all public schools (§ 22.1-16). Each district sets parameters for how schools function within the proposed state policy guidelines, and each school directs how teachers execute policy. A graphic example of how Virginia’s education policy matriculates through the political system is provided by the Virginia Education Policy Center (2013), and is shown in Figure 1 below.

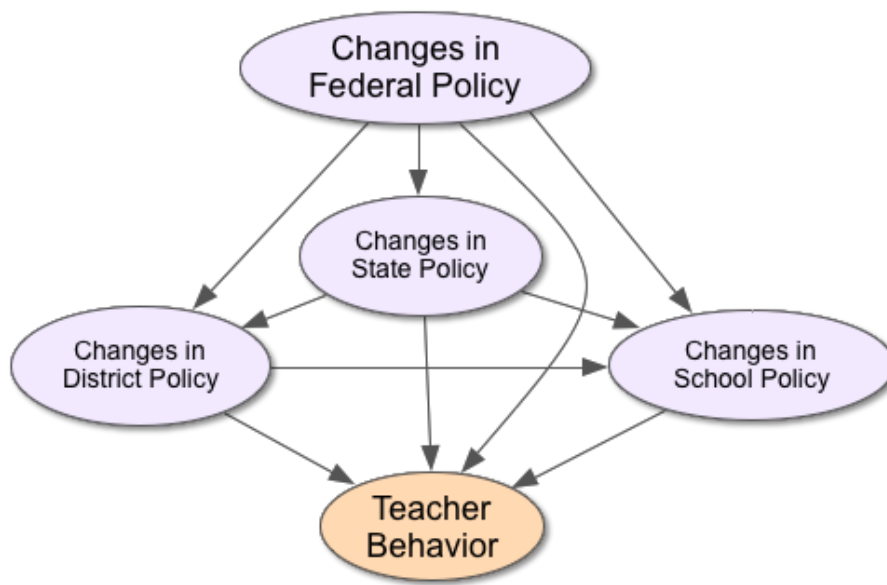


Figure 1.1 The hierarchal levels involved in making and enacting education policy.

As indicated in Figure 1, teacher behavior is at the bottom rung of policy implementation, but how teachers interpret and manage policy can influence the actual success of the original intent of the law. Introducing education policy is a difficult process that requires critical

examination of all levels of implementation, especially when goals established at one hierarchical level can actually be impossible to achieve at the teacher level (Ravitch, 2014).

Statement of Problem

Watersheds are defined as physical environmental contours, and they serve as an effective metaphor to describe how policy flows from implementation to execution.

Ecologically, a watershed describes groundwater flow from the highest point of land to the lowest communal body of water, where particles from each elevation flow downstream. Like its geologic counterpoint, education policy is a phenomenon in its own right and flows “downstream” from interest groups and policy makers to school districts, through schools, and into the classroom. As watersheds with high levels of pollutants usually terminate in murky waters, so does education policy, particularly when policy exists without appropriate follow-through at the many organizational levels that filter it.

Two environmental policy watershed moments happened in 2015 that have the potential to affect environmental literacy education at both the national and the Virginia state level. After the No Child Left Inside bill stalled and failed to be enacted by Congress in January, 2015, President Obama signed the Every Student Succeeds Act (ESSA) on December 10, 2015, which includes a mandate for environmental literacy to be taught in America’s public schools. On April 22, 2015, Virginia Governor Terence McAuliffe signed Executive Order No. Forty Two (EO42), establishing the Virginia Environmental Literacy Challenge. This challenge highlights the responsibility of the state to conserve and protect natural resources and stresses the importance of having an educated public that is able to understand the value of existing natural resources. Additionally, the executive order calls for all public school students to engage in at

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least three meaningful watershed educational experiences (MWEE) during elementary, middle, and secondary education.

The proverbial pebble has been thrown, and it is up to all interest groups involved to ensure that environmental literacy ripples effectively and equitably to all students within the watershed. The groups with this responsibility in Virginia consist of the Governor's cabinet, state environmental outreach agencies, the Department of Education, and Virginia's preK-12 public schools. The Chesapeake Bay Foundation, one of the leading forces of the No Child Left Inside Coalition, is a force driving EO42, as the bill was written in response to the multi-state 2014 Chesapeake Bay Watershed Agreement. Large-scale reform occurs when all involved parties collaborate (Fullan, 2009). Successful investigation of policy requires a bottom-up classroom approach, a top-down policy approach, and an exploration of the perimeter groups who provide environmental outreach education within the greater Richmond area. If the environmental literacy policy is expected to succeed, then classrooms must be supported in conjunction with the environmental education policies. At the core of the new policies for environmental literacy is a call for science classrooms to engage in student-led, project-based learning coupled with teacher supports. However, in this new content expansion with increased classroom expectation, who supports the teacher, what supports do they require, and how are those supports going to be most successful?

Rationale for Statement of Problem

The actions, behaviors, and decisions of the teachers of environmental literacy have an enormous impact on the effective implementation of EO42. As Lipsky stated, "policy implementation in the end comes down to the people who actually implement it" (Lipsky, 1980, p. 8). The intended policy goal of implementing EO42 (2015) is to promote meaningful

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watershed educational experiences for all of Virginia's public school students in elementary school, middle school, and high school. Public education classrooms are expected to educate students about a range of social issues, civic mindedness, and public health behaviors in addition to providing pre- K-12 academic curricula; however, with the narrowing of school curricula in response to high-stakes testing, many public schools, particularly lower-performing schools, shifted the bulk of their curriculum time to focus on coursework that culminates with high-stakes tests (Berliner, 2011). In a recent fledgling shift away from this narrowing of the curricula, public schools are now nationally required to teach environmental literacy. In Virginia's current public education environment, and particularly in lower performing schools where low test scores can lead to state-enforced school sanctions, teachers may have difficulty finding time within each day, let alone during their paid work hours, to integrate environmental literacy into curricula designed to prepare students for high-stakes Standards of Learning tests. Though multiple local environmental entities offer opportunities to connect schools with environmental educators and scientists, implementing environmental literacy curricula could cause teachers to encounter conflicts within their schools or at the local district level (Riordan and Klein, 2010). It is important to find the best supports available to assist teachers with delivering environmental literacy education, especially if supports either do not yet exist for new legislation requirements, or if these supports prove to be inadequate for teachers' needs. Environmental legislation is a necessary and logical addition to enhance science curriculum and the overall ecological health of the State; however, potential needs and conflicts that may prevent teachers from carrying out the requests of the new state executive order and federal inclusion of environmental literacy in the newly signed ESSA (2015) must be explored and overcome.

Statement of Purpose

The purpose of this study was to understand how a central Virginia school district's science teachers accept, interpret, and implement new environmental policy into the classrooms. The study was placed within the theoretical framework of street-level bureaucrat literature. I analyzed the driving political forces behind EO42, the efficacy of local Richmond environmental outreach agencies in assisting teachers in their delivery of environmental education instruction, and the successes and conflicts science teachers face when attempting to implement school-wide MWEEs.

Research Questions

- 1) How was EO42 policy developed and implemented?
- 2) How was EO42 policy translated into a district?
- 3) What local environmental outreach agencies provided professional development (PD) to Central County Public School MWEE teachers, and what were teachers' perceptions of the PD?
- 4) What were MWEE teachers' perceptions on the inclusion of MWEEs into science curricula?

Literature/Research Background

Environmental Education Policy History

The two policy parameters driving this research are the ESSA, specifically its environmental literacy guidelines, and the state of Virginia's executive order No. 42 (2015). With the 1996 expiration of the National Environmental Education Act, the United States was left without official environmental education policy for two decades, until the most recent reauthorization of the Elementary and Secondary Education Act (ESEA). The reauthorization of the ESEA, now known as the ESSA, and the addition of environmental literacy to the ESSA offers a potential solution to the environmental education gap that resulted from No Child Left Behind (NCLB). It

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also expands the national curriculum standards after decades of narrow focus on English and mathematics (Berliner, 2009; Fitchett & Heafner, 2012).

As a result of two decades of narrowed curriculum, it is unsurprising that there has been a steady decrease in the importance of environmental literacy, both in public education and among society at large. The National Environmental Education Foundation (2015) reports an overall decline in individuals being able to understand environmental issues such as pollution of drinking water, air pollution, pollution of rivers, lakes, and reservoirs, toxic waste contamination of soil and water, loss of the rainforest, global warming, and species extinction. Increased attention to “teaching to the test” under NCLB has left behind a culture of high-stakes, high-penalty policies, shifted classroom focus and narrowed curricula (Nichols and Berliner, 2008), which omits content that promotes civic-mindedness and science-rich environmental literacy lessons that involve hands-on learning and critical thinking. A recent shift of federal education policy may mark a beginning change to this decades-long theme.

Title IV of the ESSA outlines expectations for 21st century schools and lists several key components to environmental literacy. The first component of the new national public education law makes environmental education grant funds available as part of a “well-rounded education” grants program. A second component to funding under ESSA is that environmental literacy programs are eligible for funding under the umbrella of the 21st Century Community Learning Centers program. A third distinguishing characteristic exemplifies a push for next generation science standards (Bybee, 2014) with the inclusion of “hands-on learning” and “field-based or service learning” to enhance STEM programs, providing additional opportunities for environmental science education. It is this third characteristic that becomes the driving force behind my research.

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While ESSA was being examined and passed by national policy-makers, Virginia's governing body was busy creating its own pre-emptive response to the new federal education law. The response exists in the form of EO42 (2015). According to EO42, meaningful outdoor experiences and field investigations are imperative teaching platforms for environmental literacy. The MWEEs are intended to help students in public schools learn how to address environmental challenges in a cultural, local, and global perspective, and to increase student efficacy in addressing these challenges. They are intended to be a form of experiential learning that incorporates project-based learning that is both student-led and teacher-facilitated. The intent of this policy is for MWEEs to be taught in public schools at three different levels of science education: once in elementary, once in middle school, and once at the high school level.

The origin of the MWEE.

The adoption of the 1992 National Sustainable Development Strategy (NSDS) called for countries to comprise the integration of economic, social, and environmental policies both laterally, across countries, and longitudinally, through time, to encompass generations both present and future. The language of NSDS has influenced the creation of Virginia's environmental literacy communication plan. According to Virginia's Department of Education, the goals of the plan are to ensure that students have the knowledge, skills and dispositions to solve problems and resolve issues individually and collectively in ways that sustain ecological, economic and social stability. One of the methods suggested to achieve this goal is to have students engage in meaningful watershed educational experiences (MWEEs).

One powerful influence on Virginia's new environmental education policy is the Chesapeake Bay Foundation (CBF), a nonprofit, independent conservation organization. The CBF was started as the Chesapeake Bay Partnership in 1983 by a group of Baltimore businesspeople who

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were concerned about the pollution levels in the Chesapeake Bay (CBF, 2014). Thirty years later, this small group has grown so much in size and scope that the CBF provides environmental outreach education to the six states (VA, MD, DE, WV, PA, and NY) and one district (Washington D.C) that comprise the Chesapeake Bay watershed. Additionally, the CBF has grown to be a powerful lobby for political changes that affect the watershed. This lobby applies to both environmental regulation policy, as well as to promoting environmental education in public schools, and has created the Chesapeake Bay Partnership (CBF, 2014). This “Partnership” has resulted in agreements made among the states and the district within the watershed to restore and protect the Bay (CBF, 2014).

Within this Partnership are recommendations for environmental literacy for public school children; in fact, the concept of MWEEs for public school children originated from within the CBF as a way to promote environmentally responsible behaviors (ERB) that create less pollution and result in a cleaner watershed. Environmentally Responsible Behaviors are behaviors exhibited by those who believe that it is necessary to solve environmental problems, who have a sense of efficacy about the environmental problems, and who know how to do something about the problem at hand. (Bunk, 1981). Sixteen years ago, the Chesapeake 2000 Agreement was developed to reaffirm the commitment of the individuals, community-based organizations, businesses, local governments, and schools within the watershed to restore and protect the Chesapeake Bay (Chesapeake Bay Program, 2000). This agreement had multi-tiered goals to promote ERBs within the schools and community. Two of these education goals in particular established the origin of, and the requirements for, a MWEE:

1. Beginning with the class of 2005, provide a meaningful Bay or stream outdoor experience for every school student in the watershed before graduation from high school.

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2. Provide students and teachers alike with opportunities to directly participate in local restoration and protection projects, and to support stewardship efforts in schools and on school property (Chesapeake Bay Program, 2000, p.11).

With the signing of the updated 2014 Chesapeake Bay Watershed agreement under Governor MacAuliffe, the first education goal was expanded to require a meaningful watershed experience for every student in the watershed once at the elementary school level, once at the middle school level, and once at the high school level.

Since the origin of the Agreement, research has been done to explore the effectiveness of MWEEs. Results have shown that, in addition to students having positive learning experiences, students who participate in MWEEs also show a greater tendency to engage in environmentally responsible behaviors (Zint, Kraemer, & Kolenic, 2014). There are many types of learning activities that are considered to be MWEEs, but every activity is expected to encompass some form of scientific field work. According to the Chesapeake Bay Education Workgroup (2014), in order to be defined as a MWEE, the following eight components must be included:

1. Experiences are investigative or project oriented.
2. Experiences are richly structured and based on high-quality instructional design.
3. Experiences are an integral part of the instructional program.
4. Experiences are part of a sustained activity.
5. Experiences consider the watershed as a system.
6. Experiences involve external sharing and communication.
7. Experiences are enhanced by natural resources personnel.
8. Experiences are for all students.

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Meaningful watershed educational experiences include activities wherein students develop, investigate, and answer scientific inquiries about environmental problems through data collection and analyses. The goal is to either solve an environmental problem or to mitigate its impacts. The MWEE components listed above indicate that this level of classroom instruction requires an investment of time and resources. One objective of this research is to determine the range of time and resources that high school classrooms require when attempting to conduct MWEE lessons, especially for lessons involving natural resource educators.

The Purpose of Local Outreach Education

In 1952, state and federal natural resource agencies collaborated with environmental science and education departments at Virginia colleges and universities to create the Virginia Resource-Use Education Council (VRUEC). The VRUEC serve as the primary hub for communications and environmental outreach coordination, including outreach education ordered in the Virginia Environmental Literacy Challenge established in Executive Order No. 42 (2015). Examples and classifications of environmental outreach agencies and organizations who are able to provide the MWEE programs are listed in Table 1.1. These agencies provide a key component to this research, as many of the agencies listed below provide teacher education workshops on various methods used to promote MWEEs in public school science classrooms.

Table 1.1

Examples of Environmental Outreach Agencies and Organizations in Central Virginia.

<u>Environmental Agency/Organization</u>	<u>Classification of Agency/Organization</u>
Chesapeake Bay Foundation	Nonprofit that provides experiential learning
Lewis Ginter Botanical Gardens	Nonprofit that provides experiential learning
Maymont Foundation	Nonprofit that provides experiential learning
Science Museum of Virginia	Nonprofit that provides experiential learning
Soil and Water Conservation Districts	Public agency with state and federal funding
Virginia Department of Conservation and Recreation	State natural resource agency with state and federal funding
Virginia Department of Environmental Quality	State environmental regulatory agency with state and federal funding
Virginia Department of Game and Inland Fisheries	State natural resource agency with state and federal funding
Virginia Department of Historic Resources	State historic preservation office
Virginia Commonwealth University Rice Rivers Center	University research and outreach center with private and federal funding
Virginia Master Naturalist	Volunteer community outreach groups that receive state funding

Preparedness of Schools for Providing MWEEs

While national standards test primarily for skills in mathematics and English, Virginia Standards of Learning (VA SOL) also include high stakes tests in science and history. As a teacher of both high-stakes science curriculum and non-standardized science curriculum content, I have requested that students be pulled out of elective courses for the sole purpose of receiving content tutoring, and I have also had students pulled out of my classes for remediation in other high-stakes content areas. The message is clear and resonant: students must pass these tests in order to graduate and to ensure a positive contribution to the school's overall academic standing.

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The most current Science Standards of Learning for Virginia Public Schools (2010) do not explicitly mention environmental literacy. The term “watershed” is mentioned within the text a total of six times, first appearing at the end of the 4th grade curriculum in VA SOL 4.9a, again in the 6th grade curriculum as VA SOL 6a-g, and finally in the Earth Science standard VA SOL ES.8f. There is no mention of the term *Meaningful Watershed Educational Experience* anywhere within the VA science SOLs. With the recent inclusion of MWEEs in executive order #42 in conjunction with the ESSA’s request for environmental literacy in public schools, it seems logical to assume that the next revision of the VA SOLs will include environmental literacy on a broader scale and in much greater detail.

Just before the executive order was implemented, the Virginia Department of Education completed an initial survey, called E-Lit, to examine the preparedness of Virginia school districts to implement MWEE/environmental literacy into their classrooms (2016); the survey’s results indicate that Virginia’s public school districts are far from being prepared. Introducing new policy into secondary schools requires layers of preparation and supports for policy to be successful at the street-level (Ball, Maguire, & Braun, 2012). Per the Virginia Department of Education licensure requirements, all science teachers are required to have taken laboratory science courses as part of their college prep; however, there is currently no requirement for teachers to enroll in a field research based science classes. These types of classes frequently use transformative learning techniques by incorporating natural history research methods through outdoor classroom experiences (Ernst, Buddle, & Soluk, 2014). These techniques emphasize experimental design: research questions, field-based research experiments, data collection, interpretation of findings, and communication of results. Although there is a push for more stringent standards for pre-service science teachers in undergraduate education (AAAS, 2011;

Bybee, 2014), current teachers may not feel prepared, or qualified, to help students design and implement a curriculum that supports MWEE (Riordan and Klein, 2010). There are few state resources available to assist with this preparation, and no official resources at the district and school level.

Methodology

This study uses mixed-method design analyses. Two secondary surveys include online, unpaired pre and post surveys of a cohort of middle and high school MWEE teachers from “Central County,” Virginia. These teachers either participated in professional development workshops on MWEEs with local environmental education outreach groups, and/or taught MWEE content within their curriculum. The qualitative analyses include interviews of individuals in multi-levels within the public education hierarchy. Interviews were conducted with those who contributed to the creation of executive order No. 42, to determine the political motivation behind the order. Additionally, a science specialist who maintains the middle and high school science curriculum for Central County was interviewed to investigate best management practices for implementing both MWEEs and a county-wide environmental literacy continuing education program for middle school and high school science teachers.

Definition of Terms

Chesapeake Bay Foundation (CBF): a nonprofit organization formed in 1967 that focuses on the restoration and protection of the Chesapeake Bay through education, advocacy, restoration, and litigation (Chesapeake Bay Program, 2001).

Environmentally responsible behavior (ERB): behaviors exhibited by those who believe that it is necessary to solve environmental problems, who have a sense of efficacy about the environmental problems, and who know how to do something about the problem at hand (Bunk, 1981).

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Environmental literacy: “having the knowledge, skills and dispositions to solve problems and resolve issues individually and collectively that sustain ecological, economic and social stability.” (Virginia Department of Education, 2016).

Meaningful watershed educational experience (MWEE): The cornerstone of student environmental education about and in the Chesapeake Bay watershed. MWEEs seek to seamlessly connect standards-based classroom learning with outdoor field investigations to create a deeper understanding of the natural environment. According to the Chesapeake Bay Program Educational Workgroup (2011), “MWEEs ask students to explore local environmental issues through sustained, teacher supported programming that includes, but is not limited to, issue definition, outdoor field experiences, action projects, and sharing student-developed synthesis and conclusions with the school and community” (page 1).

Policy: Rules and regulations that govern the work of teachers.

Watershed: An area of land that drains into a particular river, lake, or other body of water

Chapter 2: Literature Review

Overview

Though the environmental movement began during the mid-twentieth century with the purpose of increasing awareness about the interdependence of ecological health and human health, it is a continually evolving (and devolving) process at the policy level. Environmental legislation was first introduced on a national level under the Nixon administration with the formation of the United States Environmental Protection Agency (USEPA) and with passing of the Clean Air and Clean Water Acts. With regulations in place, and nearly twenty years after these initial environmental laws were implemented, the National Environmental Education Act of 1990 (NEEA) became the first legislation that required government leadership to promote environmental literacy. This environmental agenda created education outreach funding and jobs at federal and state-level resource agencies.

One of the congressional findings of the NEEA portrayed the urgent need for public understanding of the natural environment, showed the lack of public awareness of environmental problems, and the need to educate the public about the origins of these problems (NEEA 1990). In order to deal with mounting environmental issues, NEEA called for a broad implementation of environmental programs that required well-educated, well-trained outreach education professionals to work alongside natural resource agencies, with the ultimate purpose of educating public school teachers and students in the ecological sciences. When the NEEA expired in 1996, there was no other successful national reauthorizations for environmental education. Over

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the years, attempts were made to include an environmental initiative amendment to the ESEA called the No Child Left Inside (NCLI) Act, and the CBF, as well as other environmental lobby groups, was a strong proponent of NCLI legislature. In fact, the CBF was such a powerful lobby that Maryland was the first state to require public schools to teach environmental lessons as part of its core curriculum and as part of their state curriculum standards required to obtain a high school diploma (Environmental Education Instructional Programs, 2011). In spite of the influence, the bipartisan push for NCLI failed to be ratified both in 2009 and in early 2015. However, as a result of widespread support, the NCLI initiative has become the basis for the environmental literacy policy that became part of the ESSA. Nearly twenty years after the expiration of the NEEA, the ESSA (2015) includes a mandate for environmental literacy to be taught in America's public schools. Several states have already implemented environmental literacy requirements within their public education systems, and during the 2015-2016 academic year, Virginia joined their ranks.

Investigating Virginia Education Policy

According to current Virginia General Assembly (VGA) legislation, policy is formed when a legally-reviewed legislation proposed by a representative is drafted into a bill by the Division of Legislative Services. This bill is then sent to an appropriate legislative committee by the Senate Clerk of the House Speaker, where the bill may be amended. After the committee approves the bill, it is then introduced to either the State Senate or the State House of Delegates where it is voted on. Once it passes, the bill must then pass through the other governing house. The final stop of the bill is the Governor, where the bill is signed, amended, or vetoed (VGA, 2017).

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Executive orders are an exception to traditional state policy creation methods.

According to Black's Online Law Dictionary (Retrieved from <https://thelawdictionary.org/executive-order/>), an executive order is defined as a "directive action from a (governor) to its executive governmental agencies in an official document." Though their appearance on the political stage is relatively recent, there are several uses for executive orders: public emergencies, creating state policies, promoting regulatory reform, addressing environmental impact, and ensuring states are in compliance with federal mandates are all acceptable uses for executive orders (Bernick & Wiggins, 1984; Ferguson & Bowling, 2008).

Investigating how a specific policy is created and how this policy affects multiple levels of governance can be accomplished through a street-level bureaucrat case study. Case studies are used to investigate and explain real-life scenarios in which there may be conflicting views, and in which there may be no clear, definite answer to a research question; however, results from one study may not be applicable to other similar cases (Yin, 2014). This type of qualitative investigation is described by Gerring (2004) as "an intensive study of a single unit for the purpose of understanding a large class of units" (p 352). The largest unit, in this research of Executive Order 42, are the policy makers. Other related units found underneath the umbrella of the policy makers are the science specialist and the individual classroom teachers of Central County Public Schools who are responsible for teaching MWEE lessons. However, what actually happens within a school, at the classroom level, may be different from the intended policy (Ball, Maguire, & Braun, 2012; Goldstein, 2008; Mansfield, 2013; Spillane, Reiser, & Reimer, 2002; Werts & Brewer, 2014).

A street-level policy actor is an individual who directly implements the perceived longitudinal perspectives of top-down policy makers, interpreted as policy passes through

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management (in the case of this study, the science specialist), and is the hands-on policy enactor (the MWEE teachers). Investigating the perceptions of hands-on enactors of public policy can give valuable information about the actual success of policy implementation or can indicate oversight within the process. This investigation method is not without its faults. It has variable results as policy actors have different ideologies and attitudes about the intended political goals (Yanow, 2000), and the enactment of policy is directly affected by the physical interactions between workers and clients (Lipsky, 1980). For this particular study, there is also consideration of how external groups affect EO42 policy.

Driving Political Forces Affecting Current Literacy Programs

The Chesapeake Bay Foundation currently has 19 outreach education facilities, provides outreach education to six states and the District of Columbia, conducts scientific research, and has over 200,000 members. The CBF is also a key player in both national and local environmental education policies. The CBF is a private sector non-profit entity that was initially formed in the late 1960s as an interest group of Baltimore, MD, businesspeople who were concerned about Chesapeake Bay pollution. Over the past few decades, this group grew in size and scope, adopted the motto of “Save the Bay,” and became a private sector voice for the Bay. The two main forces driving the CBF’s powerful political lobby are environmental education and resource protection, with the goals to restore and protect the Chesapeake Bay.

The CBF has been involved in large scale, nationally funded research since the 1970s, and has helped set the stage politically for conservation in the Mid-Atlantic region. In 1983, the Chesapeake Bay Program partnership was established, which formed a multi-state agreement to have a cooperative approach to “fully address the extent, complexity, and sources of pollutants entering the Bay” (Chesapeake Watershed Agreement, page 1, 2014). The 2014 Chesapeake

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Watershed Agreement (CWA) aims to create multi-dimensional partnerships among states, local governments, individual citizens, businesses, and groups existing within the Chesapeake Bay watershed, and has many different outreach education programs that it initiates with the communities that live within the watershed.

One part of the CWA is an environmental literacy goal to “enable every student in the region to graduate with the knowledge and skills to act responsibly to protect and restore their [six] local watersheds” (CWA, 2014). The CBF calls for increased student outcomes in environmental literacy with a target goal of three MWEEs - one MWEE completed during elementary, middle, and high school. Two other measures proposed in the CWA include an increase in the number of environmentally sustainable schools and the development of systemic approaches to environmental literacy for all students (CWA, 2014). These systemic approaches are expected to include environmental policies, promote ERB, and should include voluntary metrics (CWA, 2014). In addition to the mid-Atlantic region, the CBF has nationally invested public education political interests that are evidenced by the CBF being part of the No Child Left Inside Coalition which created the No Child Left Inside (NCLI) Act. Though NCLI was never signed into law, it catalyzed the environmental literacy section that was added to the ESSA and makes active, hands-on learning strategies within science curricula a priority (ESSA, 2015).

Although environmental literacy policy has reached the national platform in public education, it has yet to effectively reach into most of the public education science classrooms. According to the United States Department of Education (USDOE) Green Ribbon Schools factsheet (2012), one way to measure environmental literacy in public schools is to follow these steps:

1. Reduce environmental impact and costs;

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2. Improve the health and wellness of schools, students, and staff; and
3. Provide environmental education, which teaches many disciplines, and is especially good at effectively incorporating STEM, civic skills, and green career pathways.

However, a cursory look at programs currently in place across the nation reveals a marked lack of active, working environmental literacy programs in place. In their 2014 status report on state environmental literacy programs, the North American Association for Environmental Education listed that only one in five states has implemented a statewide environmental literacy program (2015).

Virginia's EO42 conveys the potential to address a portion of each of the Green School parameters established by the USDOE; however, the MWEE initiative only involves science curricula across the state and is not a whole school movement. Whole school movements toward environmental literacy integrate multiple concepts that should be ecological and democratic (Kensler, 2012). The order is a political starting point that can initiate the appearance of sustainable schools across the state, though three science classes, one at the elementary, middle, and secondary school level, will not accomplish the first two measurable objectives listed above for Green Ribbon Schools.

A search of the Virginia science standards of learning returns relatively few terms concerning either watershed preservation or environmentally responsible behaviors. Teachers are teaching what is in the standardized curriculum, and, in standardized classes, teachers are not teaching many environmental education concepts because there are relatively few of these concepts in Virginia's science SOLs. In summer of 2015, the Virginia Department of Education distributed a survey to school divisions called the Environmental Literacy Indicator Tool (ELIT), which was developed by the Chesapeake Bay Foundation. In this 2015 survey, 104 valid

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responses were returned, and 80 percent of the education agencies responding indicated that they were within the Chesapeake Bay Watershed (Rose, 2016). The survey asked school divisions about their capacities to implement environmental literacy programs, about student participation in MWEE programs, and about district priority needs for improving environmental education programs. The results based on descriptive statistics indicate that over 80% of Virginia's school divisions do not have any form of outdoor classroom curricula, that over half of all schools responding to the ELIT survey had no evidence that any form of MWEE was taking place in their school systems at all, and that 80% of surveyed Virginia schools were in moderate to high need of community partnerships in order to improve their MWEE curricula (Rose, 2016).

Teaching for Environmental Literacy

It is difficult to refute the benefits of experiential, outdoor education for students, and it is hardly a new concept (Dewey, 1938; Louv, 2005; Mumford, 1964; Smith & Sobel, 2010). Principles of experiential learning, such as those at the core of MWEEs, are a necessary component in forming scientific minds that are also capable of action. Transformative learning within the parameters of environmental literacy requires a shift away from traditional classroom teaching methods (O'Sullivan, 1999), particularly those methods that have been shaped by NCLB policies (Gruenewald, 2007). Since MWEEs are multi-level, project-based learning objectives, the narrowed curriculum caused by the high-stakes testing under NCLB is a major deterrent when promoting science-based ERBs within the current classroom environment. School systems, particularly those systems with low-performing children and high-stakes annual yearly progress measurements, may expect MWEEs to have the same measurable parameters (Gruenewald, 2004). Thankfully, such a scheme has not yet been written into national educational policy, as formulaic environmental lessons have a finite spectrum in an ecologically

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diverse system. Increasing critical thinking skills through well-supported MWEE integration may prove to be useful in closing achievement gaps, as well as in promoting ERB within the community (Lieberman & Hoody, 1998).

Teachers, particularly inexperienced teachers, may struggle with providing community based science content, such as MWEEs, to all of their students. Currently, many undergraduate teacher education programs do not require extensive science coursework to be completed prior to graduation (Bybee, 2014). The lessons outlined in Executive Order No. 42 require teachers to have content area confidence and a familiarity with the community around the school. John Dewey (1938) was a proponent of nature learning, as it teaches students about local resources. Dewey also recommended the following:

That teachers should become intimately acquainted with the conditions of the local community, physical, historical, economic, and occupational, in order to utilize them as educational resources (Dewey, 1938, p. 40).

Teachers need to develop close familiarity with the human and natural resources within the larger socio-geographic context of their respective school communities. Continuing education that includes experiential education methodology will build both teachers' knowledge and comfort level with scientific inquiry, but one major concern of this process is that it requires educators to invest a significant portion of their time into learning hands-on field-based science education (Bybee, 2014). A second concern is that the integration of nonprofit interests into public education is a mixed bag of results (Darling-Hammond, 2010). Nonprofit involvement under EO42 does not guarantee that urban schools or low performing schools that struggle with incorporating environmental literacy, who do not have campus green space, or who have impoverished students will have the same ability to secure grant resources and outreach assistance due to the lack of commonality with the outreach agencies as their more

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environmentally literate district counterparts (Paarlberg & Gen, 2009). Policy makers and supporters must both understand these classroom needs and support the development of curricula accordingly, or else another education policy will become muddied, or diluted and lost along the downward cascade into the classroom.

Integrating New Policy into Secondary Schools

Policy enactment results through the interpretation and translation of complex textual documents into contextualized practices (Braun, Ball, Maguire, and Hoskins, 2011). Executive Order 42 did not direct teachers on how to enact policy, it simply set the required parameters. Enacting MWEEs through EO42 policy was required to be done at three different curriculum levels; once for elementary, and twice for secondary education (once in middle grades and once for high school). What actually happens within a school, at the classroom level, may be different from the intended policy (Ball, Maguire, & Braun (2012). Policies also matriculate into schools that may have vastly difference resources. The policy implementation research cites several contextual differences that can affect policy implementation when enacting new policy into public schools:

1. Situated contexts: locale, school histories, intakes and settings (Braun et. al, 2011; Diem, 2012; Mansfield, 2013).
2. Professional contexts: values, teacher commitments and experiences, and policy management in schools (Braun et. al, 2011; Mansfield, 2013; Werts & Brewer, 2014).
3. Material contexts: staffing, budget, buildings, technology, and infrastructure (Braun et. al, 2011; Goldstein, 2008).

4. External contexts: degree and quality of local authority support, pressures and expectations from broader policy context (Braun et. al, 2011; O’Laughlin & Lindle, 2015; Werts & Brewer, 2014).

Such is the case with EO42 as MWEEs integrate not only into curriculum, but also specific content teachers, each who may interpret EO42 policy differently.

Chapter 3: Methodology

Political changes bring about complex dynamics, particularly if people disagree about what constitutes basic, fundamental education in public schools (Simpson, 2007). This study investigated how the formation of new environmental education policy is executed and how the new policy affects a single school district in central Virginia. In watershed management, when an aquatic scientist tests a river's integrity and quality within a watershed, it is understood that a single sample of water indicates only a narrow measure within larger parameters and doesn't bring into scope the many other factors that can affect the river upstream of the point sampled or land use that occurs laterally to the stream (Bodary, 2001; Vannote, Minshall, Cummins, Sedell, & Cushing, 1980). Much like successful watershed monitoring, it is important to investigate more than just a single point in education policy implementation, and a cross-sectional type of case study is justified (Gerring, 2004). This was a case study that examined the implementation of Virginia environmental literacy policy, EO42, from formation among policy-makers to execution into a central Virginia school district.

Good case studies provide an in-depth look into the motives and eventual results that occur from specific events (Creswell, 2013; Feagin, Orum, & Sjoberg, 1991), such as those that result from newly enacted policy. Saldana (2013) noted that research studies were best done if "our analyses of change processes and products take into account multiple rather than singular factors" (pg. 12). Many case studies tend to have non-transferable results due to a narrow investigative lens (Yin, 2014); However, this project widens the case by looking at the policy

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implementation of street-level policy actors (Diem, 2012; Spillane et. al, 2002). Studying the perceptions of teachers and science specialist in a large, socio-economically diverse school district could make results from this study relatable to other districts and states enacting similar environmental education policy.

The purpose of this research was: 1) to examine the perspectives and expectations of the policy makers who assisted with the creation of EO42; 2) to explore the management practices used by the Central Virginia Public School district science specialist in order to assist the district's teachers with preparing for the MWEE lessons required by EO42; 3) to research which local environmental outreach agencies assisted the science specialist in helping to prepare teachers for MWEEs, and to determine the overall effectiveness of the agencies with preparing teachers; and 4) to investigate how the MWEE lessons requirement of EO42 was received and executed by teachers in a central Virginia school district.

Research Design

Education policy does not get implemented as soon as a law is written; there are many stakeholders and influential groups involved, such as politicians, advocacy groups, school systems, and individual teachers interacting with students (Ball, Maguire, & Braun, 2012; Diem, 2012; Mansfield, 2013; O'Laughlin & Lindle, 2015). These groups can affect how a policy becomes practice. Ultimately, public education curriculum policy implementation rests in the hands of classroom teachers, and that is where evidence of policy implementation can be found (Goldstein, 2008; Lipsky, 1980; Spillane et. al, 2002) . A case study focuses on a particular event or policy, describes the study in broad terms, provides understanding of the policy being studied (Merriam 1998), and can demonstrate the successfulness of a newly enacted policy (Creswell, 2013). As there are many players involved in policy design and execution, a case

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study is a logical research design for this investigation. In order to examine this topic in a way that reflects a complex social environment involving human attitudes and behaviors, this case study incorporated a mixed-method design.

Creswell & Clark (2011) recommend incorporating a broad, real-world overview to inform the research process. In order to investigate the ideology and vision of Executive Order No. 42, a street-level bureaucrat study was used to investigate the philosophies and goals of the policy makers who contributed to the development and dissemination of EO42. Given that the policy has specific goals that are expected to be achieved at the classroom level, a quantitative study was able to provide feedback from teachers regarding their perspectives about EO42 and the level of success they achieved in meeting the policy goals that were originally established. A mixed-method approach to this case study provides greater clarity to both the policy formation of EO42 and the actual execution of the policy into the classroom. The use of both qualitative and quantitative data broadened this investigation to a variety of perspectives on environmental education policy implementation.

As this study investigated different players who contributed to the implementation and execution of EO42; data collection and analyses were conducted in four phases. Phase I explored the goals and perspectives of the policy makers involved in the creation and execution of EO42. Phase II investigated the actions taken by a Central Virginia public school district to prepare its teachers to implement new EO42 policy requirements in the classroom. Phase III examined the role and effectiveness of environmental outreach agencies in assisting educators with executing EO42 into their classrooms. Phase IV investigated how EO42 was implemented into a Central Virginia public school district and analyzed the results of policy execution by science teachers at the classroom level. The following sections delineate and describe the

reasoning behind each phase, the sampling process, the data collection methods, and the data analyses. A summary of the different phases is included in Table 3.1.

Table 3.1

This study's driving research questions

Research Questions investigated in each phase

Phase I: Research Question #1

How was EO42 Policy developed?

Phase II: Research Question #2

How was EO42 Policy translated into a school district?

Phase III: Research Question #3

What were teachers' perceptions of MWEE professional development?

Phase IV: Research Question #4

What were teachers' perceptions of including MWEES into curricula?

Phase I: Perspectives of Policy Makers and Interest Groups

How was EO42 policy developed?

Policy is more likely to be implemented when there is communication between those who make the policy and those who carry policy out at the street-level (Ball, Maguire, & Braun, 2012; Fullan, 1979). In order to begin examining the overall effectiveness of environmental policy, we must first look at the intent and the driving forces behind this executive order. When EO42 was first signed into law on Earth Day, 2015, it was described as a collaborative effort between the Virginia Department of Education and the Virginia Departments of Natural Resources. The intent of Phase I was to investigate the primary groups involved in the creation of EO42. This study investigated the communication that occurred among the different policy-makers involved in EO42.

Sample

The sample included individuals who contributed to the creation and implementation of EO42. Within the executive order, the Governor referenced the main contributing group to the state environmental literacy policy to be the Virginia Resource Use Education Council (VRUEC), and representatives from this council are included in the sample for Phase I of the study. Interviewees were identified using non-probability, peer-recommended snowball sampling (Bogdan & Biklen 2007), starting with individuals whose names appear as contacts in the Environmental Literacy Challenge within EO42. There are several advantages to snowball sampling methodology as it opens access to hard-to-reach populations and utilizes the social capital of participants in that they recommend and introduce new subjects to the research (Bogdan & Biklen 2007). A disadvantage to the sampling method is that the sample size is unknown and nonrandom. As Phase I is specific to people who contributed directly to EO42, it requires the knowledge and recommendations of those who were insiders on the development of the law to determine specific individuals who should be interviewed (Biernacki & Waldorf 1981). The starting place for Phase I began with recommendations from the Virginia Department of Education's Science Specialist; from the Deputy Director of Natural Resources for Governor Terry McAuliffe; from the Wildlife Educator at the Virginia Department of Game and Inland Fisheries; and from the Virginia's Department of Environmental Quality Outreach Education Manager.

Data Collection

Representatives from the primary interest groups that were identified through snowball sampling as providing substance to the creation of EO42 were contacted via email with an explanatory overview of the research as an attachment, and included an interview request (Appendix A). The

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study was explained and a request made for an interview. Once the participant agreed to be interviewed, the person was asked to choose a convenient time and location for the interview process. The face-to-face interviews were semi-structured in order to allow interviewees the opportunity to contribute additional topics to the conversation. The interview protocol was based upon these questions, with follow-up questions and probes for clarity:

1. What were your contributions to the development of EO42?
2. What were the goals you and the group you represent expected to achieve with the policy?
3. Are there any noticeable differences or dissensions between groups that occurred during the policy making process?
4. How do you believe the policy should be executed by science teachers at the classroom level?
5. What obstacles were encountered during policy formation?
6. What resources are available to assist districts and teachers with implementing MWEEs into the curricula?
7. Are there differences between the policy you had hoped to develop and the policy that was approved?
8. Why was the policy enacted as an executive order and not as a traditional legislative process?
9. What were some anticipated challenges and opportunities during the implementation phase?
10. Can you define a MWEE and describe a MWEE in a classroom level?

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All in-person interviews were recorded using Audacity 2.0.3! using a Dell laptop and phone interviews were recording using Google Voice. Interviews were transcribed by me. Upon completion, all transcripts were electronically mailed to the interviewees for feedback and clarification.

Data Analysis

As there were multiple interviews in Phase I, a qualitative comparative analysis (Ragin, 1987) was used to make sense of the responses (organize the responses). This qualitative approach systemically analyzes the similarities and differences of each participant's responses to the open-ended questions outlined in the data collection methodology. This type of analysis makes connections about the motives of those individuals who constructed EO42, shows differences between subjects, and provides a baseline comparison for the other phases in this research. Interviewees were referred to using code names. The policy representative from the Governor's Department of Natural Resources is referred to as "Mr. Resources." The policy representative from the Department of Game and Inland Fisheries received the name, "Ms. Land" due to "land" being in her department's name and for her adherence to her belief that MWEEs should only be conducted as land investigations. The policy representative from the Virginia Department of Environmental Quality is called, "Ms. Water" due in part to her agency's emphasis on water quality, and in part due to her description of a MWEE as a water investigation. Lastly, Ms. Education received her code name as she represents the Virginia Department of Education for MWEE policy.

Phase II: Preparatory Actions of Central County Public Schools to EO42

How is EO42 Policy translated in a school district?

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The parameters of EO42 require every child in Virginia's public education system to participate in a MWEE at the elementary, middle, and secondary school level. Since school policy implementation depends heavily on teacher instruction (Ball, Maguire, & Braun, 2012; Lipsky, 1980), it is necessary to investigate how EO42 policy requirements were disseminated to science teachers by school managers. The qualitative component of Phase II of this study includes an interview of Central County Public School's science specialist about the management practices that were used to prepare middle school and high school science teachers for new environmental literacy policy integration into the classroom. This intent of this interview was to explore how well, in this specific case study, the science specialist engineers the decree of politics into the reach of classroom teachers.

Sample

The person who has the most knowledge about integrating MWEE policy into classroom teachers' curricula is the science specialist for Central County Public Schools. After permission was obtained from Central County Public Schools and from the Institutional Review Board, the interview with the specialist took place at her choice of time and location.

Data Collection

The science specialist was contacted through an email that included an attached study information file (Appendix B). She was asked to choose a time and location that best suited her schedule and received the interview question outline in advance, per school district request. The face-to-face interview was semi-structured in order to allow the science specialist the opportunity to contribute additional topics to the conversation. The interview protocol used is below.

1. How did the district become aware of EO42?
2. What is your role as a science specialist with regard to EO42, and what support did you receive in understanding the law?

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3. What were the goals you expected to achieve as a specialist in assisting your staff to prepare for the MWEEs required under EO42, and how did you proceed with achieving these goals?
4. What were the management practices you used to prepare teachers to implement EO42 into the middle and high school science curricula?
5. What did you expect from the middle and high school teachers as they implemented MWEE lessons, per EO42 policy?
6. What did you think are the biggest obstacles science teachers would encounter implementing MWEEs into the classroom curricula per EO42 policy?
7. Were there any state protocol guidelines or state assistance available to the district in order to assist with implementing the MWEEs required by EO42 into the classroom?
8. How did you intend to continually assist the middle and high school teachers with future MWEE lessons under EO42?
9. Can you define what a MWEE is and describe what an actual lesson looks like at the classroom level?

The interview was recorded using Audacity 2.0.3! on a Dell laptop, and the interview was transcribed by me. Upon completion, the transcript was electronically mailed to the interviewee for review and response.

Data Analysis

After the interview was transcribed, it was reviewed and the responses were analyzed by question themes. As the science specialist offers a unique transitional role between policy formation and policy objective, the interview needed careful analysis. The data collected from this interview was used as analyzed using a qualitative comparison (Ragin, 1987) to reflect the perspectives of the policymakers in Phase I and for baseline for Phase III and Phase IV.

Phase III: Effect of Outreach Agencies in Assisting Teachers with EO42

What are teachers' perceptions of MWEE professional development?
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Overview

In order to lend an additional perspective to this case study, data based on two surveys collected from teachers by Central County Public Schools (Appendix C) was the focus of a secondary analysis. These data offer a look at teachers' perspectives of MWEE professional development workshops (PD) done by environmental outreach educators in October of 2015. The analysis also provides teacher overall perspectives about implementing the first year of MWEEs into middle and high school science classrooms at the end of the 2015-2016 school year. Phase III focused on teachers' perceptions of the environmental education professional development workshop that occurred at the beginning of the year and investigates teachers' responses to questions from Survey One and Survey Two (Appendix C).

In response to the newly passed EO42, the middle and secondary science teachers at Central County High School were provided professional development workshops in October, 2015. These workshops were led by multiple local education outreach agencies, both private and state-funded. The focus of these workshops were specific to MWEE curricula. The intent of this investigation was to determine how effective local outreach educators were in providing teachers with content and materials to support their classrooms. The surveys administered after these professional development workshops asked science teachers in Central County Public Schools to rate the effectiveness of eleven environmental outreach education agencies. Table 3 displays the research questions, methodology, and statistical analyses for Phase III.

Table 3.2

The driving research questions, participants, methodology, and statistical analyses for Phase III.

Research Question	Methodology	Statistical Analyses
<p><u>Phase III</u>. Research Question #3</p> <p>What local programs were in place to provide Central County Public School’s teachers with continuing education about MWEE lessons, and how effective were these programs with preparing teachers for MWEE lessons in their classrooms?</p> <p>1. What local resource agencies helped Central County Public School middle and high school teachers prepare with executing the requirements of EO42 during the 2015-2016 school year?</p> <p>2. How effective were these local resource agencies in preparing Central County Public School teachers to implement MWEE lessons for the classroom during the 2015-2016 school year?</p>	<p>Secondary Survey Data</p> <p>1. October PD Survey: Secondary survey data written and collected by Central County’s science specialist in October, 2015 of science teachers receiving MWEE in-service training. This data set is unpaired survey data. This data describes which local resource agencies were key in providing teachers with MWEE training to prepare them for EO42 implementation</p> <p>2. End of Year MWEE Survey: Secondary survey data collected by the Central County’s science specialist in Spring, 2016 of middle and secondary science teachers who teach MWEEs. This data set is unpaired survey data. Questions in this data set indicated teachers’ opinions about the effectiveness of local resource agencies in assisting teachers with preparing for MWEE curricula under EO42.</p>	<p>Quantitative</p> <p>1. Descriptive statistics</p> <p>2. A 2 x 2 Chi-squared analysis</p>

The environmental outreach agencies

There are several Virginia environmental agencies, and each agency serves a variety of purposes. However, one of the purposes that all these agencies have in common is environmental education outreach. For example, according to the Virginia Department of Game and Inland Fish’s (VDGIF) website, their intent is to offer “environmental programs...designed

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to inform interested parties about the wildlife resources and habitats in their community”

(VDGIF, 2016, retrieved from <https://www.dgif.virginia.gov/environmental-programs/>). The

Chesapeake Bay Foundation (CBF) is a non-profit, multi-state agency with a powerful lobbying platform. However, similar to the state agencies, this platform also includes goals for

environmental education, specifically for states that are part of the Chesapeake Bay watershed

(CBF 2016). The intent of Phase III of this study was to investigate the opinions of Central

County High School science teachers about the effectiveness of the different outreach education

advocacy groups in delivering MWEE professional development training. Table 3.3 lists the

environmental outreach agencies made available for the PD.

Table 3.3

Local environmental outreach agencies used to provide CCHS teachers with professional development on MWEE lessons per EO42.

Environmental Outreach Agency

Soil and Water Conservation District

Chesapeake Bay Foundation

Project Wild

Project WET

Project Underground

James River Association

Explore Learning

Project Learning Tree Environmental Education

Virginia Commonwealth University Rice Center

Math and Science Innovation Center

Sample

The sample for this phase were 109 CCPS middle and secondary science teachers who rated the effectiveness of ten different environmental outreach agencies found in the Greater Richmond area (Table 3.3). These outreach agencies participated in the professional

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development workshop coordinated by CCPS to provide middle and secondary teachers with MWEE lessons that could be used in the classroom, and is not all-inclusive of all environmental outreach programs.

Data Collection

Secondary data was analyzed in Phase III. Use of this secondary data was dependent upon obtaining permission from Central County Public Schools. The secondary data is comprised of two surveys of CCPS middle-school and high-school science teacher feedback about the effectiveness of eleven environmental outreach agencies with assisting teachers with incorporating EO42 within their classroom curricula (Table 3.4). The October PD survey was administered by CCPS after a MWEE professional development teacher workshop conducted by local environmental education agencies in October, 2015. This professional development activity was open to all CCPS secondary science teachers, regardless of science content taught. Each workshop session was led by a different environmental outreach agency, and teachers chose the workshop they attended on a first come, first served basis. The End of Year MWEE Teacher Survey (Appendix C) was given by the CCPS science specialist at the end of the 2015-2016 school year to science teachers who were specifically required to teach EO42 content within their curricula. This second survey includes questions that resemble those used on the ELIT survey developed by the CBF, and given to Virginia educators by the Virginia Department of Education in the fall of 2015 (Rose, 2016).

Table 3.4

A background summary of the two surveys sent to CCPS' secondary science teachers. Actual survey questions can be found in Appendix C.

	Survey 1 (October PD)	Survey 2 (MWEE teachers)
Purpose	Used to gather information about how all CCPS science teachers, regardless of whether or not they taught MWEEs, perceived the effectiveness of outreach educator-provided professional development about MWEE lessons	Used to gather information about how all CCPS MWEE teachers perceived their effectiveness with preparing and conducting MWEEs
Participants	Survey 1 was circulated to all CCPS' middle and high school science content teachers who attended the October, 2015 MWEE professional development workshop	Survey 2 was circulated to all CCPS' life science and biology teachers who were required to provide MWEEs to their students
Administered	Survey was administered by the CCPS science specialist directly after the MWEE PD in October, 2015	Survey was administered by the CCPS science specialist at the end of the 2015-2016 school year
Number of questions	14	32

Data Analysis

Each survey objective is discussed in terms of the percent response by teachers to questions. These responses examine educator perceptions of the abilities of the outreach agencies to prepare them for MWEE lessons. Additionally, components that could affect teachers' perceived ability to comply with EO42 are also investigated. For each objective, the questions are presented first, followed by responses broken down via survey questions (Appendix C). All of the figures, frequency data, and statistics were created using IBM's SPSS 24 and Microsoft Excel 2013. All questions used in this study were analyzed using descriptive statistics and frequency tables. The surveys represent unpaired data, which was coded and represented by

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numerical scores so quantitative analyses could be used (Creswell & Clark, 2011). In order to determine if participating in a PD with the outreach agencies made teachers more likely to attempt a MWEE lesson with the majority of their students, a Chi-squared analysis was used.

Responses to the following questions from Survey 1 (Appendix C) were used to establish general descriptive statistics based on immediate teacher feedback about the level of perceived effectiveness regarding the environmental outreach agencies' professional development workshops they attended:

1. The session increased my knowledge and skills (rank 1-5)
2. The relevance of the session to the SOLs/AP/IB was clear (rank 1-5)
3. It was clear that the session was presented by persons with education and experience in the subject matter (rank 1-5).
4. The material was presented in an organized, easily understood manner (rank 1-5).
5. The session included discussion, critique, or application of what was presented, observed, learned, or demonstrated (rank 1-5).
6. Degree to which I will be able to implement what I learned today (rank 1-5).

Survey 2 (Appendix C) provides teacher responses to multiple survey questions asked at the end of the 2015-2016 school year, when MWEE lessons required by EO42 were expected to have been completed with students. Descriptive statistics were used on the following questions from Survey 2 (Appendix C) to investigate the level of effectiveness that local environmental outreach agencies provided with preparing teachers for MWEE lessons required by EO42:

6. Overall, was the MWEE PD workshop you attended helpful in providing you with ideas that contributed to your curriculum this year? (helpful, somewhat helpful, not helpful, I did not attend a MWEE workshop)

7. Overall, was the MWEE PD workshop you attended helpful in providing you with MWEE content ideas? (helpful, somewhat helpful, not helpful, I did not attend a MWEE workshop)
8. Overall, was the MWEE PD workshop you attended helpful in providing you with MWEE materials? (helpful, somewhat helpful, not helpful, I did not attend a MWEE workshop)

Phase IV: Policy Implementation at the School Level

What are teachers' perceptions of including MWEES into curricula?

Goals established at the policy level are not always possible to achieve at the classroom level (Ball, Maguire, & Braun, 2012; Ravitch, 2014). Phase IV of this research examined whether or not the EO42 request for all middle-school and secondary-school science students to participate in MWEE lessons was successful, with MWEE teachers providing the required lesson components to all of their students. Similar to Phase III, secondary data that was collected by CCPS from science teacher surveys was analyzed in Phase IV of this investigation. In addition to investigating if student MWEE participation goals were met, an array of surveyed answers concerning teacher beliefs about outdoor education and EO42 were examined. These beliefs included self-assessments about how successfully MWEE curricula were taught. Teachers were also asked by the survey to reflect on what classroom supports were needed in order to make MWEE curricula more successful in their classrooms. Table 3.5 shows the research questions, methodology, and statistical analyses used for Phase IV.

Table 3.5

The driving research questions, expected participants, methodology, and statistical analyses for Phase IV.

Research Question	Methodology	Statistical Analyses
<p><u>Phase IV:</u> Research Question #4</p> <p>How effective was Central County Public Schools’ implementation of MWEEs required by EO42 during the 2015-2016 school year?</p> <ol style="list-style-type: none"> 1. What percentage of CCPS middle school and high school teachers who were required to teach MWEE lessons actually taught MWEE lessons? 2. What challenges did CCPS teachers face with implementing new legislation? 3. What are the perspectives of CCPS science teachers on every student performing MWEE lessons per EO42? 	<p>Analyses of secondary survey data of Central County Public Schools’ middle and secondary science teachers who taught MWEEs during year one of EO42 policy initiative.</p>	<ol style="list-style-type: none"> 1. Descriptive 2. Frequency distribution 3. T-test of the means

Sample

The sample was 63 middle and secondary school MWEE teachers who completed a survey at the end of the 2015-2016 school year (Appendix C). This secondary data was obtained with permission from Central County Public Schools for analyses in Phase IV.

Data Collection

Results of a survey given to MWEE teachers by the science specialist of Central County Public Schools at the end of the 2015-2016 school year were obtained. Surveys were issued by the science specialist to teachers via a web-based (GoogleDocs) survey form that was accessed by participants via an email message sent to all MWEE content science teachers. Each question

on the survey was mandatory and required the participant to choose an answer or to type in a response.

Data Analysis

MWEE teacher responses were analyzed in Phase IV to determine how successful teachers were at meeting the expectations set under EO42. In addition to analyzing teachers' percent completion rate of MWEE lessons, Phase IV also investigated factors that teachers indicated as impediments to delivery of MWEE lessons to their students and the perceptions of teachers regarding implementation of MWEE lessons into their curricula. These survey data were coded and represented by numerical scores so quantitative analyses can be used (Creswell & Clark, 2011). All quantitative data from the surveys were analyzed using SPSS statistical software and Microsoft Excel. Descriptive statistics and ranking of teacher responses are used to analyze and assess what teachers may need in the future in order to better achieve the MWEE lesson requirements for all students under EO42. In order to determine if there was significant differences between the perceptions of teachers who attempted to complete a MWEE and the perceptions teachers who did not attempt to complete a MWEE, an independent-samples t-test of the means was conducted.

The first part of this investigation analyzed the percent of those CCPS teachers surveyed who were able to complete the MWEE lesson required by EO42. Question 9 of the survey asks, *“For the 2015-2016 school year, I was able to provide the majority of my students a hands-on MWEE. (yes or no)”* (Appendix C). These results measure how close CCPS teachers were to achieving the 100% student participation goal required by EO42.

The second part of this investigation focused on the obstacles that teachers may have encountered while trying to perform the MWEE lesson required by EO42. This part analyzed

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how teachers ranked a variety of possible impeding factors. Questions are listed and numbered in the order they occurred on Survey 2 (Appendix C):

15. *I have adequate funding to provide MWEE lessons to my students. (Strongly disagree, disagree, neutral, agree, strongly agree, I was unable to do a MWEE)*
19. *The MWEE lesson was difficult to plan. (Strongly disagree, disagree, neutral, agree, strongly agree, I was unable to do a MWEE)*
20. *I have adequate time within a class period to teach/supervise a MWEE lesson. (Strongly disagree, disagree, neutral, agree, strongly agree, I was unable to do a MWEE)*
25. *I have adequate assistance available to plan and prepare MWEE lessons. (Strongly disagree, disagree, neutral, agree, strongly agree)*
27. *I have adequate administrative support for MWEE lessons. (Strongly disagree, disagree, neutral, agree, strongly agree)*
28. *I have adequate time available to prepare for teaching a MWEE lesson. (Strongly disagree, disagree, neutral, agree, strongly agree)*
30. *I have adequate access to reliable school transportation for off-campus MWEE lessons. (Strongly disagree, disagree, neutral, agree, strongly agree)*
31. *There is a person at my school who offers me support and assistance with teaching MWEEs. (Strongly disagree, disagree, neutral, agree, strongly agree)*
32. *There is a person within the County who offers me support and assistance with teaching MWEEs. (Strongly disagree, disagree, neutral, agree, strongly agree)*

As implementation of EO42 depends on the classroom teachers, it is important to investigate teacher beliefs about MWEE lessons in order to determine if teachers' views were different from the views of those who assisted with the creation of EO42. This part of the

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investigation investigated the overall perspectives of teachers about their belief about whether or not all children should receive a MWEE lesson. Survey 2 questions (Appendix C) are presented below:

21. *All students should participate in a MWEE lesson. (Strongly disagree, disagree, neutral, agree, strongly agree)*

26. *MWEEs are a necessary component of the science curriculum. (Strongly disagree, disagree, neutral, agree, strongly agree)*

Responses to these two questions were examined using descriptive statistics to determine general perspectives of CCPS teachers regarding implementation of MWEE lessons as required by EO42.

Study Delimitations

The limitations of this study consist of unpaired survey results for the October PD Survey and End-of-the-Year MWEE survey given by CCPS to middle and high-school science teachers. The October surveys and MWEE teacher surveys do not involve the same pool of teachers, as the sample population for the first survey included all middle and high-school science teachers who attended the staff development MWEE workshops, was not restricted to only those teachers conducting MWEEs, and has a much larger sample size than the MWEE teacher survey. As teachers are anonymous, it is impossible to pair data points for those who attended the PD to those MWEE teachers who filled out the end-of-year survey given to MWEE teachers. Though there are 109 survey responses collected from the first survey given after the October professional development workshops, the official attendance rate for the PD is currently unknown. Likewise, though there are 63 survey responses to the MWEE teacher survey, the actual number of MWEE teachers is also unknown.

Chapter 4: Findings

The focus of this chapter centers on the implementation of MWEEs into Virginia’s public education science classrooms, by researching the multiple levels that policy matriculates through.

Table 4.1 illustrates the four investigative phases that surround the vertical migration from policy formation to policy execution into science classrooms in a central Virginia school district.

Table 4.1
Descriptions of data collection approaches to describe policy formation and implementation of MWEEs

Research Phases	Phase Goals	Research Methodology
Phase I: How EO42 Policy was developed and implemented.	Interview state environmental regulatory agencies and the Department of Education subjects’ recollections of policy formation.	Interviews
Phase II: How EO42 Policy is translated into a school district	Interview CCPS’ science specialist about methods to implement policy in a school district and perspective on MWEEs	Interview
Phase III: Teachers’ perceptions of MWEE professional development	Survey data of teachers’ perspectives on the helpfulness of MWEE professional development	Secondary survey data
Phase IV: Teachers’ perceptions of including MWEES into curricula	Survey data of teachers’ perspectives of how well MWEEs were accomplished during the first year of policy execution.	Secondary survey data

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The first phase of interviews, carried out during Phase One of this research, sought to understand the viewpoints of participants who represented the Governor and the state agencies most relevant to this policy. The first cohort of interviewees in Phase One consisted of Governor McAuliffe’s Deputy Secretary of Natural Resources, two outreach educators from state environmental regulatory agencies, and one science education representative from the Virginia Department of Education. After the signing of the 2014 Chesapeake Bay Watershed Agreement, the Governor charged each of these departments to form a plan to streamline environmental literacy into public schools. Phase One focuses on these environmental education policy makers, and Table 4.2 lists the members of the representing state environmental agencies that comprised this policy-making team. The individuals involved in developing this policy represented the Governor’s secretariat for Natural Resources, consisting of the Deputy Secretary for Natural Resources, and representatives from the Virginia Department of Game and Inland Fisheries, the Virginia Department of Environmental Quality, and the Virginia Department of Education. Also involved in the policy were representatives from the Virginia Department of Forestry and the Virginia Department of Conservation and Recreation; however, these two agencies are not part of this research due to changes in job status of the individuals who represented these agencies during policy formation.

Table 4.2
Phase One interviewees and the agencies they represent.

<u>Interviewee</u>	<u>Representing Agency</u>
1. Mr. Resources	Deputy Secretary of Natural Resources.
2. Ms. Land	Represents the Virginia Department of Game and Inland Fisheries.
3. Ms. Water	Represents the Virginia Department of Environmental Quality
4. Ms. Education	Represents the Virginia Department of Education

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Phase One: How was EO42 Policy developed and implemented?

The directives of EO42 (2015) required state education and natural resource agencies to assist with the implementation of the Order. To explore development and implementation of EO42, I interviewed four policy makers who were involved. These individuals represent the Governor's Cabinet, two state environmental agencies, and one state education agency that are under the direction of the Governor. Mr. Resources is one of the Deputy Secretaries of Natural Resources under the MacAuliffe administration. Ms. Land is a team member who represents the Virginia Department of Game and Inland Fisheries and Ms. Water represents the Virginia Department of Environmental Quality. The third policy perspective was from education. Ms. Education was not present for the initial policy making sessions (she replaced the individual who was present but who has since vacated the position), but represents the interests of the Virginia Department of Education and is actively involved in the implementation of EO42.

When Governor MacAuliffe signed the Chesapeake Bay Watershed Agreement (2014), he agreed to the following MWEE environmental literacy goal:

Continually increase students' age-appropriate understanding of the watershed through participation in teacher-supported, meaningful watershed educational experiences and rigorous, inquiry-based instruction, with a target of at least one meaningful watershed educational experience in elementary, middle and high school depending on available resources.

After the multi-state Chesapeake Bay Watershed Agreement (2014) was signed by Governor McAuliffe, a policy making team was formed by Mr. Resources with the Governor's directive to brainstorm and create ways to implement the driving ideas behind EO42 into Virginia's public schools.

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Each interview was electronically recorded, with transcripts created from the audio. Completed transcripts were emailed to study participants to member check and verify accuracy. All transcripts contain the original questions presented in this study and are in my possession in a secured location. Thematic coding was used to analyze the transcripts. Responses to each interview question are analyzed and categorized into the themes shown below, and are supported with direct responses by the interviewees. A section that focuses on the analyses of the various themes is included after all responses are presented.

Goals and Contributions of Policy Makers

One of the goals of EO42 (2015) is that educators responsible for instruction about or in the environment have access to sustained professional development opportunities, tools, and resources that support efforts to provide students with high quality environmental education. This research focuses primarily on this goal through the lens of the policy-making groups. There have been 73 executive orders during Governor MacAuliffe's term, so EO42 is not an unusual occurrence. When asked why MWEE policy was done as an executive order and not as a traditional policy process, Mr. Resources immediately responded with "because we could." He went on to explain:

It is a whole lot easier to do an executive order. The General Assembly is only in town a couple of months every year. The timing of executive orders - you can do it when you want, and not when the General Assembly is in session. We operate in a divided government. Not everything that is a priority of Governor MacAuliffe is a priority of the General Assembly. It's [the passing of executive orders] a way to express policy desires and preferences in a way that can be clear and that does not have to work its way through the sausage factory of legislation.

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Ms. Land responded similarly:

There are a lot of executive orders out there. We've got one-term governors, and if governors want to make a statement about something that they believe in, then in this state we use executive orders. The Governor issues executive orders to support pet projects or something they want to make a statement about, or they want to honor a special event. Now if it goes through multiple governors and multiple efforts, the General Assembly can take it on themselves. It's a pet project thing. Legislated process would be four years and the next governor would get the credit for doing it. It's just politics.

As the interview unfolded, Mr. Resources emphasized his goals, "we all had a common purpose to build on the commitments we signed on to with the Chesapeake Bay Agreement," and stated that "it was really just another step in spreading the gospel of the importance of environmental literacy and environmental education." Mr. Resources recalled that EO42 was a policy initiated from the Governor's Policy Office and stated that his role was serving "as a coordinator for bringing folks from the agencies together." He mentioned that he's "been at the natural resource end of state government for a long time" and that he "just happens to know a lot of people." Mr. Resources described the parameters of the executive order:

There are various environmental education programs that are coordinated out of various agencies in our secretariat: the Department of Conservation and Recreation, the Department of Environmental Quality, the Department of Game and Inland Fisheries. There's a variety of environmental education programs spread across state government. The other thing happening at the time, was the Governor in 2014 signed the most recent Chesapeake Bay Watershed Agreement, and one of the elements of

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that agreement is to address environmental literacy, environmental education, and promoting meaningful watershed education experiences. This [EO42] was trying to build on the momentum of the Governor signing the Chesapeake Bay Watershed Agreement with his attention to outdoor education and meaningful watershed experiences. I remember Ms. Land was very much involved, and came up with this idea to give some recognition of these activities, to promote these activities, and connect what's happening in the classroom to the larger goals that we have for students within the Chesapeake Bay Watershed.

When asked about her agency's goals and her contributions to EO42, Ms. Land replied,

I know folks out beyond the state agencies think that it's (environmental education) being ruled by a few state resource agencies and the Department of Ed., but we've been working together with the Resource Use Council (VRUEC) since 1952. When we like each other, we get things done. Even when we don't always like each other, we get it done. I've been on the council for 35 years now. When the new SOLs were written in 1995, the council sat in on them. Having that one-on-one relationship is critical.

Ms. Land emphasized that her main goals were "to get kids outside and to recognize teachers" through the Classroom Conservation Challenge. This Challenge is a portion of EO42 that provides teachers who complete specific types of MWEEs with a certificate of completion. She recalls that:

It was a very small group that sat around the table, maybe a half-dozen agency folks, and when you have that kind of group brainstorming, you know... those were my

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goals. I wanted to see individual teachers recognized. We were all throwing out ideas, all discussing, so who knows who did what at this point in time.

Ms. Land described the policy group developing EO42 as “a very small group that sat around the table, maybe a half-dozen agency folks and NGOs (non-government officials),” Ms. Land said that she participated in the preliminary meetings that contributed to the bill and that her main “contributions would have been the Classroom Challenge” portion of EO42, but added “we were throwing out, what was this, three years ago now? We were all throwing out ideas, all discussing, so who knows who did what at this point in time. My memory isn’t that good.”

MWEEs are lessons that require an outdoor learning component. Ms. Water vocalized her desire to get kids outside. Her stated goals as a representative of her agency were:

The executive order was to help encourage students to graduate environmentally literate, and one of the ways to do that, or one of the things that needs to happen, as you know from looking at the executive order, is the teachers who are responsible for teaching have the tools and the information and the resources that they need to provide students with high level of instruction. The Conservation Classroom Challenge was our recognition of the role that teachers play in achieving that goal of environmental literacy for students. And so, we, just over the years, have recognized that individual teachers are often the leaders that champion what happens in their classroom, as well as what happens in the school. That can have a wonderful kind of growing domino effect. The Conservation Classroom was to help recognize the teachers who were working by themselves, maybe without any kind of support from their team or their administrators, and a way for those who were already kind of doing stuff to get recognition and spread the word that this was an important thing.

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So, it was a strategy from the bottom, at all levels we want to recognize the effort, so this was one area that we thought we had never encouraged or recognized was the individual classroom teacher.

Ms. Water said her main contributions to EO42 was to be part of the brainstorming sessions that helped lead to the creation of the Classroom Challenge, and was designated as one of the leaders to help implement the policy, and stated,

Starting at the beginning, I met with the team met with the Governor's office to talk about how to implement the Executive Order, and I had informal input, there wasn't a formal process that I was involved in. The Governor's office ran a few ideas past us. So we were part of that kind of brainstorming team, and that same team was pulled together, state agency educators who would be responsible for implementing it or for driving leadership to implement it. So, that was part of my role, and then within my agency, we provided models for teachers to follow.

Ms. Education emphasized her role as working closely with non-formal, state environmental outreach educators to meet the goals of EO42 to ensure "all students have a MWEE experience in elementary, middle, and high school [the second goal of EO42], that there is a sustainable schools component [the third goal of EO42], and a cohesive environmental literacy program is implemented [the first goal of EO42]." Ms. Education did not have a contribution to initial policy formation as she was hired by the Department of Education after EO42 was issued; she is active in implementation, but was not present for the bill formation. The individual who was working for the Department of Education during policy formation declined to interview for this research.

Defining a MWEE

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There was a distinct lack of cohesion among the policy makers on their definitions and descriptions of a MWEE lesson; specifically, the policy-makers disagreed philosophically on whether or not a MWEE should consist of a land investigation or a water investigation. A watershed includes groundwater flow from the highest point of land to the lowest communal body of water, where particles from each elevation flow downstream, and activities that occur within the watershed affect the integrity of the water. The Chesapeake Bay Program defines a watershed as an area of land that drains into a particular river, lake, or other body of water (retrieved 2/3/2018 from <https://www.chesapeakebay.net/discover/watershed>). This question intended to show the understandings of MWEEs that the policy makers had, and to demonstrate what their expectations were for teachers and students by obtaining examples of what they considered a MWEE to be. However, these examples flagged philosophical discrepancies among the agencies who came together in the first place to help create the law, and are indicative of the agencies they represent. Mr. Resources, a non-educator, offered a historical and very general description of MWEEs that included no structure or guidance with format:

The term Meaningful Watershed Education Experience came out of a Chesapeake Bay Agreement that was signed in the year 2000. I don't know if you know much about the Chesapeake Bay Program, but it is a multi-state coalition, both state and the District of Columbia, which is represented by the EPA (Environmental Protection Agency). They have an education workgroup that works on environmental education issues throughout the (Chesapeake Bay) watershed. It [MWEEs] really grew from that desire to get children outside and actually touch and understand, feel the resources that we talk about in a lot of abstract ways. "The Bay," "fisheries," things like that that don't have a lot of meaning but that have a lot more

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meaning when you throw a crab pot over the side of a boat and you pull it up a few minutes later and you see what's in it. I think it was also an understanding that these experiences would be linked to classroom instruction, to Standards of Learning, but it would also be something where you would be able to incorporate history, sociology, economics, (since) a variety of topics are linked to what happens in the natural environment. You know, the natural environment isn't just about biology, it's about the interaction between humans and other species. So I think for a MWEE experience to be truly meaningful you have some classroom instruction and understanding of why you're going out there, you use whatever experience it is, whether it's water quality sampling, or fisheries, or any variety of flora and fauna, and you use those in context to some of the broader learning goals that you have for your grade level, your school division, and what the State mandates schools to teach students.

Ms. Land was more succinct than Mr. Resources with the parameters of content areas that could provide MWEEs by stating that “a meaningful watershed educational experience is simply a field investigation, a scientific or social studies investigation that goes through all phases: your planning phase, and your research phase, and then you conduct the investigation, collect your data, analyze your data, then you have a reflection or publishing phase.” However, unlike the other three policy makers, Ms. Land specified that MWEE lessons had to be restricted to land investigations only, and was dismissive of any MWEE lesson that investigated waterways:

One of the biggest issues with MWEE is the fact that watershed, by definition, means land. Most of the state seems to think it means to do a macro-invertebrate study in a stream, or to do a canoe trip, or doing turbidity studies (the analysis of dissolved and

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suspended particles in water). That's a water investigation. A watershed is land. All the things that we call lakes, streams, rivers, bays, oceans, that's the water investigations. Those are not watershed investigations. Watershed investigations are learning about our impact on the land, and how soils work, and how forests work with the soil. Basically, what an actual lesson might look like at the elementary level, would be going out and measuring rainfall, looking at average rainfall for a month, or measuring rainfall at different times of the year. It might be doing a tree inventory, and figuring out how rainfall and trees work together; does more soil or more water runoff in an area that's wooded versus one that's not wooded, and measuring erosion. It could be (a lesson) creating something for that rainfall on soil. It could be as simple as figuring out where students are walking, and are they walking on areas and killing the grass that prevents run-off. It can be doing bird counts. It could be doing any kind of field investigation: how far does a squirrel have to travel to get a drink of water in the school yard, and what can we do to help that squirrel? It's not just macro-invertebrates or just canoe trips; the sky is the limit, you've just got to figure out what works for you.

Ms. Water described her version of a MWEE lesson, which was the very antithesis of what Ms. Land had described a MWEE should be as it was described as a water investigation instead of a land investigation:

The preparation phase for an aquatic investigation where kids are going to learn why water quality is important to fish. Lesson one might be in the classroom doing a lesson about macro-invertebrates, fish food; what do they look like, how do I count them, how do I sort them, what are the different types. They get put in three different

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groups: the sensitive (to pollution), the not so sensitive, and the tolerant (of pollution); and you come up with an index. You do that so they have experience counting, identifying the fish food. Then we go out into the field and we do some sampling and do some water quality tests. Then we come back to the classroom and look at all the data. What does it all mean and how does our site compare to another site in the state? Putting it all together so they can understand how water quality and what's living in the water can affect the food chain and the bigger picture. That would be a meaningful watershed investigation.

Ms. Education offered her summary of MWEEs by indicating that the “perfect MWEE is going to be a combination of three different components; the instruction of science content knowledge to support learning, the field experiences, then taking information and doing a stewardship project.” She continued to illustrate that the ideal MWEE has “student ownership, whole school atmosphere supporting it, and that it is just a wonderful experience.” Ms. Education offered a recollection of her own personal MWEE teaching experience that occurred in a school district located on the Chesapeake Bay:

I was a full time teacher. Fortunately we had water and lands near every school that were accessible to the students. So what we did is we took our environmental science class at the high school. They developed the field activities to be done by the students in the 4th grade. They made the lesson plans and the teachers reviewed them. The teachers were working on the problems with the 4th graders at school. They used the field experiences that the teenagers created with the help of the teachers. The students were actually bussed to the site and the students conducted the field experiences along with people from the Virginia Institute of Marine

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Science along with 4-H support. There were (student research) stations, and all the kids were able to circle through the stations. The school made a whole year of this, so they had a thematic year that addressed environmental literacy, and then the stewardship project was aligned to it, so the kids actually had a product coming out that helped their local community. That is a perfect MWEE. That's what you can do in a small town.

Teacher Expectations

With the implementation of EO42, teachers were expected to perform MWEES with their students at the elementary, middle, and secondary school levels. Teachers are expected to collaborate with environmental outreach educators on both MWEE lessons for their students and on continuing development in summers as well as throughout the school year. Ms. Education indicated her perspective about this expectation by saying "I think we're lucky in the state of Virginia to have such strong communication between the non-formal educators and the educators." Mr. Resources summarized expectations of teachers to adhere to the commitment of to the Chesapeake Bay Watershed Act and to promote environmental education and environmental literacy, and said "the education experts" would "figure out how to do it" as that was "the way policy-making works." In order to investigate what these "experts" figured out, I asked the same question to both of the non-formal state environmental agency educators and the formal state science educator represented in this research. According to Ms. Land, state environmental agencies on the EO42 committee did incorporate informal teacher feedback at the Virginia Association of Science Teachers' conference prior to the executive order. Her response indicated that the agency did not have much interest in standardizing the way teachers performed

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MWEEs as their feedback at the conference indicated to her that there were many different lesson formats being used at the classroom level:

We did talk to the science teachers at the science teacher's conference. We all know every single one of these teachers do things differently, and they have done them differently over the years. Some of them do very simple things (types of environmental lessons), some of them do very complex things (types of environmental lessons).

There was consensus by all interviewees that teachers should have autonomy of choice during MWEE implementation, but there were fundamental differences among policy-makers about what constituted an actual MWEE lesson. Three indicated a MWEE constituted of a lesson that involved a water-based lesson, but Ms. Land emphasized that a true MWEE only involved land-based lessons. When asked about the lessons teachers should use in the classroom, Ms. Land replied, "As far as the typical lesson, the books are filled with them."

Ms. Water echoed the abundance of available teaching resources when she remarked, "Hey, we have a whole website devoted to this." Ms. Water indicated that her agency provided the best curriculum that teachers were expected to use:

Virginia took the lead; it's essentially the best practices of science field education all in one place with the emphasis on watersheds and what's in your backyard, so I would say of all of the natural resource agencies, we have curriculum, we have lesson plans that are aligned to the standards of learning, and also are tweaked to meet the definition of a meaningful watershed experience.

The desire for teacher-led dynamics in the classroom, instead of a scripted approach towards MWEEs was also emphasized by Ms. Water in her response:

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We recognized that it was a voluntary thing. We wanted to give science teachers enough structure without having it too prescriptive, and if they came up with something that was a little bit different, that was ok. We designed the program to have that kind of individual, unique perspective that a teacher might have rather than to say, “This is the only way you can investigate biodiversity or water quality.”

Ms. Education broke down the policy expectations of educators by saying:

The non-formal educators helped to support teachers as they take those (EO42 and SOL) policies and use them in field experiences and in the conducting of MWEEs. They’re [the state environmental education agencies] supporting what is mandated that the teachers teach.

Ms. Land seemed to be a proponent of a more democratic approach towards getting students outside in other subject areas besides science. As Ms. Land is in charge of awarding the Classroom Challenge Certificates to teachers who apply, she offered comments about her observations about what teachers who had filled out the application for a certificate had done within the parameters of their classrooms, and reflected on the types of curriculum content that MWEE lessons could be supported:

At the elementary level there aren’t science teachers; they’re teachers who teach everything, and not all of these [educator-reported MWEES] have been science challenges. They get their kids outside doing something, it might not be science as much as it could be social studies or mathematics.

Aside from completing loosely-structured, teacher-designed MWEE lessons, continuing education was an expressed expectation for teachers. Ms. Education reported an increase in the availability of continuing education on MWEES for professionals:

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We have actually conducted professional developments in several areas of the state, during the summers, that provide teachers with the skills and the background knowledge to be able to conduct MWEEs. In addition, we have lessons online to help support them, and we also work closely with our state department partners to ensure that they have information that they need about the content, about different initiatives that are going on so they can tie it very explicitly into what the teachers are encountering in class. In addition, we just recently won a B-Wet Grant [Bay Watershed Education and Training grant awarded by the National Oceanic and Atmospheric Administration] so that we can take that information and spread it further. So we have professional developments planned for next summer in three different areas of the state, and then those 75 teachers that will be participating in those will be doing sustained professional development throughout the year through webinars. So we're working together to make sure we all have a common message, that we're all speaking the same language to the teachers, and make sure there's consistency in our MWEEs.

In summary, none of the interviewees offered much structure on how EO42 policy would be executed by teachers in a classroom other than emphasizing that a completed MWEE that fell within SOL standards would be the expected end product.

Obstacles to creating EO42 policy

It is important to note that at the time of these interviews, Governor MacAuliffe was ending his term as Virginia's Governor and the policy-makers all expressed concern over whether or not the next Governor (unknown at the time of these interviews) would overturn or enhance EO42. Ms. Water commented about these concerns, "The Governor wanted to get

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something done and I don't know if it would have had any kind of legs if it was a legislative process." This sentiment echoed Mr. Resources stated concerns about the government being politically divided. Ms. Education agreed that the future of EO42 depends on how the political pendulum swings with the Governor's pro-environmental policy when she wondered, "What happens (to EO42) with the new Governor?"

All four policy makers agreed that a big challenge to implementing EO42 was the lack of funding, time, and resources. It also should be noted that the agencies who were investigated for this research study questioned how seriously the other contributing agencies, particularly the Department of Education, took the newly implemented EO42 policy. According to Ms. Water, "the biggest obstacle was the implementation, having enough resources, and dividing the work up." "There wasn't enough time," was Ms. Land's opening response about the time frame allotted to construct her part of executive order (the Classroom Challenge Certificate which would be awarded to participating teachers). When asked the time frame of when the Governor's office asked her to participate and when she had approval to submit her portion of EO42 to the Governor's office, she replied, "three months." When asked about obstacles that occurred among group members during policy formation, Ms. Land was direct in her answer as she replied, "There were no differences, no dissension between the groups, I mean, it was a typical brainstorming session, so folks would go 'Oh, why don't we switch it to this?' Nothing that I would call dissension or notable differences."

Mr. Resources summarized his view of the overall policy challenges by reflecting on and summarizing his thoughts about how effective the executive order has been:

I am not sure it's (EO42) been as successful as we had hoped, and I think part of that is the difficulty you have with limited staff and resources to promote, solicit, and

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work with. A lesson I learned when I was in business is that you can't just dabble in things. If you are going to make something successful, you have to devote the resources necessary to make it successful, and those resources aren't always available. In one respect it (EO42) was successful in demonstrating the commitment to the goals and to the policies. I think the difficulty has been having the people and the time and money to really do the hand-holding and promotion. The goal would be every classroom or every school division, and that just is difficult given the constraints on resources.

Mr. Resources offered more insight when he discussed his agenda and his perceived obstacles of concern:

The biggest (obstacles) that always comes to the fore is what is it going to cost and what additional burden is it going to place on school divisions? The Department of Education is very sensitive to that; obviously schools are very sensitive to that. Resources are always a challenge, and to have the ability to do some of the things that we would like to do without the resources to do them is sometimes problematic. There's really no disagreement on the general policy goals. This is stuff we want to promote, and we want to get kids outside, and we want to link these outdoor experiences to the curriculum and the Standards of Learning, and all of that good stuff. That's not really up for debate. The debate always is "is this going to cost more in time, more money, or already layering on the pretty significant requirements under the Standards of Learning and other education policies?" That, to me, was the thing that was the most challenging.

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There are no additional funds earmarked along with EO42, but there is a historical compilation of MWEE information and lesson ideas that are available to school districts and which can be found on the natural resource agencies' outreach education websites. According to Ms. Land, there are plenty of funds available, but these are not being spent in a way that appropriately supports environmental literacy:

School systems get money from the state, they get money from property tax, and personal property taxes at the county or city level. Field investigations, Chesapeake Bay Watershed studies, or watershed studies, are part of the SOLs. They have all of the money in their school system to implement it. Now, how they choose to do it, that's an individual teacher, school, district decision. There is money because there is science money. There is SOL science implementation money. Now how you choose to spend it and put it in your local pacing guide, because we're a local controlled state, so every 132 school systems make that decision. So yeah, there's plenty of money, if you want to look at it that way, but there's no special little money.

Aside from having core philosophical differences in their expectations of what a MWEE lesson should look like, there were other nuances and obstacles discerned during the Phase One interviews. Though each policy-maker was quick to point out how well they worked within the parameters of their policy-making team, there were noticeable differences among how representatives regarded the EO42 policy, and how the policy-makers perceived how seriously other state departments, particularly the Department of Education, took the newly signed law. Other obstacles primarily focused on lack of funding included with the signing of EO42, and the short turn-around time the policy-makers had to contribute their input to the executive order.

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When the Governor's office was asked to discuss whether or not there were any conflicts among the policy-making groups creating the executive order, Mr. Resources' response to the question was a short "No. Not Really." When asked about differences among the policy team members, Mr. Resources explained that the policy "went through a number of iterations" as it "would have been something that would have been circulated amongst the various participants in our inter-agency work group." He offered the assurance that the policy "was not something that was particularly controversial" and that the "controversy comes in if you're looking for the money to expand and build on its intent."

In spite of Mr. Resources' assurances, it became evident that policy expectation, and not just a lack of funding, was an expressed key dissension. Ms. Water offered a more explanatory answer:

This team's so used to working together on environmental education, most of the people sitting around the table, other than the Governor's office, they have a four year perspective, and the rest of us have twenty years working with each other. I don't know that you would call the dissensions noticeable, but there are nuances in the sense that (there are) different goals. What the Governor's office wanted to achieve, they wanted to do something that was meaningful and flashy, and at the same time create a legacy so their understandings and their perceptions and opinions of what that is, is a little bit different than those of us who are in the street and in our offices having to implement this. When we are given an assignment and are asked to do something, there's always the calculus of, "Oh, what are the resources and the cost that it takes to do it" versus the benefits short-term or long-term, and so, we do that.

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But I think the final executive order was a good compromise. I would say there were nuances that were pretty normal.

Ms. Water went on to ask, “Have you interviewed the Department of Education yet? I’d be real curious, I think I would ask them if they see this as policy. You know, it’s an executive order, which is a type of policy, but I think in their book they don’t see it as policy.”

I did ask Ms. Education questions about conflicts and nuances that occurred during policy formation, however her response was reflective of her not being an employee with the Department of Education at the time EO42 was being formed, “although I am working very closely with the (state environmental education) groups now, I did not work with them during implementation or development of the policy.” The state educator who had currently held Ms. Education’s position during policy formation declined to be interviewed for this research study.

The primary policy push of MWEEs under EO42 stems from the 2014 Chesapeake Bay Watershed Agreement. As a parallel example of a state’s education policy response to the 2014 Agreement, Maryland’s public school system, which falls entirely within the Chesapeake Bay Watershed, has a rigorous environmental literacy graduation requirement as part of their state education standards. However, unlike Maryland’s schools, a significant portion of Virginia’s public schools exist outside of the actual Chesapeake Bay Watershed. Ms. Education confirmed that the MWEEs ordered under EO42 are not required by her agency, but said “we pushed them; we provided professional development and we do all sorts of stuff.” She continued, “If a division said ‘forget it,’ they have that ability because there is no formal legislation from (the Virginia Department of Education’s) end, and the formal legislation is from the General Assembly end.” Ms. Education went on to offer a more thorough explanation:

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First of all, you have the Chesapeake Bay Foundation. You have these foundations that are so wonderful at funding, but they only fund (school) divisions in the Chesapeake Bay Watershed. Now, when you make the MWEEs for all of Virginia, if you require it, you have to fund it. And so, there's 185,000 students that live outside of the Chesapeake Bay Watershed, and if they (the State of Virginia) dictated, they're going to have to fund it for those 185,000 students. So that's why I think it hasn't really been pushed from (the Department of Education's) end.

Ms. Water both refuted and echoed Mr. Resources claims. She alluded to controversy amongst the group members regarding policy perspectives, but agreed with Mr. Resources about the struggle for financial resources in the executive order. Ms. Water remarked that the biggest difference between the policy she had hoped to develop and the actual policy was a lack of allotted funding in the final draft of the executive order. "If you had some dedicated funding, or just some personnel, you could roll out a program that was more robust," she said, "it speaks volumes." Ms. Water went on to summarize her main worry about the approved policy when she said, "it's an executive order by a Governor who's going to be gone in a few months; it's kind of an ephemeral policy, it's not a regulation, it's not a legislation, and it's not in (Ms. Education's agency) regulations." There is indeed no current required standard for MWEEs anywhere in the Virginia Standards of Learning science framework, and there are not any described punitive measures to ensure the voluntary policy is implemented into Virginia public schools. It would seem the policy contributions requested through the Virginia Department of Environmental Quality are different from the policy contributions requested from the Virginia Department of Education; at the current date, there is no requirement for MWEE lessons in any Virginia Science Standards of Learning.

Lack of Teacher Support

The interviews provided examples of the lack of teacher support for the initiative. Concerns mainly expressed by policy-makers included an additional increase to teachers' workload and a lack of support for MWEE teachers at the school, the district, and the state level was evident from discussions with Ms. Land about her implementation of the Conservation Classroom Challenge portion of EO42. Ms. Land had intended for teachers completing the designated state challenges to be able to apply for and to receive the Conservation Classroom Challenge certificate, which was part of the executive order. The certificate is awarded to teachers who complete the required "challenge" by the State through the Virginia Department of Game and Inland Fisheries. Ms. Land remarked how she had intended for the certificate to be presented in a virtual format that a teacher could apply for and then print off her or his certificate, but that there was concern expressed by teacher leaders that "teachers (would) just say something to get their certificate," and that certificates should be manually awarded and sent to principals to distribute to teachers who had applied for the Classroom Challenge certificate.

Initially this was to be an electronic certificate thing for the Classroom Challenge. So the teachers would fill in a Google Form, XYZ form, somebody's form, and then they would hit a button and print it out. We talked to the key science leaders, the VSELA (Virginia Science Education Leaders Association) folks, and to teachers at the science teachers' conference (Virginia Association of Science Teachers), who said "Oh, no, we need to mail it to the principals." We figured for the next couple years we'll do a mailing and see what the demand is.

Ms. Land was the leading advocate for the Chesapeake Challenge portion of EO42, which awards certificates to teachers who complete MWEEs and who apply for a certificate

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through their principals. She noted that there was a difference in the anticipated volume of teacher applications for a MWEE certificate and the actual number of teachers who applied for one, and remarked that “this past year we’re only going to end up printing a dozen [teacher certificates].” Ms. Land mentioned that she felt individual principals were hindering the certificate process because they did not feel their teachers needed certificates. Ms. Education also reported that there was a workshop that was geared toward providing school administrators professional development on MWEEs, but, “the administrators were slackers and a lot of them didn’t show up.”

There were not funds earmarked specifically for the implementation of MWEEs. Mr. Resources admitted that available resources (such as classroom grants) were “spotty” and that “we did not have any additional funding available specifically for that purpose (of implementing MWEEs), and that continues to be an issue.” Mr. Resources added that he was leaving recommendations for the next administration as financial challenges would be ongoing if “we’re going to substantially increase the number of students that can experience (MWEEs) in the way it is envisioned in the Chesapeake Bay Watershed Agreement, then more directed funding needs to be provided.” Ms. Land also recognized the enormity of the task of financially implementing EO42 when she acknowledged that “there are some small grants out there, but considering there’s 80,000 teachers in the state, and a million kids who are supposed to have a MWEE three times before they graduate, there are no [financial] resources.”

At a more pragmatic, instructional level, Ms. Land and Ms. Education both agreed that elementary teachers would be challenged by the MWEE policy. Ms. Education offered further insight:

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Challenges are going to happen, especially at the elementary level where teachers do not have a high comfort level with science, and investigations, working outside, and doing some of the processes and techniques necessary to collect data. They have a fear of science, so where you have a fear of science, they (MWEEs) may not be implemented. Another problem is the emphasis from the federal government is currently on literacy and numeracy, so a lot of schools are going to focus their time and energy there. The time allotted to science may be minimal, and it may not be conducive to actually doing MWEEs. You have tight pacing guides, and in years where (courses) are going to have Standards of Learning Assessments, the teachers may not see the value of putting the time and energy into conducting a MWEE when they need to get X amounts of kids to pass the test.

Phase One Summary

There were multiple themes throughout these four interviews: the similarities and contrasts of agency goals that indicated their beliefs in the necessity of environmental literacy in public education, and lack of funding and support. The policy did not call for extra funding for schools or for teacher training despite concerns voiced by the four policy-makers interviewed. Most notably, there was a lack of consensus among the policy team about what constituted a MWEE. Even though the majority of the policy-makers gave a general description of a lesson, the very basic description of what constituted a MWEE platform was in dispute over whether or not it could be a land investigation or a water investigation. Additionally, agency representatives questioned how seriously other participating agencies, particularly the Department of Education, viewed the legitimacy of EO42, as the Department of Education has not addressed or created a formal MWEE policy for its Standards of Learning.

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The extensive planning and preparation that would be required of teachers conducting MWEEs was hardly mentioned, with only the one formal educator interviewed, Ms. Education, indicating the magnitude of planning and preparation that a school-wide, service oriented, year-long MWEE lesson had required of a small school district located next to the Chesapeake Bay. Though all the policy makers acknowledged lack of funding was a hindrance to policy execution, none of the policy-makers offered potential problems -- such as urban schools that lack campuses for research projects -- in addition to their lack of funds. Though there was some concern about the preparedness of teachers to complete MWEEs, particularly at the elementary school level, no policy maker acknowledged a lack of overall teacher training in MWEEs, and only one referenced grant funding that would only provide continuing education to 75 teachers across the entire state.

Phase Two: Qualitative Interviews of Central County Public Schools' Secondary Science Specialist.

A critical part of policy implementation is ensuring that the individuals executing the policy understand the expectations and receive support with the implementation process. Expectations of policy makers were notably unclear as Phase One indicated; policy makers did not have unanimity describing activities constituting a MWEE (land studies versus water studies). However, there was consensus among the policy makers that science teachers should have the professional liberty to conduct their own MWEEs of choice at their schools. Phase One also indicated a lack of financial support for implementing MWEE policy as funding was not included with EO42. As there is a large chasm between policy implementation and policy execution, there is a need to investigate the transfer of policy from the state level into a school district. Phase Two is an example of a high-stakes "telephone game" of translation between the

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EO42 policy makers and the science education leaders and specialists who represent the 227 school districts in Virginia; the policy needs to be communicated precisely between the policy makers and the implementers. Phase Two consists of a single interview of Central County Public Schools' secondary science specialist's (Ms. Specialist) about management practices that were used to introduce the expectations of EO42 to Central County Public Schools' middle and high school science teachers who were responsible for teaching MWEEs for the 2015-2016 school year. Ms. Specialist is the link between state level and classroom level, and it is her responsibility to investigate, translate, and integrate statewide education policy to Central County's science teachers. This data is paramount to understanding the dynamics within the school system for this particular county and serves as the "middle management" portion of this dissertation case study. The interview questions are below, and occur in the same order as they were presented to Ms. Specialist.

The following results are from a single, face-to-face interview that was conducted to broaden the view of this case study to establish the middle ground of a top-down policy investigation. This conversation was electronically recorded and transcribed. The completed transcript was emailed to the science specialist as an act of content checking and to verify accuracy. The transcript contains the original questions presented in this study, and are in the author's possession in a secured location. Direct quotations are included to highlight specific narratives from Ms. Specialist's interview in order to promote better understanding of how the EO42 policy was interpreted at the school division level.

At the beginning of the interview, I asked Ms. Specialist how she first heard about EO42. This was an introductory question that was designed understand the route of communication between state implementation and district execution. Ms. Specialist replied that she couldn't

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remember if the mode of transmission was an email or a Superintendent's memo from the Virginia Department of Education, but that it was definitely a virtual "communication from the Department of Education in some fashion." As the interview progressed, common themes arose that were reflective of Phase One: goals and contributions, definition of a MWEE lesson, teacher expectations, and conflicts that arose during implementation into the classroom.

Goals and Contributions of the CCPS Science Specialist

One of the primary goals of EO42 is that educators responsible for environmental instruction have access to sustained professional development opportunities, tools, and resources that support efforts to provide students with high quality environmental education. Ms. Specialist represents the CCPS' central office secondary science teacher management, and the goal of management is to get things done through management practices. Best management practices are defined by the Business Dictionary as "methods or techniques found to be the most effective and practical means in achieving an objective while making the optimum use of the firm's resources" (Retrieved January 20, 2018, from BusinessDictionary.com website: <http://www.businessdictionary.com/definition/best-management-practice-BMP.html>). Also, no funding supports were provided to public school districts with the signing of EO42, which can inhibit management strategies. When asked about her management strategies that enabled the county's middle and high school MWEE teachers to meet EO42 policy demands, Ms. Specialist quickly replied that "I don't know that I had a true management practice." She explained that the key component she used as the secondary science specialist was "communicating with everyone that it was an expectation that happens in 6th grade and biology." She also communicated how she shared resources, such as sample MWEE lessons, potential funding sources, and ideas. Ms. Specialist indicated again how she reached out to community environmental outreach educators

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for assistance in helping teachers prepare for MWEEs. Teacher perceptions about the environmental education workshops that occurred are explored in Phase III of this research.

Ms. Specialist was asked to describe her goals for having teachers implement EO42, and her role in helping teachers achieve these goals. This question was intended to investigate how EO42 policy goals had been translated to Ms. Specialist, and how she in turn translated these goals to teachers. Ms. Specialist replied that her goal was to get teachers to “understand what a MWEE is, the components of a MWEE, why they’re important, and that the executive order is required even though it’s not part of accreditation.”

She went on to describe how she attempted to achieve these goals:

I met with all the principals to talk about it, because a lot of principals rein in field trips, and people were turning in field trip forms to go and do something outside, and principals were denying the field trip forms. One of our (professional development) days was dedicated to environmental education for every (secondary science) teacher, regardless if they taught physics, or Earth science, or Biology 2. I brought in lots of resources from the community, and other outside organizations so [teachers] could have access to a lot of different resources, and could start planning what they wanted to do at their school.

In summary, Ms. Specialist translation of policy resulted in professional development for science teachers where environmental agencies provided information and lessons about MWEEs required through EO42 policy, and she attempted to translate policy to principals to foster more support for MWEE teachers. Her stated goals of having teachers understand and conduct MWEEs will be further examined in Phase IV of this research by examining teacher perceptions of MWEEs.

Defining a MWEE

Similar to the policy makers in Phase One, Ms. Specialist was asked to describe a MWEE lesson. She described her policy interpretation of what a MWEE should consist of, and her example lesson represents a water investigation:

The official MWEE has four components to it. There's an issue. You have to figure out what you are going to investigate, water pollution or run-off, whatever it may be. There's got to be some sort of outdoor experience and that could be outside your school or it could be at a stream or a river, just something outdoors. Then, there's got to be some sort of action project, the kids are supposed to do something with the information, so that could be like a PSA, or make a brochure, or something like that. The last part is some sort of conclusion, or something the kids have to do. The classroom teacher has to be involved in the MWEE; they can use other resources to help them. They can bring in people from the James River Association, but it should never be something that that organization does completely; the classroom teacher is supposed to be invested in it. It's not just a "you go there and you do this field trip and you're done;" there should be some work ahead of time and then some classroom follow-up for it to really count as a MWEE.

Understanding the specific process of how EO42 translates from policy directives to pragmatic implementation into the classroom is the focus of this question. Ms. Specialist defined her role as the secondary science specialist for CCPS in implementing EO42 as "helping teachers find resources and help them try and understand the executive order to figure out how they can implement this in the classroom." Ms. Specialist went on to describe how this administrative

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role took shape in translating how CCPS scaffolded environmental education directives requiring MWEE lessons into science classrooms:

So at the school division, the elementary specialist and I met and talked about where would be appropriate to put this content in because there had always been an expectation of MWEES but only once in K-12 (per the former Chesapeake Bay Agreement). The big difference with this executive order was the expectation of one MWEE per grade band (elementary, middle, and high school), so we had to figure out where that would fit; we decided to do one in 4th grade, one in 6th grade, and one in Biology for our district (all students are required by the state of Virginia to complete each of the levels of curriculum).

Teacher Expectations

As discussed in Phase One, with the signing of EO42, teachers were expected to implement MWEE lessons into elementary, middle, and secondary school classrooms. When asked to discuss how she provided teachers support for preparing classrooms for EO42, Ms. Specialist continued to describe her role in preparing teachers to implement the MWEES which were required by CCPS in 4th grade, 6th grade, and high school biology classes in order to meet the requirements of EO42 for MWEES in elementary, middle, and high school. She outlined the resources she provided to MWEE teachers, which included lesson plan examples and one day of teacher workshops on MWEES:

We knew we needed some resources for teachers who didn't feel comfortable to make their own (MWEE lessons). That is why I reached out to [specifically named teachers, adept at performing MWEES in the classroom] who created some example MWEES for those grade levels that teachers could use. Then I shared those with

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(science) department chairs [at each school] so they would have them, and then teachers also have the flexibility to make something of their own if they wanted to.

When asked about what she expected from the science teachers she managed, Ms. Specialist responded that she “expected complaints about money and time.” Standards of Learning pacing guides do not currently include MWEE components, and the state Biology curriculum includes a high-stakes test that can affect whether a student can graduate. There is little flexibility with pacing and MWEEs are time-consuming. Ms. Specialist added she had expectations that “some people have been doing great things for years, some people who never had done anything started doing some really cool things, and some people still don’t really do anything.” These expectations conflict with requirements made by EO42 for all students to experience a MWEE at the middle school and high school level, and will be further examined in Phase IV of this research.

Obstacles to translating and implementing EO42 policy

Policy makers in Phase One voiced their perceived obstacles for executing EO42 in the classroom, and they were similar to those expressed by Ms. Specialist as she emphasized that the biggest obstacles were time, resources, and funding:

There’s a lot of content in biology and they’ve got that high stakes test at the end of the year. For 6th grade, their test isn’t until three years later, so their time isn’t as big of a deal. So they really have the time, but the problem there is a lot of 6th grade teachers don’t really have a science background, so asking them to do this sort of stretches what their background knowledge is. I think time is a huge [obstacle] and resources and funding because some people really do want to do something where they take the kids out on one of the field trips, but don’t have a funding source. Also,

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if every teacher in (Central County Public Schools) wanted to do that, there aren't the resources. There's no way that the informal groups or the non-profit groups have the capacity to reach every 4th grader, 6th grader, and bio students in (CCPS). There's just no way. That's when teachers realize they sort of have to do some things on their own.

Ms. Specialist emphasized lack of resources available to support MWEEs in the classroom when she stated, "I really wanted to work out an arrangement with Parks and Recreation, because they've just got so many more facilities, but they don't really have the staff; they don't have a lot of educators, and that's not what their background is."

Lack of Teacher Support

Ms. Specialist admitted that teacher turn-over at Central County Public Schools is so high that, after the initial MWEE professional development provided to CCPS science teachers, "30% of those people are gone now." She expressed concerns similar to those indicated by the policy-makers in Phase One about the lack of financial support with EO42 when she added that the main goal was continuing to "provide resources to teachers with ongoing training which focus on how teachers could do MWEEs at their school site, rather than having something that was expensive" (such as a field trip).

The policy-maker interviews in Phase One showed no funds were earmarked for EO42 support, but indicated there were instructional supports provided to statewide science leaders. Ms. Specialist described these supports given to prepare classroom teachers in her district for implementing EO42 as emails from the Virginia Department of Education and from a two-day conference for science leaders provided by the Virginia Science Education Leadership Association:

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The support that I got in understanding the law was the Virginia Science Education Leadership Association (VSELA), which is for all science supervisors in the state. The meeting that we had in the Spring of 2015 was all about environmental literacy and environmental education. Other districts who had been doing things (MWEEs) for years shared what their district-wide plans were, how they went about getting kids into MWEEs, and who they worked with [informal educators from environmental agencies]. Some people went with the Parks System, and some used their Soil and Water Conversation people. The Department of Game and Inland Fisheries talked to us about Virginia Naturally Schools and how schools can get recognized for that.

Ms. Specialist echoed what Ms. Land indicated in Phase I about the minimal interaction between the policy-makers and the state science specialists who were responsible for disseminating the parameters of EO42. “Beyond the VSELA (Virginia Science Education Leadership Association) meetings...there wasn’t more formal training.” Ms. Specialist offered two different perspectives on the informal state environmental educators and on the state department of education; “those environmental educators provided lots of resources and answered questions, but official state Department of Education – there wasn’t a ton of guidance.”

Phase II Summary

Many themes paralleled those of the policy-makers from Phase One: lack of consensus among policy makers, complete unavailability of funding for schools and teachers, and a substantial increase in teacher workload without any guarantee of training. The statement made by Ms. Specialist about lack of guidance from policy-makers, particularly the Department of Education highlights an issue raised by Ms. Water in Phase One, who questioned how seriously

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the Virginia DOE regarded the new policy outlined in EO42. Likewise, concerns raised by Ms. Specialist about the added workload to teachers whose curricula already have an undeviating focus on SOL tests was a topic that had been examined by the policy-makers. Additionally, lack of comfort with conducting MWEEs due to a lack of content knowledge or training was expressed during the interview. A concern that was more district-specific, and not raised by the policy-makers was the high teacher turnover rate. With an estimate of one-third of science teachers leaving their schools during this three-year period, the time and resources needed to adequately train teachers to perform MWEEs to be compliant with EO42 increases exponentially. Other concerns expressed by Ms. Specialist, such as transportation and teacher success with implementing MWEEs are further explored in Part III and Part IV of this research.

Phase III: Perceptions of Outreach Agency Professional Development

One of the requirements of EO42 is for state environmental agencies to assist k-12 public schools in providing MWEEs to all students. There are many outreach education venues available in Central Virginia, and each outreach program has a special environmental focus. The first objective of Phase III was to determine which local environmental education resource agencies CCPS science teachers reported they signed up with at the October, 2015 PD. The second objective of Phase III was to investigate how CCPS science teachers¹ perceived the effectiveness of the PD workshops in preparing them for conducting MWEEs in their classrooms.

What local resource agencies helped Central County Public Schools middle and high school teachers prepare with executing the requirements of EO42 during the 2015-2016 school year?

¹ The MWEE professional development was open to all CCPS middle and high school science teachers, regardless of science subject taught.

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There were nine environmental agencies present for the CCPS MWEE professional development for middle and secondary science teachers. Two of these agencies -- the Chesapeake Bay Foundation and the James River Association -- are non-government agencies (NGA)². The remaining are agencies funded at the national, state, and local government levels. Of the agencies listed, only the Math and Science Innovation Center has a sole mission of providing K-12 education to public schools. The other agencies are either part of a larger agency or have several facets to their mission statements. Table 4.3 lists these participating environmental outreach groups

Table 4.3

Local environmental outreach agencies used to provide all participated CCHS middle and secondary science teachers with professional development on MWEEs.

-
- Chesapeake Bay Foundation
 - James River Association
 - Math and Science Innovation Center
 - Project Learning Tree Environmental Education
 - Project Underground
 - Project WET
 - Project Wild
 - Soil and Water Conservation District
 - Virginia Commonwealth University Rice Center
-

To determine how CCPS teachers perceived the effectiveness of the environmental PD workshops, two teacher surveys were administered by CCPS and provide the data for research question 2.

² NGA's can be funded by through public money, but not necessarily.

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What were CCPS teachers’ perceptions of the effectiveness of local resource agencies for helping them implement MWEEs during 2015-2016?

The survey data analyzed for this question was collected in the October PD survey and the Secondary MWEE Teacher survey (Appendix C). The responses by CCPS middle and high school science teachers were collected after a professional development workshop on MWEE in October, 2015.

Table 4.4.
Perceptions of CCPS secondary science teachers towards MWEE lessons presented by local environmental outreach agencies.

Question	Percent of Responses					Mean*	n
	1	2	3	4	5		
The session increased my knowledge and skills.	0 (0)	8 (9)	19 (22)	35 (41)	38 (45)	4.04	117
Degree to which I will be able to implement what I learned today.	2 (2)	6 (7)	27 (32)	42 (49)	23 (27)	3.80	117

*On a Scale from 1 = Strongly disagree to 5 = Strongly agree

The majority of teachers agreed that the October MWEE PD workshops increased their knowledge and that they would be able to implement what they learned.

Helpfulness of agencies for implementation: Participants were asked about the quality and usefulness of the nine participating outreach agencies in assisting each teacher with completing a MWEE lesson required by EO42. Each question required a ranking response between the numbers of 0-3 where a value of “0” represents a coded response of “Did not attend a MWEE workshop;” a value of “1” represents a coded response of “Not helpful;” a value of “2” represents a coded response of “Somewhat helpful;” and a value of “3” represents a coded response of “Helpful.” Using this schema, a question with a response of 3.0 represents a positive perception of the effect that the October, 2015 environmental outreach workshops had on preparing MWEE teachers. Unlike the October PD survey, which was administered to all

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middle and high school teachers and reflects opinions of science teachers who may not be responsible for teaching MWEE content in their classes (e.g., physics teachers), the MWEE Teacher Survey is specific to the MWEE content teachers. Thus, the MWEE Teacher survey provides a much more in-depth focus on teachers’ needs and perspectives about performing MWEES with their students.

Table 4.5.
Perceptions of middle and high school MWEE teachers towards MWEE lessons presented by local environmental outreach agencies. Survey Questions are obtained from Survey Two.

Question	Percent of Responses			n	Mean *
	Scaled Responses				
	1	2	3		
	% (n)	% (n)	% (n)		
Overall, was the MWEE PD workshop you attended helpful in providing you with ideas that contributed to your curriculum this year?	7 (3)	33 (14)	60 (25)	42	2.52
Overall, was the MWEE PD workshop you attended helpful in providing you with MWEE content ideas?	10 (4)	26 (11)	64 (27)	42	2.55
Overall, was the MWEE PD workshop you attended helpful in providing you with MWEE materials?	21 (9)	38 (16)	41 (17)	42	2.05

*On a Scale from 1 to 3 where 1 = Not helpful, 2 = somewhat helpful, and 3 = helpful
Note: data represents only MWEE teachers who attended the October

Though MWEE professional development was made available to all secondary science teachers, regardless of science content taught, not all teachers responsible for teaching MWEES attended them. Figure 4.1 below indicates that 21 of the 63 responding MWEE teachers did not participate at all in the October, 2015 professional development provided.

Percent of MWEE Teachers Attending PD

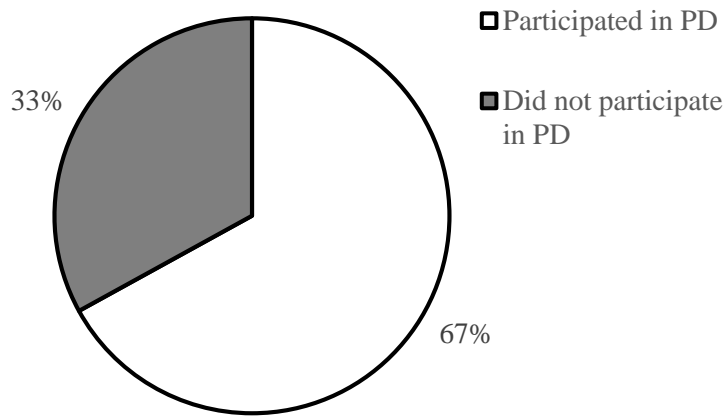


Figure 4.1. Percent of surveyed MWEE teachers who attended the October, 2015 professional development workshops provided by local environmental outreach agencies.

One-third of MWEE teachers did not attend a MWEE workshop for the October PD day.

Because all MWEE teachers need the professional development, reasons for not attending need to be explored prior to planning the next MWEE PD.

The effectiveness of this single PD in increasing teachers' abilities to complete MWEEs was investigated to determine if workshop attendance increased the likelihood of a teacher attempting a MWEE lesson with their classes. Teacher participation in the PD and teacher completion of a MWEE are shown in Table 10. A 2 x 2 Chi-squared analysis indicated a statistically significant relationship [Chi-squared (1 d.f.) = 4.17, $p < 0.05$] between teachers' PD attendance and teachers' perceived ability to complete a MWEE lesson with their students per EO42. These results indicate PD has a small, positive effect of 2 percent on whether or not a teacher completes a MWEE.

Table 4.6. *The effects of teacher PD on teacher completion of a MWEE lesson for the 2015-2016 school year*

Teacher PD attendance	Teachers who completed a MWEE lesson		Totals
	Percent Completed	Percent Incomplete	
	MWEE (Yes)	(No)	
Attended PD (Yes)	83	17	100
Did not attend (No)	81	19	100
Totals	82.5	17.5	100

Though there is a statistically significant difference in reported MWEE completion between teachers who attended a MWEE PD and teachers who did not attend, it is important to note that even though completing the PD workshop increased the likelihood of completing a teacher-perceived MWEE lesson, most teachers did not complete an actual MWEE lesson with their students and the difference between the two groups is only 2% more completing MWEE. This will be further investigated more fully in the Phase IV.

Phase IV Results: Policy Implementation at the School Level

Policy implementation is done at the street level by teachers in classrooms. With the acknowledgment from the original policy makers about funding and training that was omitted when EO42 was signed into law, a failure of science teachers to provide all of their students a MWEE lesson seems inevitable. Phase IV evaluates teachers’ success rates in providing MWEEs and investigates possible areas where classroom supports are most necessary to improve the success of future MWEE endeavors.

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What percentage of CCPS middle school and high school teachers who were required to teach MWEE lessons actually taught MWEE lessons?

Results indicate that though 53 out of 63 teachers (84%) reported they completed a MWEE lesson, the majority of teachers are not providing the correct format for MWEE lessons required by EO42, with only 14 teachers (26%) actually completing a MWEE lesson containing all four components required by EO42. The secondary data that was used in these analyses are from the MWEE Teacher survey administered at the end of the school year in June, 2016. These are *ex post facto* responses from MWEE teachers on lessons during the first year of policy implementation. To assess whether MWEE lessons required under EO42 were taught, participants were asked to respond “Yes” if they had taught a lesson they perceived to be a MWEE lesson, or “No” if they did not attempt to teach a MWEE lesson.

Table 4.7.
Percentages of CCPS MWEE teachers who taught MWEE lessons

Question	Percent Provided a MWEE		
	Total n	%	n
For the 2015-2016 school year, I was able to provide the majority of my students a hands-on MWEE.	63	83	52

As previously discussed, a MWEE is a lesson or series of lessons that have the following four components (Rose 2016):

1. *Issue Definition*: Students identify an environmental question, problem, or issue and explore through background research and investigation
2. *Outdoor Field Experiences*: Students participate in one or more outdoor field experiences sufficient to collect the data required for answering the research questions and informing student actions

3. *Action Projects*: Students participate in an action project during which students address environmental issues at the personal or societal level.
4. *Synthesis and Conclusions*: Students analyze and evaluate the results of their investigation of the issue.

When I examined the comprehensiveness of the MWEE’s the teachers said they taught, I found that few teachers provided an MWEE lesson containing all four required components. To determine what was taught, I analyzed the open-ended responses to the survey question: *“Please briefly describe the MWEE activities you used with your students, and, if applicable, include the names of any community outreach education partners who worked with you. If you were unable to do a MWEE, please type N/A.”* As Table 4.8 demonstrates, the majority of teachers were omitting the student-led Action Project component from their MWEE lesson. Responses from the 63 middle and high school science teachers indicate that 53 teachers reported the details of the MWEE lesson they attempted. Of these 53 teachers, only 26% (n=14) of teachers conducted an appropriate MWEE lesson with their students that included all four components required under EO42 policy.

Table 4.8. *Distribution of MWEE lesson components taught in 2015-2016 at CCPS.*

MWEE Lesson Component Parameters	Number of Teacher-Described Lessons N	Lessons that had Issue Definition % (n)	Lessons that had Outdoor component % (n)	Lessons that had Action Project % (n)	Lessons that had Synthesis and Conclusion % (n)
Breakdown of teacher-reported MWEE lessons	56	91 (51)	66 (37)	38 (21)	43 (24)

Teacher descriptions of MWEE lessons indicated that the majority of teachers are capable of conducting lessons that emphasize an ecological problem, that two-thirds of teachers take their students outside for some part of the lesson, but shows that the majority of teachers are falling

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short of the EO42 requirement for lessons to include a component for a student-led action project and that their lessons are also lacking a conclusion.

What did CCPS middle and high school teachers perceive to be challenges to implementing the MWEEs required under new EO42 legislation?

On the MWEE teacher survey, respondents were asked to rate various items on how challenging they would be to implement. Table 4.9 lists the question stems with responses from those teachers who performed a MWEE.

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Table 4.9.

Perceptions of what challenges CCPS secondary science teachers faced when implementing MWEE lessons per EO42.

	Percent Response					Total n*	Mean
	Scale Response						
	1	2	3	4	5		
	% (n)	% (n)	% (n)	% (n)	% (n)		
I have adequate administrative support for MWEE lessons.	3 (2)	8 (5)	24 (15)	40 (25)	25 (16)	63	3.76
I have adequate assistance available to plan and prepare MWEE lessons.	6 (4)	5 (3)	32 (20)	41 (26)	16 (10)	63	3.56
There is a person within the County who offers me support and assistance with MWEEs.	11(7)	8 (5)	29 (18)	38 (24)	14 (9)	63	3.37
I have adequate time available to prepare for teaching a MWEE lesson.	6 (4)	17 (10)	33 (21)	30 (19)	14 (9)	63	3.30
I have adequate time within a class period to teach/supervise a MWEE lesson.	5 (3)	19 (11)	28 (16)	41 (24)	7 (4)	58	3.26
There is a person at my school who offers me support and assistance with teaching MWEEs.	13 (8)	13 (8)	32 (20)	24 (15)	19 (12)	63	3.24
I have adequate access to reliable school transportation for off-campus MWEE lessons.	5 (3)	16 (10)	51 (32)	20 (13)	8 (5)	63	3.11
I have adequate funding to provide MWEE lessons to my students.	7 (4)	25 (15)	40 (24)	18 (11)	10 (6)	60	3.00
The MWEE lesson was difficult to plan.	7 (4)	50 (29)	28 (16)	12 (7)	3 (2)	58	2.55

*Where 1 = “Strongly disagree,” 2 = “Disagree,” 3 = “neutral,” 4 = “agree,” and 5 = “Strongly agree.”

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Results indicate that 34 percent of teachers did not believe they had adequate funding versus 29% who believed they did. Though 57 percent of teachers believed a MWEE lesson was not difficult to plan, 78 percent of teachers did not complete a full MWEE lesson with their students. These results also indicate that 24 percent of the MWEE teachers in CCPS do not believe they have adequate time within a class period to teach a MWEE lesson. Slightly more than half of CCPS middle and high school teachers believe they have adequate assistance available to plan MWEEs and the support of their administrators when they perform the lessons. Transportation to and from MWEE sites off school grounds is perceived as unavailable, with only 28 percent of teachers reporting that they had access to adequate transportation. Lastly, only half of teachers felt they could count on support or assistance with teaching MWEEs from someone at their school or from an individual within the CCPS system.

What were the perspectives of CCPS middle school and high school science teachers on having every student perform MWEE lessons as required by EO42 legislation?

Table 4.10 shows how teachers perceived the responsibility of teaching MWEEs to all students.

Table 4.10.
Perceptions of CCPS secondary science teachers every student required to engage in a MWEE lesson per EO42.

Question	Percent of Responses					Total n*	Mean
	Scale Response						
	1	2	3	4	5		
	% (n)	% (n)	% (n)	% (n)	% (n)		
All students should participate in a MWEE lesson.	6 (4)	6 (4)	22 (14)	35 (22)	31 (19)	63	3.76
MWEEs are a necessary component of the science curriculum.	5 (3)	9 (6)	21 (13)	44 (28)	21 (13)	63	3.67

*Where 1 = “Strongly disagree,” 2 = “Disagree,” 3 = “neutral,” 4 = “agree,” and 5 = “Strongly agree.”

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Results indicate that the 66% of teachers believe all students should participate in a MWEE lesson and that 65% of CCPS teachers believe that MWEEs are a necessary component of the science curriculum. Reaching the required goal of 100% of all students completing a MWEE is highly unlikely when 12 to 14 percent of teachers responsible for teaching MWEEs do not believe these are necessary components of the science curriculum over 20% of teachers are unsure if MWEEs should be a lesson that students engage in.

Further investigation was done using independent t-tests of the means to determine if there was a difference in perspectives between those teachers who indicated they performed a MWEE compared to teachers who did not attempt to perform a MWEE with their students. Table 4.11 indicate there were significant differences in teacher perspectives depending on whether or not teacher attempted to perform a MWEE lesson with their classes for the survey topics of funding, planning, and classroom time.

Table 4.11. *Factors that significantly affect teachers’ abilities to complete MWEEs*

Survey Questions Topics	Total N (teachers)	Teachers who reported completing MWEEs			Teachers who reported they did not complete MWEEs			t-test
		N	M	SD	N	M	SD	
Adequate funding	63	52	3.02	1.093	11	1.82	1.601	-3.037*
Planning difficult	63	52	2.50	.918	11	1.64	1.690	-2.043**
Adequate class time	63	52	3.27	1.050	11	1.73	1.737	-3.904***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

One survey question of note was whether or not a teacher had completed a MWEE-type lesson with students in the year prior to EO42. An independent-samples t-test was conducted to compare if teachers who had attempted prior MWEEs were more likely to complete a MWEE during this first year of EO42 than other teachers who had never attempted a prior MWEE

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lesson. There was a significant difference in the scores for teachers completing MWEES who had completed prior MWEES ($M=1.04$, $SD=0.839$) than for teachers not completing prior MWEES ($M=0.27$, $SD=0.647$) conditions; $t(61) = -2.846$, $p = 0.006$. These results suggest that having previous experience with completing a MWEE significantly improves whether a teacher will attempt future MWEES under EO42. Teachers who had previously attempted a MWEE in the year before policy execution were significantly more likely to attempt a MWEE lesson with their students.

Chapter 5: Discussion

On Earth Day, 2015, former Virginia Governor Terence MacAuliffe signed Executive Order No. Forty Two, establishing the Virginia Environmental Literacy Challenge, which called for all public school students to engage in at least three meaningful watershed educational experiences (MWEE) during elementary, middle, and secondary education. This non-punitive law that requires teachers to provide all of their students with MWEEs was investigated to determine how this policy was implemented into classrooms in a central Virginia school district. The purpose for this research was to create a street-level bureaucrat case study by conducting and analyzing interviews with four state employees who assisted with creating and implementing EO42 policy, by interviewing a science specialist from Central County Public Schools, and by analyzing teacher survey data. The interviews and data provided insight about the various perceptions of the policy process as EO42 was executed via MWEE lessons into science classrooms during the first year of policy implementation.

Phase I

Phase I of this research indicated EO42 was a rushed, unfunded policy response to the 2014 Chesapeake Bay Watershed Agreement. There were difficulties with the formation of EO42. In every interview with the policy makers, money and time were the noted issues at the policy-forming level. According to the Governor's office, the executive order was a "because we can" kind of policy, which, in this case, was supposed to convey a statement about the stance the Governor took on environmental education. However, this convenience in policy-making does not convey from the Governor's Mansion into the classroom. Implementation was

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summarily dismissed by policy-makers with a wave of the hand and comments of “we have websites for this” and “the experts will figure it out.” However, conducting the required MWEE lessons in Virginia’s public schools can demand extensive planning and classroom resources; these issues were not seriously addressed by the policy-makers, which lays all the burden of implementation directly into the hands of untrained, uninformed teachers. The four components of a MWEE lesson (issue definition, outdoor field work, action projects, and synthesis and conclusion) is a transformational type of lesson requiring significant planning time, training, effort, resources, and execution.

This premier environmental education executive order may make a statement at the higher echelon levels of policy, but it paints a very different picture at the classroom level and the classroom is where policy enactment succeeds or fails (Ball et. al, 2012; Braun et. al, 2011; Lipsky, 1980; Spillane et. al, 2002; Werts & Brewer, 2014). The classroom level implementation was ill-considered, as even the Governor’s Deputy Director of Natural Resources indicated during his interview when he mentioned that he was unsure of what required components teachers would need to deliver. These lesson components require time and communication, and districts received little to none of either. Teachers must have pertinent training and supports in order to perform MWEE lessons. These supports are so severely lacking that the Virginia Department of Education can only provide professional development to a number of teachers that only slightly exceeds the number of MWEE teachers in Central County, and is a far cry from being able to provide continuing education to an entire state of MWEE teachers.

Interviews provided insight into how the policy-makers from each agency viewed the roles of other agencies involved in the process of EO42. The majority of feedback was positive, but one antagonistic issue stands out from the interviews: the perceived lack of consideration the

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Virginia Department of Education gave to MWEES. Ms. Water, in her interview, indicated that she did not think the Department of Education took the executive order seriously as policy. Ms. Education mentioned that the Department of Education did not include MWEE policy into standards, thus districts that chose not to do them could not be forced to. This is clearly a divisive issue. Though there is a need for environmental literacy, perhaps a lack of funding and support are factors that inhibits MWEE concepts from being included into Virginia Standards of Learning. Absolutely no funding was earmarked for the implementation of EO42 into Virginia's public schools, and there is very limited support available to assist this implementation. Under EO42, state environmental outreach agencies were expected to assist teachers with preparing for implementing MWEES. For CCPS teachers, there was evidence of professional development having a positive effect on whether or not a teacher completed a MWEE. However, without funding, there are not enough professional development opportunities available state-wide to provide needed training for all MWEE teachers, and instead agencies and districts must rely on grant-funding to provide the few continuing education workshops they offer. Lack of policy funding results in lack of resources at the classroom level, as evidenced by the failure of CCPS to provide MWEES to its students.

Phase II

Phase II is a vivid analogy of how policy interpretation is not the same as policy translation, and highlights the importance of normalizing policy at the district and school level to improve future policy translation and execution (Ball, Maguire, and Braun, 2012). The secondary science specialist was the individual at the district level who disseminated information about EO42 to CCPS' middle and high school teachers. Prior to policy enactment, Ms. Specialist gathered her policy information from a state science leadership conference (VSELA),

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and from a virtual memo sent from the Department of Education. Teachers, likewise, heard about policy changes from an email sent by Ms. Specialist and from a professional development day where sign-up for MWEE workshops was optional. Analysis of survey data for the 2015-2016 school year shows that Central County Public School teachers faltered in the delivery of EO42, evidenced by fewer than one out of every three teachers completing a meaningful watershed educational experience with their students. More evidence of teacher disconnect from policy is indicated by 83 percent of teachers reporting via survey that they had completed a MWEE lesson with their students. This disconnect between actual performance and perceived performance could be a result of the lack of cohesion during policy formation, policy implementation, and policy translation; thus there is a tremendous ongoing need to continue to inform districts and teachers about policy and translate that into practice.

Phase III

When EO42 was signed into law, former Governor MacAuliffe required state environmental agencies to assist teachers with implementing MWEEs into their classrooms. Central County Public Schools is a larger district, and collaborated with 9 environmental outreach agencies for their October, 2015, professional development; of these 9 agencies, 6 were state agencies. This study indicated that teachers responded positively to environmental outreach agencies, and that these PD interactions slightly improved a teacher's tendency to conduct MWEEs with their students. However, results also indicate that 33% of MWEE teachers did not attend the October professional development. The results of the survey of CCPS teachers after the first year of MWEE implementation showed they overwhelmingly did not understand the four components required for a MWEE lesson, with 38% of teachers not providing lessons that included the student-led project component, and only 66% of teachers incorporating an outdoor

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learning component to their MWEE lessons. Implications from this phase suggest that with more PD participation, possibly even PD that targets teachers' weak areas, there should be a resulting increase in MWEE participation at the classroom level. However, further research should be done to investigate the quality of teacher learning that results from the environmental outreach PD (Bae, Hayes, Seitz, O'Connor, & DiStefano, 2016) before this increase is recommended.

Phase IV

Policy typically does not reach its intended goal at the first attempt, and failure of teachers to reach a 100% implementation goal is not a surprise. The actual Year One results show that only 26% of teachers were able to provide their students with an actual MWEE lesson that included the required components: environmental issue definition, outdoor field experience, action project, and conclusion. According to teacher survey responses, there are many areas in need of improvement. Not surprisingly, teachers echoed the sentiments of the policy makers as they indicated a lack of time and a lack of money, with 34% of teachers indicating they did not have enough class time to conduct a MWEE lesson, and 24% of teachers noting they did not have adequate funding to conduct MWEEs. Though 57% of teachers said a MWEE was not difficult to plan, it is important to point out that 78% of teachers were unable to execute a MWEE lesson with the four required components. Teachers who previously attempted MWEEs were more likely to continue attempting MWEEs. Teachers who attempted a MWEE versus teachers who did not attempt a MWEE indicate that there are several topics of significance that affect a teacher's perceived ability to complete a MWEE: lack of funding, lack of adequate class time, and the difficulty of planning a MWEE lesson.

Implementation and Recommendation for Policy

Implementation

Effective policy enactment requires communication among all levels of policy actors at the state, district, school, and classroom (Darling-Hammond, 2010; Goldstein, 2008; Mansfield, 2013; O’Laughlin & Lindle, 2015; Ravitch, 2014; Spilane et. al, 2002; Werts & Brewer, 2014). Currently, state-level communication with teachers consists of periodic emails from the Virginia Department of Education that promote MWEE PD workshop opportunities for teachers, and the newest Elit survey that was sent to Virginia public school districts last fall. Though, district level communication has been reduced to offering very limited MWEE PD workshops once a year in the fall, the current science specialist has applied for and received a community-based MWEE grant from the B-Wet program (funded through the National Oceanic and Atmospheric Administration) to boost school-wide MWEEs for middle school science classrooms. Communication about MWEEs among high school teachers in the district is not established or normalized, even at individual schools, there is no current exchange of lessons or lesson ideas, and there are no teacher leaders officially established for teachers who struggle with MWEEs to contact for support.

Recommendations

Unsurprisingly, there is very little feedback available on which to base my recommendations, and the current material that is available is descriptive in nature, and hardly detailed enough to offer much more than anecdotal data. According to the Chesapeake Bay Foundation’s most recent Elit survey analysis, nearly 80% of Virginia’s school districts that exists within the Chesapeake Bay Watershed (data is not reported for those Virginia districts that exist outside of the watershed) are not fully prepared to implement high quality environmental

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education. Nearly 40% of these districts are reporting that a MWEE is taking place system-wide with elementary school students, 45% of middle schools are reporting system-wide MWEE completion, and 26% of high schools are reporting that they are participating in system-wide MWEES (Sickler, 2018). Given the results found in this study based on CCPS MWEE teachers, it cannot be assumed that these results are really a system-wide event, or that the lessons are really MWEES that fulfill the four established parameters required of a MWEE lesson under EO42. Sickler (2018) also indicated the three highest levels of support needs for Virginia teachers in the Chesapeake Bay Watershed to be funding, teacher professional development, and curriculum planning and support. My recommendations to the state are to begin allocating funding to support these three areas, as policy that doesn't include funding will not become true policy (Ball et. al, 2012; Lipsky, 1980; Spillane et. al, 2002). The bulk of MWEE lessons are taught within science classrooms. My recommendations to school districts is to attempt to democratize the policy (Kensler, 2012) by requiring more content areas to teach MWEE-type lessons that fit within the parameters of the class curricula. Additionally, communication among teachers would most likely improve the tendency of teachers to complete policy requirements (Ball et. al, 2012), as it would provide examples of MWEE content lessons that are already implemented within the district.

Conclusion

Ideally, the take-away from this policy should be that all public school children will receive environmental literacy in an outdoor learning, social justice format. However, instead of the ideal, an executive order promoting environmental literacy and ecological preservation of Virginia's resources for present and future generations has failed to become implemented in a way that has little real transferable educational value for all students. As Nicholas Tampio

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(2017) says in his analysis of learning in a standardized education world, “it is a challenge for schools to reconcile the individual and the community, the school and society, and the child and the curriculum” (p. 37). Simply put, MWEEs add to this challenge, but also come without money, time, standards, support, or training. Because results of this study indicate that the requirements of EO42 failed to be upheld by teachers, it is important to examine and review where future support is needed. Without supports, the profound educational and social potential of this law becomes, at best, ephemeral, frustratingly unachievable by those teachers who believe in it and too easily dismissed by those who do not.

Limitations

The policy-maker interviews are limited to four individuals, but there were more present at the policy-making table. This study is limited to Mr. Resources, Ms. Land, Ms. Water, and Ms. Education due to individuals retiring, changes in jobs, having long-term family issues that caused them to be out of state during the time-period where interviews were conducted, and even due to individuals who simply chose not to be interviewed. Another limitation to this study that was pointed out by three of the policy-makers is the two-year period that passed between policy formation and the timing of this research – memory is a tricky factor. At the district level, this study is limited to interviews of one secondary science specialist, and does not include the perspectives of the elementary science specialist. Likewise teacher investigations are collected from a single district, and there is a single year of secondary teacher survey data obtained from Central County Public Schools, which is reflected in the 2015-2016 data in this research. Larger samples involving a variety of districts would offer stronger validity.

Future Direction for Research

“Try, try again” is a fitting motto for the process of translating MWEE policy into CCPS science classrooms, and CCPS is not an isolated example of a district struggling to implement environmental literacy. Results from the most recent Elit survey show that school districts throughout states in the entire Chesapeake Bay Watershed are falling short of the goals of the 2014 Chesapeake Watershed Act (Sickler, 2018). These results also list the top three challenges to MWEE teachers as being funding, professional development, and curriculum planning (Sickler, 2018). As public school funding is an ongoing issue, methods that can be investigated to target problematic areas uncovered in this research may prove to be a beneficial starting point for future research. One of the unknowns in this study was the instructional methods and content used by the environmental outreach agencies. Teacher surveys in this study indicated a lack of understanding about the four components required in a MWEE lesson. Surveys also indicate pressure for time and resources, such as funding and transportation. If future workshops involving environmental outreach agencies, particularly state agencies, occur, then knowledge of these areas where improvement is needed could target specific content and provide a range of examples that teachers might more readily utilize on their own campuses.

REFERENCES

- American Association for the Advancement of Science (AAAS) (2011). Vision and change in undergraduate biology education: A call to action (eds. C.A. Brewer and D. Smith). Washington, DC: AAAS.
- Bae, C., Hayes, K., Seitz, J., O'Connor, D., & Distefano, R. (2016). A coding tool for examining the substance of teacher professional learning and change with example cases from middle school science lesson study. *Teaching and Teacher Education*, Volume 60, 164-178.
- Ball, S., Maguire, M, & Braun, A. (2012). *How Schools Do Policy: policy enactments in secondary schools*. New York, NY: Routledge.
- Berliner, D. (2011). MCLB (Much Curriculum Left Behind): A U.S. Calamity in the Making. *The Educational Forum*, 73:4, 284-296
- Berliner, D. (2011). Rational Responses to High Stakes Testing: the case of curriculum narrowing and the harm that follows. *Cambridge Journal of Education*, 41(3), 287-302
- Bernick, E. & Wiggins, C. (1984). The Governor's Executive Order: an unknown power. *State & Local Government Review*, 16(1), 3-10.
- Best management practice (BMP). BusinessDictionary.com Retrieved January 20, 2018, from BusinessDictionary.com website: <http://www.businessdictionary.com/definition/best-management-practice-BMP.html>
- Biernacki, P. & Waldorf, D. (1981). Snowball sampling: problems and techniques of chain referral sampling. *Sociological Methods & Research* 10(2) 141-163.
- Black's Law Dictionary, 2nd ed. Retrieved <https://thelawdictionary.org/executive-order>
- Bodary, M., Stone, N., Lochmann, S., & Frimpong, E. (2004) Characterization of Arkansas baitfish pond effluents. *Journal of the World Aquaculture Society* 35:489-497
- Bogdan, R. C. & Biklen, S.K. (2007). *Qualitative research for education: An introduction to theory and methods* (5th ed.). Needham Heights, MA: Allyn & Bacon.

Running Header: A Watershed Moment: Implementing State Environmental Literacy Policy into a Central Virginia School District

- Braun, A., Ball, S., Maguire, M., & Hoskins, K. (2011). Taking context seriously: towards explaining policy enactments in the secondary school. *Studies in the Cultural Politics of Education*, 32(4) pgs. 585-596.
- Bunk, B. 1981. Knowledge, utility, and sense of efficacy as determinants of environmentally responsible behavior. *Psychological Reports* (48) pgs. 9-10.
- Bybee, R. (2014). NGSS and the Next Generation of Science Teachers. *Journal of Science Teacher Education*, 25:2, 211-221.
- Chesapeake Bay Education Workgroup (2011). The Meaningful Watershed Education Experience. Retrieved from https://www.chesapeakebay.net/documents/Revised_MWEE_definition_-_FINAL.pdf
- Chesapeake Bay Program (2001). Chesapeake 2000. Retrieved from http://www.chesapeakebay.net/channel_files/19193/chesapeake_2000.pdf
- Chesapeake Bay Watershed Agreement. (2014). Retrieved from: <http://www.chesapeakebay.net/documents/ChesapeakeBayWatershedAgreementFINAL.pdf>
- Coyle, K. (2005). Environmental Literacy in America: What ten years of NEETF/Roper research and related studies say about environmental literacy in the U.S. The National Environmental Education & Training Foundation.
- Creswell, J. (2013). *Qualitative inquiry and research design: Choosing among five approaches*. Thousand Oaks, CA: Sage Publications.
- Creswell, J. & Clark, V. (2011). *Designing and Conducting Mixed Methods Research*. Thousand Oaks, CA: Sage Publications Inc.
- Darling-Hammond, L. (2010). *The Flat World and Education: How America's Commitment to Equity Will Determine Our Future*. New York, NY: Teachers College Press.
- Dewey, J. (1938). *Experience and Education*. The MacMillan Company, NY.
- Diem, S. (2012). The Relationship between Policy Design, Context, and Implementation in Integration Plans. *Education Policy Analysis Archives*, 20 (23). Retrieved May 9, 2018 from <https://epaa.asu.edu/ojs/article/view/958/993>.
- Environmental Education Instructional Programs for Grades Prekindergarten-12th Grade. Office of the Secretary of State of Maryland. Retrieved from <http://www.dsd.state.md.us/comar/comarhtml/13a/13a.04.17.01.htm>

Running Header: A Watershed Moment: Implementing State Environmental Literacy Policy into a Central Virginia School District

- Ernst, C., Buddle, C., & Soluk, L. (2014). The Value of Introducing Natural History Field Research into Undergraduate Curricula: A case study. *Bioscience Education* Advance online publication. Retrieved <https://www.tandfonline.com/doi/full/10.11120/beej.2014.00023?scroll=top&needAccess=true>.
- Establishing the Virginia Environmental Literacy Challenge. Exec. Order No. Forty Two, (2015), retrieved from, <https://governor.virginia.gov/media/3797/eo-42-establishing-the-virginia-environmental-literacy-challengeada.pdf>
- Every Student Succeeds Act of 2015, Pub.L. No. 114-5
- Feagin, J., Orum, A., & Sjoberg, G. (Eds.), (1991). A case for case study. Chapel Hill, NC: University of North Carolina Press.
- Ferguson, M & Bowling, C. (2008). Executive Orders and Administrative Control. *Public Administration Review*, 68(1), pp. S20-S28.
- Fitchett, P. & Heafner, T. (2012). A national Perspective on the Effects of High-Stakes Testing and Standardization on Elementary Social Studies Marginalization. *Theory and Research in Social Education*, 38:1, 114-130.
- Fullan, M. (2009). Large-scale Reform Comes of Age. *Journal of Educational Change*, 10(1), pp. 101-113.
- Fullan, M. & Pomfret, A. (1979). Research on Curriculum and Instruction Implementation. *Review of Educational Research*, 47(2), pp. 335-397.
- Gerring, J. (2004). What Is a Case Study, and What Is It Good For? *American Political Science Review*, 98(2), pp. 341-354.
- Goldstein, L. (2008) Kindergarten teachers making “street-level” education policy in the wake of No Child Left Behind. *Early Education and Development*, 19(3), 448-478.
- Gruenewald, D. (2004) A Foucauldian analysis of environmental education: toward the socio-ecological challenge of the Earth Charter, *Curriculum Inquiry*, 34(1), 63-99.
- Gruenewald, D. & Offei, B. (2007). Oil and Water Still: how No Child Left Behind limits and distorts environmental education in US schools. *Environmental Education Research*, 13(2), 171-188.
- Kensler, L. (2012). Ecology, Democracy, and Green Schools: An integrated framework. *Journal of School Leadership*, Volume 22, 789 – 814.
- Lieberman, G. & Hoody, L. (1998) Closing the Achievement Gap: using the environment as an integrated context for learning (Poway, CA, Science Wizards)

- Running Header: A Watershed Moment: Implementing State Environmental Literacy Policy into a Central Virginia School District
- Lipsky, M. (1980). *Street-level Bureaucracy: Dilemmas of the Individual in Public Services*. New York, NY: Russell Sage Foundation.
- Louv, Richard. (2005) *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*. Chapel Hill, NC: Algonquin Books.
- Mansfield, K. C. (2013). The growth of single-sex schools: Federal policy meets local needs and interests. *Education Policy Analysis Archives*, 21(78).
- Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco, CA: Jossey-Bass.
- Mitchell, M., & Jolley, J. (2012). *Research Design Explained*. Cengage Learning. Belmont, CA.
- Mumford, Lewis. (1964) The Automation of Knowledge. *Educational Technology Research and Development*. September 1964, 12, (3), pp 261-276.
- National Center for Environmental Information. (2018). 2017 was Earth's third-warmest year on record. Retrieved from: <https://www.climate.gov/news-features/featured-images/2017-was-earths-third-warmest-year-record>
- National Environmental Education Foundation. (2015). Environmental Literacy in the United States: an agenda for leadership in the 21st century. Retrieved from: <https://www.neefusa.org/resource/environmental-literacy-report-2015>
- Nichols, S., & Berliner, D. (2008). Testing the Joy Out of Learning. *Educational Leadership*, 65(6), pp. 14-18.
- No Child Left Inside Coalition. (2009). About the No Child Left Inside Coalition. Retrieved from <http://www.cbf.org/Page.aspx?pid=895>
- North American Association of Environmental Education. (2015). State Environmental Literacy
- O'Laughlin, L, & Lindle, J. (2015). Principals as political agents in the implementation of IDEA's Least Restrictive Environment mandate. *Educational Policy*, 29 (1), 140-161.
- O'Sullivan, E. (1999). *Transformative Learning: Educational vision for the 21st century*. University of Toronto Press, Toronto.
- Paarlberg, L. & Gen, S. (2009). Exploring the determinants of nonprofit coproduction of public service delivery: the case of k-12 public education. *American Review of Public Administration* 39(4), p. 391.
- Paul, J. (2005). *Introduction to the philosophies of research and criticism in education and the social sciences*. Upper Saddle River, NJ: Pearson, Prentice Hall.

Running Header: A Watershed Moment: Implementing State Environmental Literacy Policy into a Central Virginia School District

- Ragin, C. (1987). *The comparative method: Moving beyond qualitative and quantitative methods*. Berkeley, CA: University of California Press.
- Ravitch, Diane. (2014). Hoaxes in educational policy. *The Teacher Educator* 49, 153-165.
- Riordan, M., & Klein, E. (2010). Environmental Education in Action: How expeditionary learning schools support classroom teachers in tackling issues of sustainability. *Teacher Education Quarterly* 34(4) p. 119-137
- Rose, C. (2016). Environmental Literacy Indicator Tool (ELIT): summary and descriptive statistics. Virginia Department of Education.
- Roth, C. (1992). Environmental Literacy: Its roots, evolution, and directions in the 1990s. Eric Clearinghouse for Science, Mathematics, and Environmental Education. Ohio State University Publications: Columbus.
- Saldana, J. (2013). *The Coding Manual for Qualitative Researchers*. Los Angeles, CA. Sage publications.
- Science standards of learning for Virginia public schools. Richmond, Virginia: Virginia Department of Education, 2010.
- Sickler, J. (2018). Chesapeake Bay Watershed 2017 Environmental Literacy Report: Results from the Watershed ELIT Survey. *Chesapeake Bay Program Workgroup*. Retrieved from https://www.chesapeakebay.net/documents/Chesapeake_ELIT_2017_-_Watershed_Results_.pdf
- Simpson, D. J., (2007). Educational philanthropy: An instrument of qualified change. *Journal of Negro Education*, 76(3), 230-239.
- Smith, G. & Sobel, D. (2010) *Place and community-based education in schools*. New York, NY: Routledge, 2010.
- Spillane, J., Reiser, B. & Reimer, T. (2002). Policy implementation and cognition: Reframing and refocusing implementation research. *Review of Educational Research* 72(3), 387-431.
- Tampio, N. (2016) Democracy and National Education Standards. *The Journal of Politics*, 79(1), 33-44.
- U.S. Department of Education (USDE). (2012a). The U.S. Department of Education Green Ribbon Schools Recognition Award. Retrieved from <http://www2.ed.gov/programs/green-ribbon-schools/factsheet.pdf>
- Vannote, R., Minshall, G., Cummins, K., Sedell, J., & Gushing, C. (1980). The River Continuum Concept. *Canadian Journal of Fish and Aquatic Science*. 37, 130-137.

Running Header: A Watershed Moment: Implementing State Environmental Literacy Policy into a Central Virginia School District

Virginia Code Article VIII, § 4. Retrieved from <http://www.doe.virginia.gov/boe/virginia-board-of-education-bylaws.pdf>

Virginia Department of Education: Instruction, Environmental Literacy. Retrieved from http://www.doe.virginia.gov/instruction/environmental_literacy/index.shtml

Virginia Department of Game and Inland Fish (VDGIF). Educational Programs. Retrieved on April, 17, 2018 from <https://www.dgif.virginia.gov/environmental-programs>

Virginia Education Policy Center. (2013). Retrieved from <http://teach.coe.jmu.edu/va-edpolicy/>

Virginia General Assembly :: Virginia Legislature, Legislative Essentials. Retrieved on February 20, 2017 from <http://viriniageneralassembly.gov/virginiaLegislature.php?secid=20&activesec=2#!hb=1&mainContentTabs=4&content=4,includes/contentTemplate.php%3Ftid%3D52%26ctype%3Db%26cid%3D90&in=1>

Watershed. Chesapeake Bay Program, retrieved 2/3/2018 from <https://www.chesapeakebay.net/discover/watershed>

Werts, A & Brewer, C. (2014) Reframing the Study of Policy Implmentation: Lived experience as politics. *Educational Policy*, 29(1). 206-229.

Yanow, D. (2000). *Conducting Interpretive Policy Analysis*. Sage University Paper Series Qualitative Research Methods, Vol. 47. Thousand Oaks, CA: Sage Publications.

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Sage Publications.

Zint, M., Kraemer, A., & Kolenic, G. (2014). Evaluating meaningful watershed educational experiences: An exploration into the effects on participating students' environmental stewardship characteristics and the relationships between these predictors of environmentally responsible behavior. *Studies in Educational Evaluation*. 41, pp. 4-17.

Appendix A:

Hello!

My name is Melinda VanDevelder and I am currently a doctoral student at VCU completing dissertation research on EO42. You were listed as a contact person on the Executive Order (or recommended as a contact person), and I was curious if I could ask you a series of questions in order to include your point of view about the Executive Order in my research. If you are interested in participating in my case study, I have attached the study questions to this email, and we can set up a conference time that is convenient for you. If you are not interested in doing or completing the study, you are free to opt out at any time.

Thank you very much for your time and attention.

Sincerely,

Melinda (Bodary) VanDevelder, doctoral student
VCU Department of Educational Leadership
bodarym@vcu.edu

Appendix B

Hello!

My name is Melinda VanDevelder and I am currently a doctoral student at VCU completing dissertation research on EO42. You were the secondary science specialist for Central County Public Schools* during the enactment and roll-out of EO42, and I was curious if I could ask you a series of questions in order to include your point of view about the Executive Order in my research. If you are interested in participating in my case study, I have attached the study questions to this email, and we can set up a conference time that is convenient for you. If you are not interested in doing or completing the study, you are free to opt out at any time.

Thank you very much for your time and attention.

Sincerely,

Melinda (Bodary) VanDevelder, doctoral student
VCU Department of Educational Leadership
bodarym@vcu.edu

*Name changed for confidentiality

Appendix C

Questions used on Survey One

Note: Questions 1-6 of the survey Likert-style with a ranking of 1 indicating a “strongly disagree” response, and a ranking of 5 indicating a “strongly agree” response. Questions that were asked of science teachers are as follows in the exact order as found on the survey:

1. The session increased my knowledge and skills (rank 1-5)
2. The relevance of the session to the SOLs/AP/IB was clear (rank 1-5)
3. It was clear that the session was presented by persons with education and experience in the subject matter (rank 1-5).
4. The material was presented in an organized, easily understood manner (rank 1-5).
5. The session included discussion, critique, or application of what was presented, observed, learned, or demonstrated (rank 1-5).
6. Degree to which I will be able to implement what I learned today (rank 1-5).

Note: Questions 7-10 of the survey presented with a yes or no response, and are shown in consecutive order as they are found on the survey:

7. The information presented was pertinent to issues at my school (yes or no).
8. I am likely to use the information from today’s training to improve classroom instruction (yes or no).
9. The facility was appropriate to the type of training and had the necessary equipment to facilitate the instruction (yes or no).
10. Would you recommend this presenter for future workshops (yes or no)?

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Note: Questions 11-14 were presented as open-ended, didn't require a mandatory answer in order to complete the survey in Google Form, and are shown in consecutive order as they are found on the survey:

11. The best features of the day were (open-ended response).
12. Suggestions for improvement include (open-ended response).
13. Other comments and reactions I wish to offer (open-ended response).
14. Topics I would like offered at future professional development days (open-ended response).

Questions from Survey Two

Note: Questions are shown in the order of appearance on the online survey. Answer selections are indicated in the (parentheses) after each question.

1. Your name (short answer)
2. Select your workplace. If you work at multiple schools, please list your base school. (pull down selection)
3. Which course content did you teach this year (Life science or Biology)
4. Did you attend a Meaningful Watershed Education Experience (MWEE) workshop at the October 12 Professional Development (PD) Meeting? (Yes or No)
5. Which MWEE workshop did you attend at the PD meeting? (Multiple workshops and an “I didn’t attend a workshop” option)
6. Overall, was the MWEE PD workshop you attended helpful in providing you with ideas that contributed to your curriculum this year? (helpful, somewhat helpful, not helpful, I did not attend a MWEE workshop)
7. Overall, was the MWEE PD workshop you attended helpful in providing you with MWEE content ideas? (helpful, somewhat helpful, not helpful, I did not attend a MWEE workshop)
8. Overall, was the MWEE PD workshop you attended helpful in providing you with MWEE materials? (helpful, somewhat helpful, not helpful, I did not attend a MWEE workshop)
9. For the 2015-2016 school year, I was able to provide the majority of my students a hands-on MWEE. (yes or no)

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10. In previous school years, I have usually been able to provide the majority of my students a hands-on MWEE. (yes, no, not applicable)
11. The MWEE I provided to my students this year directly correlated with a Virginia Science SOL. (yes, somewhat, no, I was unable to do a MWEE)
12. Did the WEE workshop you attended at the October PD provide you with the concept for your MWEE? (yes, somewhat, no, I was unable to do a MWEE, I did not attend a MWEE PD workshop)
13. Did you and the majority of your students attend a field trip as a MWEE? (yes, no, I was unable to do a MWEE)
14. Please briefly describe the MWEE activities you used with your students, and, if applicable, include the names of any community outreach education partners who worked with you. If you were unable to do a MWEE, please type N/A. (long answer text)
15. I have adequate funding to provide MWEE lessons to my students. (Strongly disagree, disagree, neutral, agree, strongly agree, I was unable to do a MWEE)
16. Students performed well with the MWEE lesson provided. (Strongly disagree, disagree, neutral, agree, strongly agree, I was unable to do a MWEE)
17. Students learned environmental concepts with the MWEE lesson. (Strongly disagree, disagree, neutral, agree, strongly agree, I was unable to do a MWEE)
18. Students were engaged while performing the MWEE lesson. (Strongly disagree, disagree, neutral, agree, strongly agree, I was unable to do a MWEE)
19. The MWEE lesson was difficult to plan. (Strongly disagree, disagree, neutral, agree, strongly agree, I was unable to do a MWEE)

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20. I have adequate time within a class period to teach/supervise a MWEE lesson. (Strongly disagree, disagree, neutral, agree, strongly agree, I was unable to do a MWEE)
21. All students should participate in a MWEE lesson. (Strongly disagree, disagree, neutral, agree, strongly agree)
22. I feel confident about teaching class outdoors. (Strongly disagree, disagree, neutral, agree, strongly agree)
23. I feel confident in my ability to lead MWEE lessons. (Strongly disagree, disagree, neutral, agree, strongly agree)
24. I feel I have the adequate skills needed to teach MWEE lessons. (Strongly disagree, disagree, neutral, agree, strongly agree)
25. I have adequate assistance available to plan and prepare MWEE lessons. (Strongly disagree, disagree, neutral, agree, strongly agree)
26. MWEEs are a necessary component of the science curriculum. (Strongly disagree, disagree, neutral, agree, strongly agree)
27. I have adequate administrative support for MWEE lessons. (Strongly disagree, disagree, neutral, agree, strongly agree)
28. I have adequate time available to prepare for teaching a MWEE lesson. (Strongly disagree, disagree, neutral, agree, strongly agree)
29. I can align a MWEE lesson within appropriate Virginia Standards of Learning parameters (Strongly disagree, disagree, neutral, agree, strongly agree)
30. I have adequate access to reliable school transportation for off-campus MWEE lessons. (Strongly disagree, disagree, neutral, agree, strongly agree)

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31. There is a person at my school who offers me support and assistance with teaching

MWEEs. (Strongly disagree, disagree, neutral, agree, strongly agree)

32. There is a person within the County who offers me support and assistance with teaching

MWEEs. (Strongly disagree, disagree, neutral, agree, strongly agree)