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Overcoming Barriers to Teaching Action-Based Environmental Education: A Multiple Case Study of Teachers in the Public School Classroom

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OVERCOMING BARRIERS TO TEACHING ACTION-BASED ENVIRONMENTAL
EDUCATION: A MULTIPLE CASE STUDY OF TEACHERS
IN THE PUBLIC SCHOOL CLASSROOM

A Specialist Project
Presented to
The Faculty of the Department of Educational Administration, Leadership & Research
Western Kentucky University
Bowling Green, Kentucky

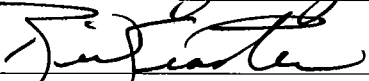
In Partial Fulfillment
Of the Requirements for the Degree
Specialist in Education

By
Terry Rachael Adams

May 2013


OVERCOMING BARRIERS TO TEACHING ACTION BASED ENVIRONMENTAL
EDUCATION: A MULTIPLE CASE STUDY OF TEACHERS
IN THE PUBLIC SCHOOL CLASSROOM.

Date Recommended January 21, 2013


Dr. Ric Keaster, Director of Thesis


Dr. Sharon Spall


Dr. Bud Schlinker

 4-1-13
Dean, Graduate Studies and Research Date

I dedicate this thesis to my son Steven Curtis Jones II who gave up his life while I was in the middle of this project. His last demand to those he loved was, “Do something amazing. DO SOMETHING!” This thesis is but one way that I honor my son.

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This specialist project came to fruition because of the support, patience, and guidance of my research committee. The initial chair of this study was Dr. Sharon Spall. She not only guided me through this process, sharing her extensive knowledge and experience, but she gave me the time and space I needed to work through the overwhelming obstacles that I had to overcome as I struggled to complete this project. She waited and listened patiently as I worked through my grief over the loss of my son, which occurred in the middle of this study, and then she provided structure and direction as I worked to regain my focus. I am forever grateful for the countless hours Dr. Spall spent editing my work to help me create as flawless a product as possible. Through her support and assistance, I gained a much greater understanding of the research process which will guide my future professional goals.

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Lastly, I am grateful for the time and cooperation of the three teachers who shared their classroom experiences with me. Without the willingness of the participants

to discuss those often difficult and sometimes political issues that affect their practice,
this study would not have been possible.

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Terry Rachael Adams

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As the human population increases, it becomes increasingly more important for society to understand the impact of humans on the environment. Preserving fixed resources by engaging in sustainable practices is necessary to ensure those resources are available for future generations. Since the early 1960s, policy makers and educators alike have sought to ensure that students graduate environmentally literate. Previous research has identified a multitude of barriers that limit classroom teacher's ability to integrate environmental education into their curriculum. The purpose of this study was to investigate how teachers overcome those barriers that restrict the integration of action-based environmental education into the public school classroom. This was a three-case study of public high school teachers. Data were gathered for this qualitative study through observations, interviews, and the collection of documents. Constant comparative method was utilized to analyze data. The researcher conducted a within-case analysis for each case and a cross-case analysis as well. Through the use of coding, the researcher identified patterns and themes across cases. Barriers identified by participants included resources, time, and risk. The primary factors uncovered by this study, which potentially affect teacher efficacy, are personal and educational background, the availability of mentors, and support of outside agencies. The implications for policy makers and institutions of higher education that can be drawn from this study are that, through the course of teacher undergraduate and graduate education, teachers should be provided

with field experiences in the area of environmental education. In addition to providing field experiences, finding ways to link teachers to outside environmentally focused agencies and mentors increases teacher efficacy by providing support and resources.

Introduction

Statement of the Problem

John Disinger (1985) identified the evolution of the definition of environmental education. Disinger noted that a single definition of environmental education has eluded those who have attempted to reduce the field to a single and specific set of criteria. By nature of the discipline, environmental education is fluid. Environmental education is ever changing as society and the values held by society change; it is ever changing as political climate vacillates and as technology advances, populations grow, and the issues environmental education seeks to address are revealed or resolved. Environmental education is multi-disciplinary, multi-faceted, and multi-dimensional, therefore becoming a product of the aims of the individual field, group, or discipline that seeks to promote it (Disinger, 1985; McBeth & Volk, 2010), thus complicating the inclusion of environmental issues into the arena of public education.

However fluid the nature of environmental education, the inclusion of environmental issues into the public school curriculum is more relevant than at any other point in time. The heightened awareness of environmental issues by the media, spawned by global focus on climate change and renewable sources of energy, ensures that few students are left without some awareness of environmental issues. However, this awareness is often filtered through the perspectives of the media and the views of others more than by accurate and defensible knowledge (Coyle, 2005). As the world seeks to address the environmental issues that undoubtedly plague humanity as our population grows, it becomes imperative that we produce citizens who have the ability to critically analyze the world in which we live and to solve the problems we face (Coyle, 2005).

Those citizens must not only be aware of, but also possess the skills necessary to act on those problems. How do we as educators produce environmentally literate citizens who can act to solve real world problems under the constraints imposed on educators in a public school classroom?

Purpose of the Study

A review of the literature reveals that barriers to the teaching of environmental education are both universal and issue specific in nature. Teachers around the world face similar obstacles despite the fact that surveys of both the general public and of professional educators reveal that the majority of citizens believe environmental issues should be taught in schools (Coyle, 2005; Rickinson et al., 2004). Unfortunately, few educators have a background in environmental issues, which results in deficits in both content and pedagogical knowledge in relationship to the environment (Desjean-Perrotta, Moseley, & Cantu, 2008; Kim & Fortner, 2006; Zak & Munson, 2008). Those deficits affect teacher efficacy in that they create or restrict teacher confidence (Plevyak, Bendixen-Noe, Henderson, Roth & Wilke, 2001; Smith-Sebasto & Smith, 1997). Even those teachers who have the knowledge and skills needed to successfully teach environmental issues are faced with a host of outside and issue-specific constraints such as money, time, liability, focus on state and national standards, and support of administrators (Kim & Fortner, 2006; Rickinson et al., 2004). The purpose of this study is to uncover how teachers who integrate action-based environmental education into the classroom have overcome barriers.

Research Question

The literature clearly defines the barriers that restrict teachers from providing students with authentic experiences that teach environmental issues. This three-case study sought to discover the following: How have teachers overcome barriers that restrict the integration of action-based environmental education into the public school classroom? For the purpose of this study, action-based environmental education includes inquiry learning, hands-on learning, place-based learning, outdoor learning, and service-based learning.

Significance of the Study

This study focused on overcoming barriers to teaching environmental education. Therefore, individuals who are attempting to develop environmental programs in public schools will benefit from the information obtained during this research study.

In addition to those who seek to develop environmental programs, other educators will benefit also. Action-based environmental programs involve many types of learning, which are relevant to teachers in other disciplines as well. Teachers who seek to include instruction in their classroom that is inquiry based, service learning based, or community based will benefit from this study.

Lastly, the researcher's personal practice will benefit from this research study. As a teacher, the researcher worked for several years to develop an environmental education program that engaged students in authentic, service-based learning opportunities. As a school administrator, the researcher hopes to create an educational program in which students learn in a real world context while developing both a global perspective and an

understanding of how their role as citizens affect their community and the planet as whole. This study will enable the researcher to learn from the experiences of other educators how to help teachers overcome the barriers that restrict such learning.

Limitations

This study was limited to three teachers who were invited and agreed to participate in an inquiry about environmental education. This was a short-term study, which did not research teaching behaviors over time. The interviews were limited to three teachers' practices at one point in time.

Definitions

Action-based Environmental Education

For the purpose of this study, *action-based environmental education* is a term constructed by the researcher to describe any lesson in which students learn by doing. This learning includes but may not be limited to inquiry learning, hands-on learning, place-based learning, outdoor learning, and service learning.

Constructivist Theory

Constructivism is a theory of knowledge proposed by Jean Piaget which postulates that humans learn through their experiences as they derive meaning from the world around them (Fosnot, 1996).

Environmental Education

The National Environmental Education Policy Act (U.S. Public Law 91-516, 1969) states "For the purpose of this Act, the term 'environmental education' means the educational process dealing with man's relationship with his natural surroundings, and

includes the relation of population, conservations, transportation, technology, and urban and regional planning to the total human environment” (p. 1).

Experiential Education

Experiential Education is a philosophy in which teaching and learning occur through experiences that tie learning and content directly to the environment (Itin, 1999).

Review of Literature

Introduction

Throughout human history man has sought understanding of his place in this world. Much of that understanding occurred through the acquisition of resources to meet his biological needs and manifested itself through the evolution of culture and religion (Dow, 2006; Stone, 2008). It can be argued that at no point in history other than the modern era has man encountered such a complex intersection between the growth of human population, association with modern culture and religion, technological advancement, and his connection to the natural world. These complexities become obvious in times of heightened global environmental concern that parallel economic crisis, religious associations related to political partisanship, international conflict, and the globalization of society (Lee, 2006). Within this reality environmental education continues to gain a foothold in the public school classroom (Crouch & Abbot, 2009; Disinger, 1997; Gruenewald, 2005).

History of Environmental Education

Environmental education evolved from the nature study, outdoor education, and conservation movements (Disinger, 2001). Though these movements paved the way for progress, the environmental movement became an independent entity in the 1960s. The movement was born in part due to the publication of Rachel Carson's book *Silent Spring* (1962), which illuminated the risks of pesticide use, particularly DDT. While reintroducing Carson's landmark book, former Vice President Al Gore (Carson, 1994) maintained that Carson provided the public awareness that built the foundation for the creation of both public policy and governmental agencies. These agencies remain key

agents in the ongoing development of environmental legislation and public education initiatives. Though Carson died two years following the 1962 publication of her work, Gore suggests that her legacy created a spark that led to the formation of the Environmental Defense Fund in 1967. The formation of The Environmental Protection Agency (EPA) and the passage of National Environmental Education Act followed in 1970.

According to the EPA, the major goals of the National Environmental Protection Act of 1970 were to promote programs that support environmental education in schools and institutions of higher education. Though insufficient funding left this piece of legislation impotent, the United States has witnessed a proliferation in government agencies, groups, organizations, clubs, and associations focused on improving the state of our environment. These developments led to the passage of the second National Environmental Education Act of 1990 (Lewis & Zeldin, 1991).

In the introduction of the National Environmental Education Act of 1990 (NEEA), Congress states, “There is growing evidence of international environmental problems, such as global warming, ocean pollution, and declines in species diversity, and that these problems pose serious threats to human health and the environment on a global scale” (p.1). Congress further states that “Existing Federal [support] for development and training of professionals in environmental fields is not sufficient” (NEEA, 1990, p.1). This legislation provided funding for environmental education programs in institutions of higher education as well as those managed by public organizations like the National Parks System (National Environmental Education Act, 1990).

Legislation introduced to the 110th Congress by Representative John Sarbanes of Maryland presents a new justification for environmental education programs in schools. *The No Child Left Inside Act* passed in the House with bi-partisan support on September 18, 2008, hoped to reconnect kids with nature by providing \$2,000,000 in stimulus funds to states that agree to ensure that every child that graduates high school is environmentally literate (Lowell, 2008). Birthed by a collection of over 200 groups known as the No Child Left Inside Coalition, this act points to recent research correlating childhood obesity, diabetes, depression, bi-polar disorder, and attention deficit disorder to children's increasing disconnection to nature (Louv, 2006; Lowell, 2008). The legislation was sent to committee in 2011 where it currently waits discussion by the Senate (Lowell, 2008; Pine, 2008) and if passed, offers another opportunity for the integration of environmental education into the public school classroom.

Environmental Education and Student Achievement

The intended purpose of past environmental education legislation was based on the premise that in order to solve global environmental problems, society must educate the general workforce concerning environmental issues and train them accordingly (National Environmental Education Act, 1990). However, despite the governmental emphasis on creating knowledgeable and aware citizens who can act to solve global environmental problems, 10 years of research conducted by The National Environmental Education and Training Foundation reviewed by Coyle (2005) found that the American public has limited understanding of environmental issues. Despite the fact that 95% of American adults and 96% of parents support teaching environmental education in schools, the report discloses that one-third of Americans cannot pass a basic

environmental literacy test. In fact, environmental literacy has decreased from the 1970's to present. Surveys conducted by the Roper Reports (Roper-Starch, 2000) found that students, who would be expected to be the most environmentally literate, are in fact not. Adults from the ages of 18 to 35 are statistically more environmentally literate with college graduates performing significantly higher than individuals who have a high school education or lower. These differences possibly indicate shortcomings in the ability of K-12 educational systems to produce environmentally literate graduates.

Gambro and Switzky (1996) observed similar patterns of responses when they analyzed data from the Longitudinal Survey of American Youth (LSAY). A 4-year study conducted by Miller, Suchner, Hoffer, Brown and Pifer (1991) researched teacher and student attitudes in relationship to math and science on the secondary level. Analysis of the data collected showed that 60% to 70% of high school seniors could answer basic knowledge questions about the environment but only 41.6% to 45.6% of seniors correctly answered the application questions. Possibly holding greater implications for secondary educators, this study suggests that little growth occurred in environmental literacy from the tenth grade to the twelfth grade.

This discrepancy between the goal to produce environmentally literate citizens and the actual educational outcomes becomes even more pronounced when one surveys the literature pertaining to student achievement in schools that do implement broad-based environmental programs as opposed to those that do not. A noted side effect of the implementation of environmental education programs into public schools is increased academic achievement in core content areas, reasoning, analysis, and creativity (England & Marcinkowski, 2007). In a national study conducted by the State Education and

Environment Roundtable, Lieberman and Hoody (1998) focused on 40 successful programs that used the Environment as an Integrating Context for Learning (EIC). The environmental programs used for this study shared several commonalities that included hands-on authentic learning within the context of students' school and community. More than 400 students in 40 schools participated. Four different surveys were administered; stakeholders were interviewed; and comparisons of standardized test scores, GPA's, and attitudes were conducted in 14 of the study schools. In those schools, 92% of the comparisons revealed that students involved in the EIC program outperformed their non-participating counterparts in academic achievement.

Students who participated in this study demonstrated increased achievement in all core subject areas (math, science, reading, writing, and social studies) as well as exhibited greater enthusiasm for learning, higher motivation, and improved behavior. In addition to greater achievement in core subjects, 98% of educators reported that they perceived students to have increased ability to think creatively, 97% reported that students were more proficient at solving problems and thinking critically, and 89% reported that students exhibited greater ability to understand the relationships that exist in and between complex systems.

Another study conducted by England and Marcinkowski (2007) focused on an analysis of service learning-based environmental programs in Florida high schools and colleges. The authors utilized a two-phase method of gathering data that consisted of a quantitative survey of environmental education programs in Florida followed by a qualitative study of teacher perceptions consisting of case studies and interviews. After identifying how many and what kinds of programs existed and what sources of funding

supported them, England and Marcinkowski developed an instrument consisting of a 38-question survey comprising 30 Likert questions and 8 open-ended questions. Seven domains of learning were analyzed: school participation and behavior, academic achievement and success, career development, social/interpersonal development, personal development, ethical/moral development, and civic responsibility development. Teachers who responded to the survey reported increased student growth for all seven domains tested. Lack of verification of the reliability of teacher responses was a limitation of this study.

The findings of these studies suggest that schools and students may benefit from widespread implementation of the environmental programs which legislation seeks to support. Students may benefit both academically and socially. Schools may benefit by reduced discipline referrals and greater student participation.

Barriers to Environmental Education

The federal government deems environmental education important enough to pass legislation to promote it. Strong evidence exists that suggests positive correlations between environmental education programs and student achievement (Lieberman & Hoody, 1998). Yet teachers still struggle to integrate environmental issues into public school classrooms (Kim & Fortner, 2006; Plevyak et al., 2001; Rickinson et al., 2004; Winther, Volk, & Shrock, 2002). In a review of the international literature pertaining to outdoor learning, which included studies on outdoor environmental learning, Rickinson et al. (2004) identified five major barriers to the provision of outdoor learning by teachers and schools. One primary barrier identified is concern for children's safety and the legal liability associated with potential risks. A second barrier, teachers' confidence and level

of expertise, impacts not only teacher choices as to what they teach, but also how they teach the content and how well they teach the content. Curriculum requirements such as district, state, and nationally mandated content provide another barrier. Teachers often lack choice in the content they teach due to these mandates. Physical barriers such as time, resources, and support are also identified barriers. Lastly, wider barriers defined as student to staff ratios, course structures, school day schedules, and school budgets restrict the teaching of action-based environmental education. Kim and Fortner (2006) categorize these barriers as internal barriers and external barriers. Their research indicates that these barriers are issue specific, meaning that different environmental issues are not taught in response to specific barriers such as level of text coverage, inclusion in curriculum standards, or teachers' level of content knowledge. For example, if a subject is underrepresented in textbooks, this barrier is specific to that particular environmental issue. The following sections explore the research in relationship to key specific barriers.

Internal Barriers. Internal barriers are those specific to the individual teacher. These include factors that affect teacher attitudes such as individual values, beliefs, and experiences. Internal barriers also include factors determining teacher competency such as content and pedagogical knowledge. Both of these types of internal barriers in turn affect teacher confidence and efficacy (Kim & Fortner, 2006).

Teacher attitudes. A complex relationship exists between the internal barriers that affect teachers' ability to successfully integrate the environment into their classes. Shuman and Ham (1997) have proposed a theoretical model addressing the influences that determine teachers' commitment to environmental education teaching. Through the

development of their model they applied Field Theory, Theory of Planned Behavior, and Life-Span Development Theory to environmental education creating the Model of Environmental Education Commitment (MEEC). This model postulates that not only do teachers' life experiences factor into their attitudes about environmental education but also into their perceptions concerning how much control they exert over the teaching of environmental issues. Teacher attitudes toward the environment affect whether or not they teach environmental issues. In turn, numerous experiences affect teacher attitudes. Attitudes are determined by such factors as political affiliation, parental influence, past experiences in nature, self-competence about the content knowledge or the lack of, disgust sensitivity, religious beliefs, teacher preparation programs, the establishment of a sense of place, and social norms (Bixler & Floyd, 1999; Moseley & Utley, 2008; Shuman & Ham, 1997). Attitudes, pedagogical knowledge, content knowledge, and experiences in turn affect teacher efficacy. Teacher efficacy is a complicated psychological construct that has been shown to affect not only what teachers teach but also how much students learn and students' attitudes about the content they are learning (Mosley & Utley, 2008; Richardson, 1996).

Teacher content and pedagogical knowledge. Teachers often perceive external factors to be the greatest barriers when in actuality content and pedagogical knowledge may present more significant barriers (Dyment, 2005; Kim & Fortner, 2006; Simmons; 1998). Studies exploring the connection between teacher content knowledge and their ability to teach environmental issues are limited but indicate that teachers often lack understanding of ecological and environmental relationships. A study of pre-service teachers conducted by Dejean-Perrotta, Moseley, and Cantu (2008) focused on ethnicity

and dominant residential experience. As a result of their research they discovered that teachers lacked the knowledge to be considered environmentally literate. The authors of this study utilized an instrument called the Draw-An-Environment Test (DAET), which was a modification of an earlier child's test called Draw-A-Scientist. Using the modified instrument, 118 early childhood pre-service teachers drew a picture of the environment and then completed open-ended sentences relating to operational definitions of the environment published in The North American Association for Environmental Education's (NAAEE, 2004) *Guidelines for the Initial Preparation and Professional Development of Environmental Educators*.

The authors of this study developed a code system by assigning numbers to various components of the NAAEE (2004) defined environmental core concepts. Each participant's response was reviewed then coded individually and as a group for the number of components common to the NAAEE guidelines found in each response. Only 23% of the participants in this study group used all four of the components of the NAAEE definition of the environment in their own definitions. Though these four participants used all four components, they viewed them as separate components of the environment and not as interrelated systems. Out of 116 responses only two of the respondents were able to make the connections necessary to explain the interdependence of systems. Not only did the teachers in this study lack the understanding of relationships, which are necessary for teaching environmental education, but their responses were comparable to those of children who were given similar evaluations in other studies. A limitation of this study is that the authors assumed no clear distinction between teacher perception and teacher understanding.

Another study conducted by Zak and Munson (2008) explored teacher understandings of ecology using concept maps that required elementary pre-service teachers to describe inter-relationships among key ecological concepts. The study included 56 teachers from four universities in Minnesota. Authors of this study identified 16 ecology concepts by reviewing multiple sources and then comparing them to state and national standards to determine concepts that appeared most frequently. Participants were instructed how to create concept maps and they were shown examples of exemplary concept maps. Teachers were then given the 16 ecological concepts on Post-It Notes and were told to omit any concept of which they were unsure of the meaning. Though 75% of the participants in this study were able to cluster concepts relating to energy flow and food webs, 48% omitted the terms “biotic and abiotic,” 13% omitted the term “energy flow,” and 11% omitted the term “biological diversity” from their concept maps altogether, which revealed significant gaps in teacher understandings about ecological relationships.

The relationship between content knowledge, pedagogical knowledge, and implementation of environmental programs was evidenced in a study by Winther, Volk and Schrock (2002) who explored teacher decision making. The study focused on eight randomly chosen teacher volunteers after each implemented an issues-based environmental education program. Teachers were trained on how to implement the model. During the process teachers were observed, surveyed, and asked for student work samples as sources of data. Teachers in this study reported feeling overwhelmed by their lack of knowledge pertaining to ecology and also indicated that the program required a paradigm shift from traditional teaching methods that they found challenging. Teachers

found transposing their role of director to facilitator difficult. They struggled to shift from teacher-centered instruction to student-centered learning in the context of real-world events (Winther, Volk, & Shrock, 2002).

Pedagogical knowledge and content knowledge are intimately connected to teacher preparation programs (Heimlich, Braus, Olivoio, Barringer-Smith, & McKeown-Ice, 2004; Meichtry & Smith, 2007; Plevyak et al., 2001; Powers, 2004; Smith-Sebasto & Smith, 1997). Studies of the impact of teacher preparation programs revealed that teachers who studied environmental issue related preparatory programs have significantly higher pedagogical knowledge, content knowledge, and rate of inclusion of environmental concepts into the classroom curriculum (Kim & Fortner, 2006; Meichtry & Smith, 2007; Plevyak et al., 2001; Smith-Sebasto & Smith, 1997).

Two such studies compare the inclusion of environmental education between teachers who participated in state-mandated environmental preparatory studies and those who did not. Three states were compared: Wisconsin, Ohio, and Illinois. Wisconsin had state-mandated pre-service competence related to environmental education. Ohio and Illinois did not. The first study conducted by Plevyak et al., (2001) targeted school teachers in Grades K-6 in Wisconsin and Ohio in the 1996-1997 school year. A booklet-type instrument was developed based on a Likert scale that contained four sections: level of implementation of environmental education, environmental education personal goals and attitudes, environmental pre-service and in-service education, and professional background and demographics. The results of this study found a statistical difference between teachers in Wisconsin and Ohio. Teachers in both states exhibited a desire to teach environmental issues. However, teachers in Wisconsin felt more confident about

teaching environmental issues, had a greater understanding of how to integrate environmental education into their curriculum, and agreed they had a responsibility to teach environmental issues. Neither state showed a statistical significance between state mandates and level of inclusion of environmental concepts.

The second study completed by Smith-Sebasto and Smith (1997) employed a variation of a teacher questionnaire developed by the Wisconsin Center for Environmental Education. This study targeted a broader subpopulation than the study by Plevyak et al. (2001). The authors sent surveys to 500 randomly selected teachers in Grades K-12 who were teaching in Illinois and Wisconsin in the spring of 1994. This study had strikingly similar results to previous studies and revealed common threads in barriers perceived by teachers in relationship to the inclusion of environmental concepts. In fact, the top five reasons reported by teachers in both Wisconsin and Illinois were almost identical. They included shortages of resources, money, preparation time, knowledge or background, or class time. The results of both of these studies indicate that mandating teacher preparation in environmental issues does not ensure that it occurs; when it does occur, it increases teacher competency; and that teacher preparation alone cannot ensure successful implementation of environmental issues. As the authors of this study suggest, teachers may not value environmental issues enough to make room for them in the curriculum because they do not know enough about them to place value on them.

If one assumes that knowledge of a subject is a precursor to its inclusion in any curriculum, then teacher preparation programs are vital components to the teaching of environmental education. Research on teacher preparation programs indicate that

institutions of higher education have not historically participated in providing this knowledge to pre-service teachers. Less than 30% of institutions surveyed provide teachers with preparation in environmental education (McKeown-Ice, 2000). A national study conducted at both public and private institutions of higher education from 42 states investigated why environmental education has not found a prominent place in teacher pre-service programs. Respondents to this survey indicated that the biggest barrier is time, which interestingly corresponds to public school teachers perceptions of barriers as well. Participants indicated that universities had too many other mandated requirements. The second greatest factor identified was that environmental education is not state mandated (Heimlich, Braus, Olivolo, Barringer-Smith & McKewon-Ice, 2004).

Another study that focused on higher education faculty perspectives was conducted by Powers (2004) and identifies similar barriers. Through telephone interviews with 18 professors of education from 10 states, the author identified seven major barriers faced by colleges and universities. Though all participants agreed that all pre-service teachers should graduate with the knowledge and skills necessary to integrate environmental education into their classrooms, multiple constraints were identified. The barriers identified include time/credit acquisition, standards, politics, lack of in-service teacher role models, competition from other special interest groups, attitudes of pre-service teachers, and knowledge of university faculty members.

External Barriers. External barriers are those outside influences that teachers perceive as obstacles to teaching and learning. Consistently, teachers perceive external barriers such as accountability, school-mandated curriculum, liability, money, resources,

and time to be their greatest barriers to the teaching of environmental concepts (Dyment, 2005; Kim & Fortner, 2006; Rickinson et al., 2007; Simmons, 1998)

Resources. Teacher content and pedagogical knowledge are a twofold issue in relationship to barriers to the inclusion of environmental education in the classroom. Not only does formal training at the postsecondary level affect teacher content and pedagogical knowledge, but the quality and availability of instructional materials also play a key role in the accuracy and quality of instruction that teachers deliver. Disinger (2001) states that teachers are generally formally trained in various other disciplines and seldom have the content knowledge required of an environmental educator; therefore, they rely very heavily on instructional materials available from outside sources.

These outside sources often represent the position, view, or agenda of the organization that produces them. Because environmental education is such an interdisciplinary subject which is surrounded by complex societal and political issues, both the creation and selection of appropriate materials becomes difficult (Disinger, 2001). Materials are produced by businesses and industries, governmental organizations, commercial publishers, and environmental groups; each harbors slightly different goals and intentions surrounding the materials produced. Disinger (2001) maintains that as a result “Some materials are factually or conceptually incorrect, some are grossly misleading, some are deeply biased, some are pedagogically flawed and some are merely frivolous” (p.11).

Both the Independent Commission on Environmental Education (ICEE) and the North American Association of Environmental Educators (NAAEE) have contributed to an analysis of available environmental education materials (Disinger, 2001). In 1996

NAEE published *Environmental Education Teacher Materials: Guidelines for Excellence*. The result of these efforts created clear standards by which to measure the quality of environmental education instructional materials and a process by which to evaluate those materials.

The ICEE was the first to review instructional materials in 1997. The commission did find some quality environmental materials but concluded that they are not always integrated into the content correctly; often activities are woven into existing curriculum sporadically leading to incorrect understandings of not only the science behind the environmental issues but also of the issues themselves (Disinger, 1997).

Even when environmental topics are represented in textbooks, they are often not included in a systematic way. Most often integrated into science texts, topics are limited to a science perspective therefore eliminating the interdisciplinary nature of the subject (Disinger, 2001). Kim and Fortner (2006) completed a textbook content analysis revealing that textbooks cover environmental issues disproportionately. In this study, the researcher pages allotted to each issue, the frequency in which issues appeared in texts, and the preferred topics taught by teachers were noted. They found that the topics allotted the greatest coverage in textbooks were not the same topics that teachers allotted the most time to teaching. This indicated that where textbooks are concerned, the barriers are topic specific.

Accountability. Accountability, which often gives rise to state or district-mandated curriculums, may be a significant barrier to the development of environmental education in the classroom. Gruenewald (2005) states that current trends of accountability seriously limit the expansion of both place-based and environmental

education. He also maintains that environmental education remains marginalized as a sub-discipline of science and that a paradigm shift must occur in order for environmental education to prosper. Gruenewald advocates “placed-based” education and maintains that environmental education is a sub-domain of this broader field. Place-based education utilizes the child’s existing environment as a learning tool. That environment might be their local community, their school grounds, or their school building.

Making strong connections between political influences on thought in relationship to the environment and the accountability models that become manifestations of those political influences, Gruenewald (2005) states that place-based education is likely to have greater appeal than environmental education in the United States. Whether people identify with or are alienated by environmentalism, they can still appreciate and care about the places they live.

Independent of an individual preference for place-based education or for environmental education, the accountability barriers pose the same restrictions. Gruenewald (2005) maintains that accountability models rely only on assessments that can quantitatively measure learning, thus marginalizing the value of all other learning that is not likely to be discerned using standardized test practices. Funding for programs and research are based on these statistical quantifications of learning. This relationship may pose a significant barrier to teachers who function under such stringent accountability models. As a result, only those environmental concepts that find their way into state curriculum guidelines are likely to be consistently taught, and only those strongly assessed in state-defined content are likely to be allotted significant time in classroom instruction. This paradigm forces some environmental educators to focus on

the effect of environmental education programs on traditional student achievement in order to justify its inclusion in state curriculums and therefore in the classroom.

Conclusion

Environmental education is a relatively young component of public education programs having developed into a discipline since the 1960s. Though structured environmental education programs have been shown to increase student achievement and to reduce the achievement gap (Lieberman & Hoody, 1998), environmental education still struggles to find the appropriate role in public classrooms (Disinger, 1997; Gruenwald, 2005). Barriers to the inclusion of environmental education are many; some are internal and some are external. Internal barriers such as teacher attitudes and knowledge are further exacerbated by external barriers such as accountability, time, and adequate resources (Dyment, 2005; Kim & Fortner, 2006; Rickinson et al., 2004; Simmons, 1998). Professional organizations are working to develop guidelines for pre-service teachers, in-service teachers, and for the evaluation of instructional materials with the goal of mainstreaming environmental education into the classroom (NAAEE, 1996).

Methodology

Introduction

The purpose of this study is to answer the question, “How have teachers overcome barriers that restrict the integration of action-based environmental education into the public school classroom?” After reviewing the literature, it becomes evident that the barriers restricting the teaching of environmental issues are both numerous and diverse. These barriers impede the ability of public schools to produce high school graduates who are environmentally literate, and therefore impede society in developing citizens that are capable of solving global environmental problems. Despite the barriers, some teachers are successful at integrating environmental issues into their classrooms.

A multiple-case study design was utilized for this study. Creswell (1998) describes the case study as a “bounded system” in that it focuses on one or more individuals or programs bounded by a particular place and a particular time. According to Creswell (1998) the case study allows for an in-depth study through the use of multiple sources of information such as observations, interviews, and the collection of data via documents and/or audio-visual materials. The multiple-case study design is a tool for conducting action research. Action research, which traces its origins to theory developed by Kurt Lewin in the 1930’s, is a method for investigating issues with the purpose of improving professional practice. The theory originally focused on improving the manufacturing process but became connected to progressive education for it allows educators to participate in the development and analysis of their own practice (Hendricks, 2009).

Case study method is utilized by many different disciplines for a variety of contexts (Creswell, 1998). Educational research lends itself to case study method for it

allows the researcher to gain a comprehensive understanding of the individual case through the detailed analysis of the teacher as a whole and also as one component of one or more systems. The case study examines the teacher in the classroom setting while unveiling relationships between that setting and the broader systems that impact the classroom. Through the use of interviews, observations, and document collection, the researcher constructs meaning and conveys that meaning through a thick, rich description that allows the reader to determine the transferability to other settings (Creswell, 1998).

Setting

The settings for this study were three different public schools in a southern state. The term *public school* refers to schools that receive state and federal funding. A variety of schools fall under the umbrella of public schools that are not necessarily typical K-12 institutions. Magnet schools, Department of Defense (DoDEA) schools, charter schools, and laboratory schools are included in this classification and therefore were included in this study.

Magnet schools are public schools operated by local, state, and federal funds that allow families choice. These schools are often theme based and often provide students with non-traditional forms of education (Magnet Schools of America, 2007). DoDEA schools are federally funded, publically run schools that serve military families both at home and abroad (Department of Defense Education Activity, 2012). Charter schools, like Magnet schools, offer families choice and are funded by local, state and federal dollars. These schools are allowed to operate outside some of the constraints of public schools and must show progress to maintain their charter. Lastly, laboratory schools are a unique type of public school founded by the late educational philosopher and researcher

John Dewey in 1896 in Chicago. Laboratory schools are associated with colleges and universities and operate to allow for teacher education, research, experimentation, and professional development (Harms & DePencier, 1996).

This research examines the practice of three secondary public school educators who routinely integrate action-based environmental education into their curriculum. None of the participants of this study were employed by charter schools or magnet schools.

The setting for Case A was a laboratory K-12 model school associated with a state university. The setting for Case B was a traditional K-12 public high school. The setting for Case C was a Department of Defense High School on a military base.

Sampling

Purposeful sampling was employed to choose participants for this study. Purposeful sampling involves choosing participants based on the purpose and aims of the proposed study (Bogdan & Biklen, 2007; Creswell, 1998). These individuals meet predetermined criteria that were established to ensure applicability to the question posed. The central research question of this study was “How have teachers overcome barriers that restrict the integration of action-based environmental education into the public school classroom?” Thus, it was therefore necessary that participants in this study consist of public school teachers who teach environmental issues. The teachers for this study were secondary school teachers in a southern state currently teaching Grades 7-12. Participating teachers had taught for at least two years and completed at least one environmental education course. They were chosen from course lists provided by university faculty and by recommendation of other educators. Due to the

interdisciplinary nature of environmental studies, teachers were chosen independent of the subjects that they teach. Choice was limited to teachers available who volunteered to participate.

Role of the Researcher

The researcher in this study is currently a school administrator with a background in science education and an endorsement in environmental education. The researcher sought information that will guide the development and implementation of environmental education programs.

Assuming the role of qualitative action researcher utilizing multiple case study method, the researcher became the instrument. The researcher therefore interacted with all components of the study from the formation of the research question, to implementation of the methodology, and the creation of the questions asked to gather the data. The researcher thus becomes the tool that not only identifies relevant information but then assimilates those data into a logical understanding of phenomena. This approach was appropriate to this research study for several key reasons. First, obstacles impeding the integration of environmental issues into the classroom are issue specific, meaning they relate to and vary by specific issue (Kim & Fortner, 2006). Qualitative research allowed the researcher to elicit detailed responses from participants that revealed underlying issues, attitudes, and intentions that might otherwise be missed using quantitative methods. The teachers provided the individual perspective and circumstance that contributed to the curriculum choices that each teacher makes. Qualitative research allowed the researcher the opportunity to talk to teachers, listen to what they have to say,

and then to redirect questioning or pose additional questions that allowed the researcher to probe much deeper into the teachers' perspectives.

Throughout this process, the researcher was aware of the potential for bias based on personal experiences and views. The researcher self-monitored to ensure the research reflected the views of the participants and not the views of the researcher. The researcher utilized a reflexive journal throughout the research study to record the thoughts and observations of the researcher and to assist in self-monitoring of objectivity (Creswell, 1998).

Data Collection

This study utilized a multiple case study method in which data were gathered through personal interviews and the collection of artifacts. The data sources that were incorporated into the study were interview responses, documents, and any audio-visual materials the participating teachers felt reflected some quality or aspect of their practice relative to this study. The researcher triangulated information from observations, documents, and interviews to create a more comprehensive understanding and representation of the data. This triangulation allowed for a greater understanding of each case and gave deeper insight into the views, professional habits, and characteristics of the environmental educators participating in the study as well as the issues surrounding the integration of environmental education in public schools (Creswell, 1998).

Interviews. Face-to-face interviews occurred at the school in which the teachers were employed in order to give the researcher the opportunity to make observations concerning the educational environment. These observations gave the researcher greater insights into the overall school program as well as the classroom learning environment,

which were entered into a reflexive journal. The interviews allowed the researcher to gather the detailed perspective of each teacher. Each interview included one follow-up interview either in person, or by phone, for further clarification or to provide information as needed. A consistent set of structured questions created by the researcher was used for each interview. Additional probes were used as needed to dig deeper into a subject, to clarify explanations, or to expand upon the comments of the teachers. All questions were open-ended, therefore allowing for greater exploration of individual teacher points of view.

The observations, documents, interviews, and reflexive journal allowed for the researcher to obtain thick descriptions of the environmental educators' work context. All materials, transcriptions, and tapes remained in the possession of the researcher throughout the study. Consult Appendix A for the interview questions used for the teachers.

The purpose of this study was to determine what factors allowed some educators to successfully overcome barriers that restrict teaching environmental issues in public schools. During the interview process, the teachers shared their educational backgrounds, personal views and perspectives, and experiences that contributed to their professional role as environmental educators. Most of the interview questions related to identifying characteristics of the teacher, types of learning opportunities provided by the teacher, and methods employed by the teacher to overcome barriers. The interviews lasted on average 1 hour to 1.5 hours and occurred outside the regular school day.

Consideration was granted to building rapport with subjects to reduce or eliminate inhibitions on the part of the participants. All participants signed a human subjects'

consent form and were assured of anonymity. The researcher was sensitive to personal and professional differences both in presence and in preparation of the interview questions.

Documents. In addition to interviews, participants were asked to submit documents and artifacts that indicated their level of implementation of environmental issues. These documents and artifacts revealed information about instructional practices that were not observed. Documents collected for the purpose of this study were handouts, lesson plans, student work samples, and other documentation that teachers felt relevant to their role as environmental educator. The researcher reviewed each document or piece of evidence and made notes concerning the artifacts, thoughts about the artifacts, or connections between the artifacts in the reflexive journal. These notes and an analysis of artifacts were used to find relationships between the documents, interviews, and observations.

Data Analysis

Utilizing the constant comparative method, data analysis occurred throughout the research process following the steps cited in Bogdan and Biklen (2007). The researcher conducted a within-case analysis of each case then engaged in a cross-case analysis to identify unifying patterns and themes as well as contradictory data (Meriam, 1998). Thematic data analysis occurred during and after the data gathering process. While gathering data for research, careful attention was given to the identification of patterns, themes, and issues significant to the identification of categories for coding. Ongoing written notes were utilized to document connections, observations, and the relationships between data. Immediate analysis of those notes enabled the researcher to continuously

rethink and seek explanations for emerging correlations that contributed to the working understanding that developed through this process.

In addition to the ongoing analysis of written notes, all interviews were audio-taped, transcribed, and then coded using units of data. Each segment or unit of meaning was attached to an index card that included a notation correlating the card to its original source. The notation used was 7/23/2010/TC/1/1 denoting date, Teacher C, Question 1, and Card 1 (Appendix B). Using open coding, transcribed interviews and notes were read then sorted into categories of information that represented relationships of broad patterns and themes. As information was observed, recorded, analyzed, and processed, the open coding categories were refined, expanded, or reduced as the data warranted. During this process the researcher continuously refined categories, reconsidered the assignment of cards to categories, and rearranged cards as warranted.

When after extensive analysis of open coding offered no further insight into selected categories, axial coding was used to find relationships between primary categories of information. Axial coding involves identifying subtopics of the primary categories that reveal connections and relationships between those categories. These links helped determine the relationships between the segments of meaning, the categories, and the research question (Creswell, 1998). Once these relationships were identified, selective coding was used to write the narrative that discussed and expanded upon the connections revealed by the data and answered the research question (Creswell, 1998). The researcher identified the themes and patterns related to the research question, compared those to the documents provided, and then used those segments of data to construct meaning and therefore gain an understanding of each teacher's unique case and

how she/he was able to overcome the barriers that restrict the teaching of action-based environmental education in the public school classroom.

The researcher then organized the patterns and themes into a narrative that answered the research question. This narrative included all information relevant to the research and provided the researcher with both broad and specific insights into each individual case. Each teacher was then given a copy of the narrative to check for accuracy. Each case was treated as a bounded unit. The researcher completed each case analysis and narrative before moving on to the next case.

After all three cases were completed, the researcher conducted a cross-case analysis (Meriam, 1997). The cross-case analysis identified common themes and patterns and provided for stronger explanations giving the researcher greater insight into the research questions. The researcher constructed meaning from the cross-case analysis then summarized those conclusions in a narrative.

The researcher therefore conducted a qualitative analysis through the construction and application of specific research questions as they correlate to the overall research question and the literature search. The researcher cross-referenced the teachers' responses to interview questions with supporting documents to check for congruency and accuracy lending to the strength of the overall analysis.

Lastly, the researcher ensured the confidentiality and anonymity of each participant. The researcher retained possession of all transcripts, tapes, and field notes by storing them in a locked cabinet. All of the last names of teachers were omitted in the final narrative and expunged from transcripts. The names of institutions and of the state were removed from the resulting transcripts and narratives.

Trustworthiness. Trustworthiness can be defined in the context of qualitative research as the degree of confidence that can be placed in the accuracy of data. This degree of trustworthiness can be broad in context and may apply to the accuracy of data collected, the degree to which the data are applicable to the specific situation or transferrable to other situations, or even the degree to which the data are neutral and not influenced by the personal bias of the researcher (Hendricks, 2009). For this research study, verification of trustworthiness was established through peer debriefing, member checks, detailed journal writing, thick description, creation of an audit trail, systematic reflective planning, and presentation of results to the research project committee (Hendricks, 2009).

Peer Debriefing. Peer debriefing is the process of sharing the research process with a nonparticipating associate such as a colleague, classmate, or mentor (Hendricks, 2009). Peer debriefing was used throughout the research study. A weekly peer debriefing meeting was initially held in which data and analysis were discussed with both fellow graduate students and the chair of this research study. During this debriefing, detailed field notes were discussed and open analysis of those notes presented. Later, peer debriefing was held with the researcher and the chair of the research committee. The coding process for the transcribed interviews was presented to the chair of the research committee. Peer feedback enabled the researcher to reflect on not only the accuracy of the record-keeping process employed but also on the interpretation of the data. This feedback provided alternative perspectives to that of the researcher that enabled her to obtain a broader view, identify issues that she might personally have

overlooked, illuminate bias of which she might be unaware, reveal alternative connections between data fragments, and encourage deeper analysis of data.

Member Checks. Member checks provide another tool for verification of trustworthiness. Member checks involve sharing analysis of data with the participants and discussing the researcher's interpretation of data gathered (Hendricks, 2009). Teachers were made aware before the interviews that they would have full access to the notes and data gathered. After each interview, a copy of field notes and the transcribed manuscript were provided to each teacher. Teachers were given the opportunity to preview the data to determine the degree the data accurately reflected what was said by the teacher and observed by the researcher. Member checks demanded that the data gathered were detailed and accurately reflected what the teacher said.

Journal Writing. Journal writing was used throughout the research study. Detailed notes and observations were recorded systematically and reflected on immediately following contact with the subjects. Intentional focus on the identification of any researcher bias was noted in the journal so that appropriate measures to monitor bias were taken. Notes included observations made of the physical environment; interactions between individuals, ideas, thoughts, or interpretations of the researcher; and any ancillary information not included in the interview responses. Detailed journal writing ensured that all the pieces of the puzzle were included and that analysis was based on the observable and recordable data. Journal writing also ensured that the researcher's mental processes were recorded so that lines of thinking could be expanded, connections could be more easily transferrable, and thoughts were not lost.

Thick Description. Thick description involves relating the details of the study accurately and in depth such that a clear account of the setting, methods, participants, and events are provided. Thick description allows readers of this study to determine whether or to what degree it is applicable to their own situations or is transferrable to other settings (Hendricks, 2009). Thick description was derived from journal entries as well as in the analysis of data and then incorporated into the narrative of each case.

Audit Trail. The creation of an audit trail is simply the act of keeping accurate records that include all data gathered, notes, artifacts, and audio-tapes (Hendricks, 2009). When made available to any interested party, this audit trail provides verification of trustworthiness by allowing others to examine the basis of the researcher's reasoning. The open sharing of data, whether scientific or social science data, is critical to the peer review process which allows for data and interpretation to be scrutinized, repeated, and validated. During and after this research project, all raw data, notes, audio-tapes, coding information and analysis was made available to any and all concerned parties.

Reflective Planning. Continuous reflective planning is an important component of qualitative research. Through this process the researcher continuously examines the research process and makes modifications as new information or understandings emerge (Hendricks, 2009). The researcher incorporated a strategy of limited continuous reflective planning. Research methods remained consistent on the most basic level: questions asked, documents requested, and research methods utilized. However, continuous reflection on the process and the data gathered occurred allowing the researcher to rethink associations, connections, analysis, and coding relationships.

Throughout the process, continuous planning coupled with peer debriefing allowed the researcher to interact with the data in a comprehensive manner.

Presentation of Results. This research study was reviewed by peers and presented to a graduate research committee for both critique and evaluation. The presentation of results allowed for verification of trustworthiness through the evaluation of outside sources.

Summary

This three-case study focused on the instructional practices of three public school teachers who integrate action-based environmental education into their curriculum. These teachers encountered a variety of constraints as they sought to provide learning opportunities for their students. The research study qualitatively addressed how those teachers are able to overcome those constraints. The constraints identified within the literature search were the driving concepts used to develop interview questions. Data were gathered through personal interviews, observations of the setting, and the collection of documents and artifacts.

Through teacher interviews, a case-by-case description evolved unveiling the psychological and physical attributes of both the teacher and the teaching context that addressed the research question. Through a case-by-case exploration of teaching practices in relationship to environmental education, the reader gains insight into the experiences and characteristics of the teacher that contribute to their success, or lack of success, as environmental educators.

Results

Introduction

The purpose of this three-case study was to answer the question, “How have teachers overcome barriers that restrict the integration of action-based environmental education into the public school classroom?” The study focused on the classroom practices of three environmental educators, Susan, Lauren and Steven. Data were gathered in the form of observations, interviews, and documents. Documents include teacher worksheets, lesson plans, student work samples, and any other relevant types of documentation. Each case takes place in a different setting. Each case will begin with a description of the setting in which the teachers practice their craft followed by identification of patterns of themes, analysis of those themes as they relate to the research question, and a summary.

Case A: Susan

The Setting. Susan is a high school science teacher in a laboratory school run by a public university. Founded and based on the progressive ideas of John Dewey, laboratory schools serve as a field training ground for future educators. University faculty, Pre-K-12 teachers, and pre-service teachers are provided a unique opportunity to interact and collaborate (Harms & DePencier, 1996).

This laboratory school is the last remaining laboratory school in the state and has a rich tradition. The school has been in continuous operation for over 100 years. It originally opened its doors in 1906 and was considered a private school at that time. It merged with the city school system in 1936 then separated again in 1961. The school currently enrolls around 720 children ages Pre-K to twelfth grade and is open to the public. Though any student can attend, enrollment is strictly limited to about 60 students

per grade level. The school consistently scores in the top 10% of schools in the state in terms of state accountability and offers gifted programs and an inclusive approach to special education. The exceptional performance of the school, coupled with enrollment restrictions, make admission both highly sought and competitive. Students are placed on a waiting list and admitted on a first-come/first-serve basis. The school receives federal and state funding and therefore is classified as a public school.

Because the laboratory school is located in a university town, there is a rich history of academic excellence and is located on the campus of the university. Children whose parents teach for or are employed by the university attend the school.

Susan. Susan, an innovative and creative science teacher of more than 25 years, has been awarded (1) Conservation Teacher of the Year by the (state) Association of Conservation Districts and (2) Outstanding Secondary Science Teacher by the (state) Academy of Sciences. Susan integrates multiple types of action-based environmental education into her classroom; she teaches her students using place-based learning, inquiry learning, service-learning, and hands-on learning.

She has an outdoor classroom that she utilizes to allow students to do authentic scientific inquiry. For example, her students have participated in scientific studies on germination rates of tomato plants, acid rain, microbe degradation of oil spills, and soil composition.

Susan guides students to analyze their school and community utilizing both place-based learning and service learning. For example, her students have monitored water in the community, worked with elementary students to teach them about composting and

soil, helped kindergartners raise pumpkins, and worked to improve and carry out the school's recycling program.

Susan also teaches her students by using a variety of other types of hands-on lessons. For example, her students build models of energy efficient homes. They use leaf and twig characteristics to identify trees on their school campus and to observe the life cycle of plants. They also engage in critical-thinking and problem-solving activities such as developing proposals for treating an oil spill.

Background. Susan obtained her Bachelor of Science degree at Allegheny College in Pennsylvania and then pursued graduate studies in biochemistry and histology without obtaining a degree. After college, Susan joined the Peace Corps where she worked in Yemen Arab Republic to organize a vaccination program. Susan stated that, following the Peace Corps, she realized she had a passion for teaching and for “working with underachievers and trying to motivate students.” She obtained a teaching position in a small school in Vermont for 3 to 4 years, and then taught overseas at the TASIS School in Cyprus. She followed her husband, who was a doctoral student, to Chapel Hill North Carolina where she obtained a Master of Arts in Education and most of her experience teaching high school. Her husband then obtained a position at Wake Forest University, so Susan moved to Winston-Salem and taught in several charter schools until her husband moved once again to a state university where he was offered a tenured position. Susan currently teaches in the laboratory school associated with that university. It was in this position, while Susan worked to obtain her advanced certification, that she found her passion for environmental education.

Themes

Susan's journey, first as an educator then as an environmental educator, is catalogued in the preceding section. Susan's life experiences and educational experiences crafted the attitudes, knowledge sets, skill sets, and beliefs that impact her role as environmental educator. From these experiences, several themes emerge as factors affecting the teacher's role as environmental educator.

Characteristics of the School. The school in which Susan teaches is a public school but not a traditional public school. Susan teaches in a laboratory school associated with a major university. The laboratory school is a tuition-based school but also receives state funding. Student test scores go the county school district. During the interview, Susan related that the school is a difficult school to get into because it has a reputation of quality.

This school has a population of only 240 students in Grades 9-12. Due to the size of the school, there are only two teachers in the entire science department, which according to Susan, requires that teachers be extremely diverse but also allows teachers to know most of the parents. Susan also feels that the size of the school provides a unique opportunity for them to meet the needs of all students. According to Susan, the student demographics include a large number of gifted and talented students and a large number of special needs students. She feels the school does a really good job with special needs students as a result and states that "there is an acceptance and an embracement of all." Susan acknowledged that their school lacks a lot of cultural diversity and that the cultural diversity that is present is a result of the university. She stated that a lot of the university

students and parents send their children to the laboratory school. Susan says that she has good students with involved, college-educated parents.

The laboratory school also provides opportunities to collaborate across grade levels. The elementary and middle schools are housed on the same property as the high school. Susan stated during the interview that having all the schools on one campus allows teachers to “go out and use and be helpful to the middle school and the elementary school.” She feels it gives students a sense of accomplishment when they can go outside to their outdoor classroom and see work they have done throughout their K-12 academic career and say, “I did that.”

Multiple times during the interview, Susan acknowledged that the structure of the laboratory school allowed her greater flexibility and greater opportunities than is typically available at other public schools. This flexibility of the learning environment allows the teacher greater freedom to try innovative instructional practices.

Background and Training. Susan’s background offers many insights into Susan as a person. This background reveals a history of high level, intellectual pursuits as well as a high level of altruism. The fact that she majored in science and pursued graduate work in biochemistry and histology identifies Susan as highly qualified in her content area. In the state in which Susan currently teaches, high school teachers are not required to major in their subject area.

Susan’s experience in the Peace Corp and her job teaching overseas in Cyprus also reveal some core characteristics of her personality that influence her choices as an educator, such as an underlying desire to help others who are less fortunate, a sense of adventure, and a willingness to take risks. Susan substantiates this analysis during her

interview and in a follow-up communication when she states that she discovered she had a passion for “working with under achievers and trying to motivate students.” She also stated in her interview that she simply does not worry about the risks associated with giving students action-based environmental education opportunities.

In addition to what Susan’s formal educational background reveal about her personal qualities, they also provided Susan with very diverse and interesting experiences which afford her a broader perspective than someone with limited world experiences. These experiences do not just include working in a variety of contexts (Peace Corp in Yemen, teaching in Cyprus, public school teaching, and charter school teaching in the US) but also include intensive field experiences in environmental education.

Susan describes several field experiences that were instrumental in her development as an environmental educator. Susan participated in Research Experiences for Teachers (RET) sponsored by the National Science Foundation. During this 10-week research internship, teachers worked with a state university researching effects of coal mining on the local ecosystem. This research involved completing water testing and soil analysis in three different areas, then comparing the impact of the coal industry on local ecology. Through this experience, Susan not only gained the personal knowledge relating to the research process but she also was given money to use to take the project back to her students and to purchase equipment. Susan states, “I just learned so much during that time and really became committed to environmental education.”

Mentors and Support Systems. The interview revealed that mentors and support systems are critical factors in Susan’s ability to overcome the barriers to integrating action-based environmental education into her curriculum. Susan relates that her primary

support comes from a faculty instructor who she views as her mentor in addition to other prominent environmental educators. Susan also receives support from outside agencies, parents, colleagues, and school administrators.

During the interview, Susan discussed the importance of these mentors in her development as an environmental educator. She acknowledged that it was through her coursework for her advanced certification at the university that she acquired the knowledge and resources necessary to be an environmental educator. She states, “(The instructor) kind of guided me and because of her association with (the university), I was introduced to a lot of really good opportunities and that makes all the difference.” She further states, “I became much more knowledgeable and, what’s the word, familiar with doing outdoor field trips.”

Susan discussed during the interview that her mentors helped to model for her what she needs to do for other teachers. She feels that even after teachers receive training, they often “just get bogged down and they don’t make time.” She believes that young teachers need an advocate to help them become more active.

Teacher Attitudes and Beliefs. The views, attitudes, and beliefs of the teacher emerged as themes throughout the interview. Susan said that the environment had always been important to her, but it was not until about 4 or 5 years ago that she really became driven by it. She explains that the politics of global warming and looking at alternative ways of doing things really intrigued her. She wishes that she had a better understanding of energy conservation when she built her home. Susan said that she feels that society has digressed in the value they place on the environment since she was in college in the 60s. She maintains that we were closer to being a green society then than we are now.

Susan also thinks it is important that students become aware of the politics of issues and possess the ability to think critically so that they do not accept the views of others at face value. She states, “It’s easier for some people to push for things that cost a lot of money because then they are getting their needs met, like oil, coal in (the state).” Susan believes that it is important to make students aware of the agendas and biases that groups or individuals might have and how those are reflected in the media. Susan stated, “I think making students aware of that is really, really important because I wasn’t aware of it until very late in life, and I might have been much more active, more of an activist, if I understood that earlier.” She points out that those agendas are a “real revelation” to many of her students. Some of them gain a new perspective, and some of them choose not to see it. It is that new perspective that Susan hopes to create when she integrates environmental issues into her classes. Susan’s concerns about the politics of environmental issues are part of the motivating factors for its inclusion into her classroom.

Resources. Susan identified availability of resources as a personal barrier to teaching action-based environmental education in the public school classroom. Susan stated that because she teaches in a laboratory school, money is very limited. Unlike regular public schools, the school is not fully funded by the state and must rely on some of its funding from the university. Susan said that when the university is in a “budget crunch,” things get more difficult for the school. Funding for transportation is a significant issue because of the nature of the laboratory school. The school does not get state funding for buses. The school does have some buses now due to a grant. Susan has overcome the barrier of a lack of resources by writing grants; by participating in

environmental training such as internships, courses, and workshops; and by partnering with community and state organizations.

Susan says that she is a member of various environmental and education groups that have helped her to obtain resources through grants and partnerships. These grants come from a variety of sources. She says that one particular organization has been very good to her. This organization gave her a grant for her outdoor classroom and they bought her books. Susan also helped her students write grants to the local university and to the school's parent organization in order to obtain recycling containers. The school's parent organization has been a source of funding for some of Susan's other trips and projects as well.

In addition to belonging to community and education groups, Susan has a unique opportunity to partner with the university. Not only is the school where she teaches a part of the university, but she has made connections with the Center for Environmental Education at the university through courses and workshops. These connections allow Susan to solicit funding from the university through grants and also to borrow materials from the university as well.

Susan invests time and effort writing grants but she has also spent a considerable amount of her personal time in the summer attending courses, workshops, and participating in internships that have led to the acquisition of resources for her students. When Susan obtained her advanced certification she sought an environmental education endorsement. She took summer courses through the university which incorporated field experiences that not only gave her firsthand knowledge of activities to use with her students but also provided her with classroom resources such as probes. Susan's

participation in the RET program allowed her to work with the university researching the effects of coal mining on ecosystems. Through this 10-week summer program, Susan was given both money for transportation and supplies to use in her classroom, enabling her to give her students field experiences. Susan stated that she could not have given her students that experience without the funding provided by the RET program.

Time. Susan identifies time as a restriction on her ability to teach action-based environmental issues in her classroom. She points out that it takes considerable time to do the types of activities she wants to do with her students, and in a core class like biology, she is pressed to cover the content required by the state. Susan has worked to overcome this barrier through collaboration, lesson planning, combining co-curricular and curricular activities, and through teaching elective courses.

Susan described several incidences where collaborating with colleagues has assisted her in her ability to teach environmental issues in her classes. For example, she stated that she had always managed the recycling program for the school. She said that this was a very nasty job that she did not feel justified the time it took away from class to complete every Friday. She now collaborates with a fellow teacher who sponsors the science club. The science club students manage the recycling and Susan simply helps the other teacher oversee the program.

Susan also collaborates with other teachers on lesson planning. She has worked with the Advanced Placement teacher to obtain activities that both teach her content and teach environmental concepts. Susan says that by finding lessons that teach state standards through environmental education, she is able to cover more of her required content and still teach action-based activities.

Susan also reduces time and planning by combining co-curricular and curricular activities. She sponsors a student competition called Envirothon. Susan says that Envirothon is a great program and probably where she does most of her work with the environment. Through her work with Envirothon, Susan has gained knowledge and experience that fed into her classroom. Susan further combines the co-curricular and curricular activities by including her classroom students on field trips and experiences that she does with the students who participate in Envirothon.

Susan works to free up time in core classes to teach environmental issues but she has more freedom to do so in elective classes. Teaching an environmental science class offers Susan the ability to focus exclusively on environmental issues. She has also integrated environmental issues into other elective classes in the past such as oceanography.

Though Susan works to overcome time as a barrier, she gives up a significant amount of her own time after school to work with and even camps out with Envirothon students on the weekends. She has given up multiple summers for training, workshops, and classes. Susan gives up her own time in order to maximize class time.

Risk. One factor in Susan's ability to overcome barriers to the integration of action-based environmental education into her classroom is her willingness to take risks. Susan said she takes all kinds of risks. For example, to overcome transportation barriers, Susan transports students in her own vehicle if she needs to. She has her CDL license which allows her to drive a bus. She is allowed to drive the bus if another teacher is on the bus. She says if she does not have another teacher, she does it anyway. Susan says

she realizes that it could be a problem if anything ever happened, but she relies on the faith that her parents have in her.

Summary of Case A. The ability of Susan to overcome the barriers to teaching action-based environmental education in the public school classroom stem from a combination of characteristics of the school, the background and training of the teacher, availability of mentors and support systems, and teacher attitudes and beliefs. The personal value that Susan places on the environment and on politics influences her willingness to exert the effort necessary to overcome constraints. Her strong background in science, sense of altruism, sense of adventure, and willingness to take risks has carried over into her teaching, enabling her to act on her values. These characteristics help motivate Susan to spend the long hours necessary to work with kids after school, to receive extra training, and to take the risks needed to provide students with authentic action-based opportunities to learn. Susan maintains that much of her success at doing so is related to being given the freedom to be creative, then being rewarded and acknowledged for doing so.

In addition to Susan's personal characteristics, background, and experiences, her teaching environment plays a role in her ability to overcome barriers. The flexibility and partnerships afforded to her by teaching in a laboratory school associated with a university have provided her with ease of opportunity. Though Susan's teaching environment have made these opportunities easier to come by, it is her own intrinsic motivation that has allowed her to take advantage of those opportunities which include funding, education, partnerships, and mentors. Susan has worked long hours to seek out

funding and resources, to plan engaging lessons, to form partnerships, and to gain pedagogical and content knowledge.

Case B: Lauren

Setting. Lauren teaches at a public high school (Grades 9-12) in a southern state of the United States. The school is located in a county school system that currently serves more than 14,000 students. Though the rural community served by this school traditionally embraces an agricultural environment, the area has seen some economic and industrial development. Though the school system in which this school resides has great ethnic diversity serving over 40 different languages, this particular school serves primarily white farming families. Lauren stated that the school does not have enough ethnic diversity to be held accountable for racial subpopulations for No Child Left Behind (NCLB) and that the school has about 75% free and reduced lunch. Lauren described the poverty of her students by saying, “Not as poor as _____ County. I taught there before. Kids here, they might not be the best shoes but they can afford shoes.”

The county is home to a major state university that has a center for environmental education and has provided opportunities for Lauren to work with a diverse group of people connected to the field. Lauren does not teach in the same town or the same school system as the teacher described in Case A.

Lauren’s classroom is not a traditional classroom with desks in rows. Since Lauren is a Special Education teacher, she may only have a maximum of 8 students in her classroom at one time. Lauren has two small circular tables in her room and several large storage tubs filled with kits and supplies used to teach environmental education.

Lauren. Lauren, a tall, athletic woman who approaches life with humor, teaches students with emotional behavior disorders in a public high school. Her position is often

divided between collaboration and teaching in a resource classroom. At the beginning of the year, she collaborates with content area teachers in every content area. As the year progresses, she moves into a resource classroom with students who fail to be successful when integrated into the regular education classroom. The nature of Lauren's position dictates that she be knowledgeable of multiple content areas and of the relationships between those content areas. Lauren approaches her teaching from an interdisciplinary approach and maintains that doing so helps her students learn. During the course of our conversation, Lauren repeatedly focused on the word "fun," maintaining that the students she serves need a high level of engagement in order to learn. Lauren's approach to environmental education is to utilize the curriculum provided by national environmental organizations, such as Project Wild and Project Wet. Though she has taken her students on extended learning activities in the past, she predominantly teaches using place-based education and hands-on activities with limited opportunities for field work or service learning.

Background. Lauren began her educational journey toward teaching environmental education in the 1990s in undergraduate school. She attended Murray State University obtaining a bachelor of science degree in agriculture with an emphasis in horticulture. During this time, Lauren took some undergraduate courses in environmental education where she became acquainted with university personnel in the field of environmental education. After graduating with an undergraduate degree, Lauren worked as a nursery specialist for Lowes Home Improvement. She stated that she hated working retail, so she quit that job and began working as an aide in a private school that she worked for in high school as a tutor. In this position she worked with fifth-grade students

with disabilities. That school specialized in children with dyslexia, hyperactivity, and behavioral issues. Lauren said she loved that job but did not realize that she could do similar work in public schools. She said she simply did not realize that special needs students went to public schools because her experience with them had always been in a private setting. In her mind, teaching was “a classroom full of fourth graders singing songs.” Lauren said that she was encouraged by a friend that was a university professor to return to college for a second undergraduate degree in special education.

Lauren was one year away from her second graduate degree when she moved to her current city to marry her husband. She finished her education then became a special education teacher in a neighboring rural county and later obtained her current position. She obtained a master’s degree in learning and behavioral disorders and later earned an advanced certification, which is 30 hours beyond a master’s degree. During the process of obtaining her advanced certification, she obtained an endorsement in environmental education.

Themes

Teaching Assignment. Lauren teaches both resource and collaboration classes for students with emotional and behavioral disorders (EBD). Lauren’s teaching assignment provides a unique set of barriers to teaching action-based environmental education. Lauren teaches Emotional Behavioral Disordered (EBD) students whose behavior and cognitive ability restrict their ability to be successful in a regular education classroom. Lauren described multiple ways in which these characteristics of her students affect the ways in which she can deliver instruction. Her student’s emotional disabilities,

intellectual disabilities, changing schedules, and litigious parents all impact the instructional strategies that she employs.

Lauren believes that she cannot deal with sensitive issues such as global warming because emotionally her students cannot handle such topics. She stated, “We can go with the local stuff but you can’t go with the big stuff because it just shorts them out.” She went on to further explain, “We can’t do the end of the world is nigh, because my kids will freak out. They’ll lose it. It’s too much. It burns them out.”

Not only must Lauren be sensitive to the emotional state of her students, she must be sensitive of their cognitive level of development. Lauren feels the complex issues that require critical thinking and a global perspective provide too great a challenge for her students. She stated, “I’ve got a kid who honest to goodness we worked for a year to learn that 2×3 is the same as 3×2 . It didn’t matter how many different ways we drew it. We did everything. We rolled dice, we put coins out there. We did everything.” She stated, “Are you familiar with the David Sobarro book? When you’re dealing with a little kid, you don’t talk about the environmental problems, you talk about the fun stuff. Most of the kids that I deal with are mentally 8.”

Because of the emotional and cognitive disabilities of her students, Lauren must also continuously accommodate changing schedules. She stated that at the beginning of the year, all of her students were integrated into the regular classroom, but in recent weeks some of her students were pulled back into resource and she obtained a couple of new students on her caseload that needed behavioral support. For the remainder of the school year, Lauren will teach these students all subjects in a resource classroom. She states that these changes are typical and occur every year. She may spend part of her year

as a collaboration teacher assisting a content teacher and part of her year teaching multiple subjects in a resource room. Lauren also stated that her case load changes during the year as students either newly enroll or are switched to her case load mid-year. Lauren indicated that when most of her students are out in the regular classroom, she does not have the opportunity to do as much environmental education.

Lastly, Lauren indicated that the types of parents she works with affect the types of activities that she does with her students. In the past, she has taken students to do stream monitoring and on environmental field trips but currently has students with parents who she described as “sue happy” or who threaten to call the state department of education if their wishes are not followed. Lauren said that she will not take students anywhere under those circumstances.

Background and Training. Lauren’s background and interests provide some insight into personal characteristics that may play a role in her decision to be an environmental educator. Lauren is a kayaker and has belonged to kayaking groups in the past. She also participated in an adult roller derby league a few years ago and is currently involved in cycling. Lauren is an active individual who loves the outdoors and stated that she has a sense of adventure. Lauren repeatedly described environmental education as fun and also stated that she wanted to teach “the fun kids” (special needs students) because she loves the challenge. She stated, “You know, it’s a challenge, it’s climbing a glass mountain, it’s crazy, it’s never a dull moment, and that’s what I wanted to do.”

Lauren attributes her interest in the environment to her undergraduate training in agriculture/horticulture. She explained that her degree program required that she know about such things as soil chemistry, water chemistry, herbicides, and pesticides in

relationship to crops such as tobacco. This awareness created in her a concern for the environment. She maintains that interest was for selfish reasons. She realized that “This stuff can kill me.” She explained, “That kind of shakes you up a bit. When you know what that stuff is, you think, maybe I should rethink this smoking thing.”

Lauren’s first exposure to environmental education occurred in undergraduate school. She attended a Project Wild workshop as part of one of her undergraduate courses. At that time, she did not pursue education as a career, and it was not until she worked on her master’s degree that she really pursued more courses in environmental education. As part of the endorsement that she obtained, she took a week-long field course that was offered through a partnership between two state universities. This course was entirely hands-on and exposed her to a variety of activities to use with students and also provided her with free instructional materials. After taking the course, Lauren enjoyed it so much that she presented sessions for the same course in subsequent years.

Mentors and Support Systems. Lauren emphasized the courses that she took more than any particular mentor that influenced her ability to teach environmental education. These courses were through two different major universities that have a Center for Environmental Education and Sustainability and frequently partner together for teacher training. Lauren has partnered with the directors of those programs at times to teach environmental workshops for teachers.

Though Lauren did not attribute mentors to her ability to teach action-based environmental education, she did emphasize the need for support systems; in particular, she noted support personnel within a building. Lauren stated that it takes a lot of time to put together the activities and that the time required is a huge deterrent to teachers. She

said that she had a student teacher's assistant that she used to copy, laminate, cut out, and organize components of various activities that she used. She believes that someone in the building needs to have the materials already assembled for easy access for teachers. She maintains that there needs to be at least one person in the building who "knows what's being taught where, who's teaching it, what they might need, and what kind of kids they have." She believes there needs to be a person in the building to say, "I've got something you're going to love" then go into the teacher's classroom and model the lesson for a period. She believes that teachers do not have time to think ahead of time about how their lesson might integrate environmental education so a support person who could help them not only gather activities but know where they best integrate into the curriculum would increase instruction in environmental education.

Curriculum and Resources. Lauren limits most of her environmental lessons to place-based lessons or activities that can be completed in the classroom or on campus. Lauren predominantly utilizes activities found in published resources such as Project Wet, Project Wild, and Project Learning Tree. She believes these publications provide everything a teacher needs to integrate environmental education into the classroom. From working with and observing the Director of the Center of Environmental Education and Sustainability, she got the idea to create a set of kits based on these activities that she stores in plastic tubs in her rooms. Lauren indicated that finding the time and materials to make the kits can be an obstacle for some teachers. She stated, "And you do one of these and you are just beat. Financially you are beat. Emotionally you are beat because you have to get it all together." She overcomes those obstacles by scavenging for parts for the kits and using teacher's assistants to help assemble them. She said she has taken

materials out of dumpsters, bought old board games and taken the pieces out of them, and asked for items from retiring teachers who were cleaning out their classrooms. She stated, “Because all those little checkers and rings, whatever, you just shuffle it in and use it for this stuff.”

In addition to scavenging for items for her kits, Lauren maximizes her resources by using the school grounds for environmental education. She utilizes the grassy area just outside the school near her classroom for many activities. By using the school grounds, Lauren is able to avoid the cost, hassle, and risk associated with field trips. Lauren stated, “I cannot imagine anything more hellish than going through the process of getting transportation for a field trip.” Lauren stated that funding is not the barrier that restricts transportation as a resource; it is the paperwork and district transportation procedures that are limiting factors. She stated that the paperwork has to be submitted weeks ahead of time, the dates cannot be changed on short notice, and now a nurse must accompany students on field trips or the teacher must be trained in emergency medical procedures. She said, “How do I know if the weather’s going to be okay that day? This is not a rain or shine activity. This is the sun (that) is shining; let’s go.” Lauren concluded by saying, “Why? Why would I take a field trip? No way. It is too much of a hassle.”

Time. Lauren indicates that time is a significant barrier to teaching action-based environmental education. The time constraints are primarily imposed by two factors: state mandated standards which pressure teachers to cover a large quantity of concepts and the time required to prepare for environmental education lessons.

Lauren stated that core content is a huge barrier. She said, “We have to do so much. Now they’re changing it this year.” She went on to say, “...all the teachers are freaking out because they don’t know what’s going to be on the final assessment.” One way that Lauren overcomes the barrier of time constraints imposed by state mandate core content is to integrate environmental education into the required core content. For example, she teaches velocity and volume through stream analysis and graphing when doing a lesson called *Oh Deer*. She teaches nutrition and health through an environmental activity called *March Munchies* and she teaches classification, observation, and habitats through an activity called *The Hundred Inch Hike*.

Another way that Lauren overcomes the barrier of time constraints imposed by state mandates of core content is to utilize the time after testing to focus on environmental activities. She stated, “So the week after testing, I know I’m going to do *From Fiber to Fashion*. We’re going to do food labels because that also ties into like *Global Grocery Bags* on how food gets transferred.”

Lauren saves time preparing for lessons in several ways. One way that Lauren saves time is by utilizing resources in Project Wet, Project Wild, and Project Learning Tree. The lessons are already developed and cross referenced by the concepts they teach and appropriate grade level.

Another way that Lauren saves time is by what she calls “front loading.” She prepared all the kits ahead of time. She stated that she prepares them once, then she has it done and can not only use them in the future but also loans them out to other teachers. By preparing the kits and labeling them, she simply has to pull them out and use them. She said she saves time by “looking at the way elementary teachers do it. They tend to

have everything [organized]. You know an elementary teacher doesn't have time to wander around and hunt for the scissors. If it's part of this, it needs to be in there. So that's the point of organizing everything that way."

Lastly, the school in which Lauren teaches provides her with student assistants. As previously mentioned, Lauren saves time by using teacher's assistants to copy, cut, laminate, and organize.

Teacher Attitudes and Beliefs. Several teacher attitudes and beliefs emerged during the interview. One belief that resonated throughout the interview is that Lauren feels education should be practical. She believes education should be directly connected to the lives of her students and that environmental education is one way to do that. Lauren said, "Seventy-five percent of these kids out here, you can set them down with a book and a marker and tell them what you want them to figure out and they'll figure it out, but 25% of them, regardless of whether or not they're special education, they're not going to get it unless you give them something real to work with, and that's where this comes in."

Lauren believes the only way to reach the students that she serves is through a hands-on, realistic approach to education. She said that not only is environmental education "a lot of fun, but it is a neat way to bring hands-on activities to kids who need hands-on activities." She further stated, "Kids actually learn something." She feels that environmental education is fun and real-world, which is a powerful motivator for her students. She said, "It turns the driest, most boring, most miserable stuff into something real, so that is a huge motivator." She believes that when teachers are dealing with special education students, they are wasting their time if they do not make the lesson real

and tangible. She believes environmental education is even more relevant to her students because they live in a rural area. She relates, “These kids know bugs, they know snakes, they know you don’t just go turn over a rock and pick up whatever. This is stuff that they know because they experience it every day.”

Another attitude that emerged during the interview relates to state requirements. Lauren feels that the expectation that her students be college ready is unrealistic and that state testing requirements restrict her from teaching what is most meaningful to her students. When relating a story about her struggles to get a student to understand the basic multiplication fact that 2×3 is the same as 3×2 she relates, “And you’re telling me I’ve got to get this kid ready for college. No, no, not going to happen. He’s 18. Not going to happen.” She believes that instead of focusing on college readiness, her students need to learn practical things, such as how to count change and what to eat or not to eat. She wants them to be literate and environmentally literate. For example, Lauren stated “There are certain things that they say are safe to put on your garden, but if you do, you’ll probably end up with cancer. Cancer is not fun. These are things that my kids need to know. But instead, I’m preparing them for a final assessment that will have little effect on whether or not they decide that Seven Dust is a good thing to snort. It’s a complete waste for my kids.” When discussing the need to wait until after state testing to focus more on environmental education Lauren stated, “You wait until the last bit of school to teach something that means something to the kids.”

Two other attitudes Lauren possesses emerged repeatedly throughout the interview. Lauren feels education should be fun, and she loves environmental education. She finds it fun and she maintains that her students find it fun as well. When describing

various activities and lessons, Lauren almost always used the phrase, “and that was fun.” Her descriptions of the activities were animated and filled with excitement. For example, when describing a future activity she said, “I love teaching that one in the spring. I’m getting fired up for that one.” She also stated, “I love environmental ed. We have a blast. When I’ve got a good group of kids, we’re running around, we’re watching birds....”

Lauren exudes not only fun but humor as well. For example, when discussing her desire to put a wetland on campus, she said, “We have enough property here at _____ to put in a wetland, or a pond or something, because I mean, why not? The band can march around it. Put it on the 50 yard line.” Lauren has a very enthusiastic and animated personality.

Summary of Case B. Lauren’s background and interests have influenced her desire to teach environmental education. Her educational background and interests provided her with not only the training but also motivation. Lauren had a previous interest in the outdoors in both her personal life and academic life. Her personal hobbies involve physical activity in the outdoors such as kayaking and cycling. It is unclear whether Lauren’s interest in the outdoors motivated her to major in horticulture or whether her major in horticulture affected her interest in the outdoors. Lauren attributes her involvement in environmental education to her academic major and to the fact that she finds it fun and her students learn better by doing. Lauren’s enjoyment of nature and the outdoors has carried over into her teaching.

Lauren’s educational background further influenced her ability and desire to integrate action-based environmental education into her classroom. Lauren attended two state universities which both housed a Center for Environmental Education and

Sustainability. The availability of these programs not only provided Lauren with the classes and training she needed but also with resources and opportunities to both collaborate and to interact with other environmental educators. Through the connections that Lauren made with these programs, she became involved in not just integrating environmental education into her classroom but also in presenting workshops for other environmental educators.

The barriers to integrating action-based environmental education in Lauren's case include student schedules, student emotion and cognitive disabilities, time, parental involvement, transportation restrictions, and availability of resources. Lauren has overcome these barriers by using curriculum published by national non-profit organizations, scavenging resources, and teaching place-based education. Lauren has not overcome all of her obstacles to teaching action-based environmental education. She desires to give her students more field experiences but finds district and state transportation restrictions and risk of liability too daunting.

Case C: Steven

Setting. Steven teaches in a Department of Defense high school on a United States Army base in a south central state. Department of Defense schools serve military children and their families around the world. In 1994, two separate systems, one that served military families overseas and one that served families stateside, merged into one system under the Department of Defense Education Activity (DoDEA). The DoDEA operates under the Office of the Secretary of Defense. DoDEA schools are organized into districts headed by superintendents and serve Pre-K through twelfth-grade students. DoDEA schools are accredited through regional accrediting agencies.

DoDEA schools serve students with unique obstacles to overcome. Children of military families move frequently and must also deal with the stress of having parents deployed. Because of these unique circumstances, DoDEA leaders ensure that schools provide a uniform curriculum and set of standards. The DoDEA conducts internal and external monitoring of educational programs based on data every 5 years. As a result, these schools boast consistently high levels of achievement on standardized tests.

The high school at which Steven is employed serves over 400 students of military families. Steven describes the school as having a sizeable number of minorities, around 50%, and a lower than average percent of students on free and reduced lunch. The high school was established in 1932 when the army camp on which it resides became a permanent garrison. The existing building was constructed in 1958, but recent renovations have removed a large part of the original structure.

Steven. Steven began his journey as an environmental educator when the DoDEA decided to begin a new program and his supervisor told him that he was required to teach environmental science. Though Steven was mandated to teach environmental science, he stated that it was an area in which he had always been interested. Steven also teaches physics and earth and space science in Grades 9-12.

Steven works to provide his students with authentic learning opportunities. He teaches using place-based learning, service-learning, hands-on learning, and inquiry learning. Steven teaches place-based learning by utilizing the grounds at the military base to teach a variety of concepts. For example, Steven uses un-mowed fields to teach ecological succession, uses a nearby meadow to study biological diversity, and conducts air and water quality tests on base. Steven ties his curriculum back to the community by

exploring the environmental impact of local industries and by taking his students to explore the geology, hydrology, and ecosystems of area state and national parks. His students travel to the local power plant and are given the opportunity not only to tour but to also ask questions of power plant administrators.

He engages his students in higher-order thinking concerning complex environmental and political issues. Steven takes his students hiking, camping, and on extended learning trips in which he utilizes not only his own expertise to provide his students with concrete learning but also draws upon the expertise of others in the field. Steven also sponsors an environmental club that manages a recycling program, and participates in energy awareness activities on base, such as encouraging the continued use of clothes lines.

Background. Steve obtained his undergraduate degree in earth space science with a minor in geography from a state university in the state in which he resides. He later obtained a master's degree in counseling with a minor in psychology and then an advanced teaching certification in the field of science education. He stated that his advanced certification was obtained by patching classes together from all over the United States. He said the DoDEA sent him to Penn State, Auburn, University of Maryland, and San Diego University to take classes.

However, Steven accredits his hands-on style of teaching and knowledge of environmental education to his undergraduate training in earth science. He said that his training in was basically environmental education. While obtaining his undergraduate degree from Western Kentucky University, he had a strong focus on hydrology which studies water systems and the environmental impact of various variables on those

systems. He took hydrology, karst geomorphology, karst geology, and karst topography, which all focused on the relationship between environmental issues and the karst environment. Steven described his field experiences in these classes as being the most influential in developing his approach to teaching. One class in particular had a tremendous impact on Steven. He took a 3-week field class out west. He stated that he learned more in that 3-week course than in the first 3 years of the program combined. He clarified by stating that it was not necessarily that he learned more but that the experience cemented what he had previously learned. As a classroom teacher, he tries to provide his students with similar opportunities.

Themes

Steven's background and experiences related to his efficacy as an environmental educator are described in the preceding sections. Steven's educational background and personal experiences led to the creation of a particular set of skills, attitudes, and beliefs that emerge as factors contributing to that efficacy. From these experiences several themes emerged.

Teacher Attitudes and Beliefs. Steven described several educational and personal experiences that contributed to his attitudes and beliefs as an environmental educator. He said that he first became interested in environmental education as a child. He stated, "I honestly remember back in 1975 sitting in a fifth-grade class, a teacher gave out a weekly reader and they were talking about global warming. It scared the crap out of me. That would get anybody thinking about the future and everything they said in that article has come to pass." Steven said that later in his life, during undergrad, he took a class on weather and climate and that everything his professor predicted back in 1986 he

has seen come to pass. Steven's early exposure to predictions concerning climate change that he was able to actually witness come to fruition in his lifetime contributed to his belief that environmental issues are important.

Steven also described several other issues that shaped his attitude toward environmental education. One issue relates to a lesson that he teaches concerning phthalates. He stated that the first year he taught his students that phthalates found in plastics have been linked to early breast development in girls and a deformity in boys in which the opening of the penis is on the bottom instead of the top; he learned that his nephew suffers from that condition.

Steven personally has two children with autism. He notices patterns such as the dramatic increases in cancer, ADD, and autism and wonders if they are caused from the build-up of chemicals in our systems over time. He cited a study that revealed that 100% of women who ever had their breast milk tested had DDT in their breast milk. These concerns provide Steven with both a natural curiosity and a legitimate concern that influence his decision to teach environmental education.

Characteristics of the School. The fact that the school is housed on a U.S military base provides a unique set of barriers and opportunities for Steven. Those barriers and opportunities include a leadership hierarchy and both barriers and opportunities related to funding.

Steven stated that, "There's a higher up here on post that you wouldn't have elsewhere, I'd guess. That is someone is higher in rank enough and they say this is what's going to happen, then that's what's going to happen whether you agree with it or not." Steven related a story about a 2-year study plot that he had sectioned off not to be

mowed. His students used it to study ecological succession and biodiversity. He said that one day right before graduation, a high ranking officer drove by and said, “Somebody mow that. That looks terrible.” The field was immediately mowed down. He described the hierarchy as a type of trickle-down effect. He said the corporal who ordered it mowed probably didn’t know that it was his study plot, and likely the person he told to mow it did not know either. By the time it trickled all the way down to maintenance, his class never entered into it.

On the other hand, the military hierarchy can also be a benefit to Steven. For example, Steven said that when funding gets tight, someone higher up will order certain areas to not be mowed to save money. This allows him to use those areas for class. He also says that it gives his students opportunities to have an impact on post operations. For example, the base commander decided to take down all the clothes lines on base because he thought they looked bad. Steven’s students wrote letters to encourage their continued use. Steven stated, “All he’d have to say is, ‘You know what, we’re going to allow those,’ and it would be done.”

Another issue relating to the structure of the school is that of funding. Steven relayed that resources were not really an issue. However, the process for obtaining resources is not structured. He said that the Department of Defense has a headquarters in Arlington, VA. When they decided to establish a new class, they just sent him a bunch of supplies and he had to sort through it to determine what was useful and what was not. He said they never asked him what he needed or what he wanted. It was just sent to him. He said sometimes they will call someone up and say they have a certain amount of money that has to be spent by the same afternoon leaving the teacher scrambling to find useful

materials to order without time to research it. He said he has gotten an order at 1:00 in the afternoon requiring that he spend \$25,000 by 3:00 pm the same day.

Time. Steven identified time as a barrier. Steven indicated that he struggles with time to cover material and time to grade assignments.

In addition to the issues related to the fact that Steven teaches on a military base, the structure of the school day affects Steven's ability to teach action-based environmental education. His school is on an alternating block in which some classes meet on odd days and some meet on even days. Most classes meet every other day. Steven said that he is lucky because his AP environmental program is a pilot program and therefore meets every day. This schedule allows him twice as much time to teach his content. He stated that he does not know how he could do it on a regular schedule, because he does not manage to cover everything now. Steven said that with the AP environmental science class, he maximizes time by requiring student reading in the summer and placing high demands on the students early in the school year. Steven discussed several ways that he is considering maximizing his class time in the future including combining chapter tests and possibly going in less depth.

Steven simply gives up a great deal of his personal time to grade papers and create lessons. He stated that the first week of the school year he honestly doesn't find time to go home.

Politics. Steven feels that politics are one of the greatest obstacles that he must overcome when teaching action-based environmental education. He said that because it is a military base, there are a lot of conservative parents on base that believe that environmental issues are made up by the liberal media. He said that he is looked upon as

the “hippy liberal teacher” and that people can be condescending about it. Steven does not believe that liberal or conservative politics should come into it and that he simply does not let it bother him. He says that his students often find themselves having to defend what they have learned to parents who tell them that it is not true. When discussing how Steven handles the complaints of parents who do not like it when he teaches sensitive issues such as evolution, Steven said, “Pretty much so what I do is pull out the evidence and I teach what I teach. And if they don’t like it they can complain or they can come in and yell or whatever, but I don’t avoid it.” He said another way that he appeases some people is by emphasizing that oil and coal companies are not our enemies. They would not produce the product if we as consumers did not purchase it. This places the responsibility on the consumer and not the corporation.

Resources. Steven said that he used to give his students even more experiences than he currently does. He said he used to take his students on a lot of field trips in which his students would go hiking and camping. He would use these experiences as a fun way to teach them in the natural environment. He said that over the last 20 years, the school has suffered budget cuts and those types of trips have been dramatically reduced.

Despite budget cuts Steven still provides his students with many valuable experiences. He relayed multiple ways in which he obtained and utilized resources with limited expense. He utilizes place-based education, his own knowledge and expertise, the expertise of others in the field, and free resources provided by companies.

Steven reduces expenses by using the grounds of the military base as places of observation, inquiry, and experimentation. By using the existing grounds, he reduces the costs associated with field trips and the time required to take those trips.

When Steven does take field trips, he states that little expense is involved. He does not generally take his students on tours or exhibits. He takes them to state and national parks, on free tours of local industries, or out into the natural environment, such as the fossil beds in Indiana, where he uses the natural resources of the area to teach them using his own knowledge or expertise. Steven said, “We don’t just go on a tour. I take them and I lead them through it. I show them how it works, how the rock formations got to be, how everything forms.” In some cases he draws on the knowledge of experts in the field that he came to know as he obtained his own education. Steven says that the bus expense is the only expense, and if they do decide to take a tour, the students pay for themselves.

Steven stated that Advanced Placement training provides him with the most knowledge of which materials he desires to use in class. Instead of the trial and error method of trying new products until you find what you like, the organizers of the training ask the supply companies to bring kits to demonstrate for the teachers. Steven said the companies are happy to provide the teachers with free kits to try because it provides them with greater business. Steven uses many of these kits to teach his students. He maintains that they are easier for the students to use and save him the time required to gather and order the materials needed. Steven described several kits that he uses for water analysis, such as a fecal coli form kit that simply changes color, dissolved oxygen kits, and phosphate kits. Therefore, the use of kits is one way that Steven manages both resources and time.

Lastly, Steven overcomes the acquisition of resources as a barrier by spending a lot of his own money on supplies. He stated that he spends “a lot of out of pocket for

ridiculous things like little fish crackers and skittles” or to “buy beads and potting soil and so on.”

Student Safety. Steven indicated that concerns about student safety have increased over the years. He said the army used to give the kids whatever they gave the soldiers. He said that if he was taking the kids into the tick infested woods, they would get some little military issued packets of Deet and go on. He said now they are not allowed to give them anything. Steven said that he is more reluctant to do some activities with students after finding several hundred ticks crawling on him after working in a meadow.

Though Steven did not view it as an obstacle, Steven described an example of how chaperones on a student camping trip also posed a risk to student safety. During one camping trip, two of the chaperones engaged in inappropriate conduct with each other and one engaged in inappropriate contact with students. Steven said that he was upset more than the students, and the incident had to be reported to his supervisor. Steven said that was more than 10 years ago and he has had no problems with chaperones since. Steven has not let the risks associated with student safety affect his ability to teach action-based environmental education. He said he has had very few incidents of concern.

Summary of Case C

Barriers to the integration of action-based environmental education identified by Steven include hierarchy of leadership, time, politics, acquisition of resources, and student safety. Steven overcomes each of these barriers in a different way.

Steven overcomes the problems associated with the hierarchical leadership on a military base simply by being flexible and persistent. For example, when the garrison

commander demanded that his test plot be mowed down, he simply found another location off the beaten path.

Steven minimizes the time he must spend preparing for lessons by utilizing kits. He reduces the time required to teach action-based environmental education by using the natural environment found on base and by assigning his AP students work over the summer. Steven is still looking for other ways to reduce the time barrier. He has considered such strategies as combining chapter tests and decreasing the depth to which he teaches.

Steven overcomes the barrier of politics primarily through the use of evidence but also through indifference. He simply teaches students without concern for opposition. He does teach his students personal responsibility in lieu of blaming corporations for our environmental problems.

Lastly, Steven overcomes the barrier acquisition of resources by using the base and local community as his outdoor classroom, by spending his own money, by utilizing his own expertise to provide more meaningful and cost effective field trips and by participating in AP trainings that exposed him a variety of resources.

Cross-Case Comparison

Though each of the three teachers interviewed taught in dramatically different environments, each faced similar barriers to the integration of action-based environmental education into the public school classroom. Barriers that these teachers shared in common include overcoming the polarized political associations to environmental issues, finding time, money and resources, and managing student safety. Susan and Lauren both encountered barriers relating to transportation. Steven did not.

Susan and Steven also encountered barriers associated with leadership hierarchy as a result of the fact that both their schools were associated with another outside major organization that oversees the school's operations. For Susan, this organization is a state university; for Steven it is the United States military. Several common themes emerged in relationship to overcoming these barriers through this interview process.

The first common theme that emerged is that of educational background. Each teacher interviewed majored in a content area in undergraduate school. Susan majored in biochemistry and histology, Lauren majored in horticulture, and Steven majored in earth space science and geology. Two of the three teachers got into teaching only after undergraduate school. In addition to this commonality, each teacher described field experiences during their education that contributed to their desire to teach students using action-based environmental education. Each of these teachers described these field experiences as the primary factor contributing to their motivation to teach action-based environmental education.

All three teachers related an enjoyment of outdoor activities such as camping, canoeing and kayaking. Susan is the only teacher who explicitly stated that her experiences and enjoyment of the outdoors is what made her value the environment and played a role in her motivation to teach environmental education. However, all three teachers indicated that they had taken students on camping and canoeing trips, and all three teachers described their environmental work with students as "fun."

In addition to common motivations for the work these teachers do with students, these teachers often approached obstacles in the same ways. All three teachers invested their own time and money to provide opportunities for their students. All three teachers

participated in extra training opportunities in order to obtain greater knowledge and free resources, and all three teachers employed the assistance of prior university professors that acted as mentors. Susan sought assistance from regional environmental organizations. Steven sought assistance from personnel at National Parks. While there were commonalities across the three, there were decided differences across the themes as well. Table 1 displays the common factors that the data suggests contribute to teacher efficacy.

Table 1.

Common Factors Contributing to Teacher Efficacy			
	Case A: Susan	Case B: Lauren	Case C: Steven
Characteristics of the School or Setting	<i>Non-traditional public school classroom. Laboratory school setting allows for flexibility. Laboratory school boasts high expectations for innovative education. Connection to the local university. Green space allows for outdoor classroom.</i>	<i>Traditional public school special education classroom. Teaching assignment allows for flexibility.</i>	<i>Non-traditional public school. School on military base allows for flexibility. Green space allows for outdoor activities.</i>
Background and Training	<i>Undergraduate major in field instead of education. Strong academic background with graduate work in Biochemistry. Field experiences Local university has a Center for Environmental Education and Sustainability.</i>	<i>Undergraduate major in field instead of education. Background in Horticulture. Field Experiences. Local university has a Center for Environmental Education and Sustainability as well as the university she graduated from (not the same as Case A).</i>	<i>Undergraduate major in field. Background in Geology. Field Experiences. University from which he graduated has a Center for Environmental Education and Sustainability.</i>
Mentors and Support Systems	<i>University mentors. Partners with outside agencies</i>	<i>University mentors.</i>	<i>University mentors. Partners with outside agencies.</i>
Attitudes and Beliefs	<i>Passion for teaching and motivating difficult students. Belief that the environment is important. Values student awareness of the politics of issues. Believes education should be real world and engaging.</i>	<i>Passion for teaching and motivating difficult students. Belief that the environment is important. Believes education should be real world and engaging.</i>	<i>Belief that the environment is important. Values student awareness of the politics of issues. Believes that education should be real world and engaging.</i>
Characteristics of Teacher	<i>Outdoor hobbies. Sense of adventure. High work ethic. Need for fun. High level of altruism.</i>	<i>Outdoor hobbies. Sense of adventure. Need for fun. High level of altruism.</i>	<i>Outdoor hobbies. Sense of adventure. Need for fun. High work ethic.</i>

Discussion and Implications

If society is to overcome the challenges associated with the impact of human population growth and advances in technology on our environment, then it is critical that we produce citizens with the knowledge base, creativity, and critical-thinking skills needed to solve global issues. Despite the heightened concern over environmental issues spawned by global climate change, a multitude of legislative acts designed to promote environmental education and the fact that 96% of parents believe environmental education should be taught (Roper-Starch Worldwide, 2000), teacher surveys indicate that only 44% of high school teachers integrate environmental issues into their classrooms (Survey Research Center, 2000). The literature identifies a multitude of barriers that impede the integration of environmental education into the classroom. In order for advocates of wide-scale environmental education to see systemic changes in the integration of environmental issues into the public school classroom, we must not only identify what the barriers are but also how teachers have overcome those barriers. This three-case study sought to answer the question, “How have teachers overcome barriers that restrict the integration of action-based environmental education into the public school classroom?”

Through the course of this three-case study, the data indicate that teachers who integrate action-based environmental education into their classrooms not only share some common personality traits but also share some common types of background experiences they bring into the classroom. These common traits are summarized in Table 1. The data support the postulate that the personality and background of the teachers are significant

factors in their ability to overcome the barriers that restrict the integration of action-based environmental education. Whether the experiences develop the personality or the personality chooses the experiences, the teachers in this study all shared several key factors in common. Each of them was an active individual who enjoyed outdoor hobbies and activities prior to becoming involved in environmental education. All three of them discussed camping, hiking, canoeing, or kayaking. All three exhibited characteristics that could be viewed as having a sense of adventure. Susan joined the Peace Corp immediately after college and traveled far from her family to Yemen and then Cyprus to volunteer and work. Lauren had hobbies that include kayaking, cycling, and even roller derby at one time. Steve also discussed hiking and camping adventures. One word that resounded through all three interviews was the word “fun.” These teachers like to have fun adventures and they want their students to experience the same. Two of the three teachers directly made comments indicating that they have a high sense of altruism. Susan stated that while in the Peace Corp she discovered she had a passion for helping the underachievers. Lauren stated that while working with special education students as an aide she discovered that she loved working with what she called “the fun kids.”

In addition to personality traits such as a sense of adventure, a love of fun, a propensity toward outdoor activities, and a sense of altruism, these teachers also all majored in a science related content area and all engaged in field experiences either in college or while teaching. All of these teachers accredited their involvement with action-based environmental education to these field experiences.

This study cannot make any defensible correlation between personality traits and experiences; however, the data support the idea that there may be a correlation between

intrinsic personality traits of teachers and their motivation to make the extra effort necessary to overcome the barriers that restrict the integration of action-based environmental education into their classrooms. In light of the fact that teacher personality traits are not factors that proponents of environmental education programs can influence, the focus then becomes the specific actions teachers engaged in to overcome those barriers.

What does become clear from the data is that teacher participation in field experiences, exposure to environmental education in college, the presence of mentors, and support from outside agencies are all factors that may promote the integration of action-based environmental education into the classroom and that once teachers become motivated to do so they are able to overcome general barriers and issue specific barriers using relatively consistent strategies.

Case A: Susan

An analysis of Case A reveals that the primary barriers that Susan faces while integrating action-based environmental education into her classroom are the acquisition of money and equipment, transportation for extended learning trips, time, and risk of liability. Susan exerted a tremendous amount of extra effort to overcome these barriers by joining local environmental organizations that provided support and resources, attending a multitude of trainings that not only prepared her with pedagogical knowledge but also awarded her with money and resources, collaborating with both university faculty and other colleagues and by assuming personal risk and responsibility for student safety. The actions that Susan employed to overcome these barriers are summarized in Table 2.

Table 2. Case A: Susan

	Barriers	Teacher Actions
Resources	Money	<i>Teacher wrote grants</i> <i>Teacher solicited money from parent organization and the university.</i>
	Equipment	<i>Borrowed from local university.</i> <i>Received donated materials.</i> <i>Obtained materials through teacher participation in training programs.</i>
	Transportation	<i>Teacher obtained CDL license.</i> <i>Teacher provided transportation in her own vehicle.</i>
Time	Instructional Time	<i>Teacher collaborated with other teachers.</i> <i>Teacher created dual purpose lessons.</i> <i>Teacher combined co-curricular, curricular and extra-curricular activities.</i>
	Personal Time	<i>Teacher sacrificed personal time.</i> <i>Teacher combined co-curricular, curricula and extra-curricular activities.</i>
Risk	Liability	<i>Teacher assumed risk.</i>
	Reprisal for Violating Rules and Regulations	<i>Teacher assumed risk.</i>

Case B: Lauren

Barriers identified by Lauren were resources, time, risk, and characteristics of her students. Lauren shared some of the same barriers as both Susan and Steven but addressed those barriers quite differently. In fact, Lauren did not overcome all of the barriers that she faced. Lauren did attend workshops, trainings, and field experiences on her own time which she used to obtain materials and she also borrowed materials from the local university like Susan did. However, most of Lauren’s instruction came from

national programs such as Project Wild and Project Wet. The activities in these publications require only limited resources, which Lauren obtained through scavenging. Though Lauren had taken students to participate in field experiences in the past, she discontinued doing that when transportation issues became more complicated. She also stated that her willingness to give students those hands-on experiences depended on which students she had in class. Lauren teaches Emotional Behavioral Disordered (EBD) students. If her students had demanding parents who were prone to threatening lawsuits or to turn the school into the state, she was not willing to risk taking the kids out of the building.

Since Lauren chose to utilize activities from books published by national environmental groups, her greatest obstacle was time. She overcame the issue of time by teaching her subjects from an interdisciplinary approach in which she taught her required content using environmental education, by utilizing instructional aides to prepare kits that she re-used each year and by waiting until after state testing to teach some of the activities that were not directly tied to content.

In conclusion, Lauren did not overcome all of the obstacles that restrict the teaching published activities that could be completed using prepared kits or on school grounds. By limiting her instruction in this way she reduced the time required to teach environmental education, reduced the risk and liability of student injury, reduced the money and resources needed, and avoided the need to provide transportation. The actions Lauren took, or failed to take, to overcome barriers are listed in Table 3.

Table 3. Case B: Lauren

	Barriers	Teacher Actions
Resources	Money	<i>Teacher used low costs or free materials.</i>
	Equipment	<i>Borrowed from local university.</i> <i>Received donated materials.</i> <i>Obtained materials through teacher participation in training programs.</i> <i>Teacher salvaged materials.</i>
	Transportation	<i>Teacher did not transport students or transported them infrequently.</i>
Time	Instructional Time	<i>Teacher utilized time after state assessments.</i> <i>Teacher created dual purpose lessons.</i> <i>Teacher limited lessons to place-based education using classroom kits and school grounds.</i>
	Personal Time	<i>Teacher utilized instructional aides to prepare materials.</i>
Risk	Liability	<i>Teacher only assumed the risk on a year to year basis based on the behavior of students and parents.</i>
	Reprisal for Violating Rules and Regulations	<i>Teacher did not risk reprisal.</i>
Characteristics of Students	Low Cognitive Ability	<i>Teacher focused on basic practical knowledge with little depth or analysis.</i>

Case C: Steven

Steven identified the barriers of resources, time, risk and politics as being the primary barriers to the inclusion of action-based environmental education into his classroom. Steven indicated that resources are less of a barrier to him than some of the

other issues. The Department of Defense funds his classroom expenses. He does reduce expenses by trying out materials at workshops before ordering therefore eliminating the risk of wasting money on materials that are useful. He also reduces expenses by using the grounds of the military base for many of his lessons.

Time is a barrier that Steven struggles with. He sacrifices a lot of his personal time to engage students in action-based lessons in his classes. Though Steven did indicate that he teaches environmental issues in his biology classes, he predominantly teaches them in his Advanced Placement Environmental Science (AP) class. When he integrates those topics into his biology classes he utilizes dual purpose lessons that teach both the content of the class and environmental topics as well. He stated that he has extended time in his AP classes, and that when that extended time is removed, he will have to combine some exams and teach less content to compensate for the loss of time.

Steven also discussed risk as a barrier to teaching environmental issues. Ticks in particular were a concern to Steven. He overcame this barrier by using pesticides and asking students to dress appropriately. He reduced student exposure to one particular field with a high infestation. Otherwise, Steven assumed the risk of liability and took students on many extended trips which included hiking, camping, and canoeing.

Lastly, Steven stated that politics are a barrier to teaching environmental issues. He simply teaches them anyway. When parents complain, he deals with that issue by teaching the students the evidence and by remaining politically neutral. He works to not project any bias towards particular industries like power companies and focuses more on what the individual students can do to make a difference in their community. The actions

that Steven utilized to overcome the barriers that restrict the integration of action-based environmental education into his classroom are summarized in Table 4.

Table 4. Case C: Steven

	Barriers	Teacher Actions
Resources	Money	<p><i>Teacher used free trial materials.</i></p> <p><i>Teacher utilized the grounds of the military base.</i></p> <p><i>Teacher utilized his own expertise or the expertise of mentors on trips.</i></p> <p><i>Students pay their own way if entrance fees are required.</i></p>
	Equipment	<p><i>The teacher went to AP workshops where he was given the opportunity to try out various materials free before purchasing.</i></p>
Time	Instructional Time	<p><i>The teacher teaches the content as an AP class that meets twice as long as other classes.</i></p> <p><i>The teacher requires students to complete work over the summer before class begins.</i></p> <p><i>Teacher plans to combine chapter tests to make more time and teach in less depth.</i></p> <p><i>Teacher created dual purpose lessons.</i></p>
	Personal Time	<p><i>The teacher sacrificed personal time.</i></p>
Risk	Liability	<p><i>The teacher assumed the risk.</i></p>
	Reprisal for Violating Rules and Regulations	<p><i>The teacher assumed the risk.</i></p>
Politics		<p><i>Teacher counters political opposition with evidence.</i></p> <p><i>The teacher remained politically neutral offering both perspectives.</i></p>

Conclusions. In conclusion, evidence exists to support the premise that individual teacher qualities contribute to both a teacher’s motivation and ability to

integrate action-based environmental education into the public school classroom. The three teachers interviewed for this multiple case study shared common traits and background experiences that may have contributed to their decision to teach environmental issues. Each of these three teachers also shared common barriers. Though each overcame those barriers in a different way, the strategies employed by the two teachers that engaged their students in a variety of types of action-based education involved the utilization of outside agencies for support and materials, collaboration, participation in field experiences and the sacrifice of a great deal of personal time and expense. Based on the interviews of these teachers, the greatest external factors contributing to a teacher's ability to overcome the barriers that restrict action-based environmental education are teacher involvement in field experiences, undergraduate and graduate training, and the availability of mentors or support systems.

Relation of Findings to Literature

During the course of this research study, the participants identified barriers to the integration of action-based environmental education into the public school classroom that were uncovered in previous research. Interestingly, these barriers were pretty consistent across all three cases though some minor variations did exist. Barriers identified in the literature can be classified as internal barriers or external barriers (Kim & Fortner, 2006). Internal barriers include teacher attitudes, values, beliefs, and experiences. External barriers include such factors as time, money, resources, risk, and accountability (Dyment, 2005; Kim & Fortner, 2006; Rickinson et al., 2004; Simmons, 1998). The purpose of this study was to uncover ways in which teachers overcome these barriers. Throughout the course of this study, discussions with teachers confirmed that these barriers serve as

challenges for teachers to overcome and though the strategies used to overcome those barriers varied by issue and setting, common patterns emerged in relationship to how teachers overcame these barriers.

It is difficult to ascertain if in fact the teachers interviewed “overcame” internal barriers for what the literature identifies as barriers might be identified as personality traits. However, whether a teacher values environmental education or has a willingness to take risks, the research results suggest that providing teachers with experiences such as field work motivates teachers to engage in environmental education.

Previous research indicates that teacher content knowledge and exposure to environmental education in college increases teacher pedagogical knowledge and therefore, efficacy (Kim & Fortner, 2006; Meichtry & Smith, 2007; Plevyak et al., 2001; Smith-Sebasto & Smith, 1997; Winther, Volk, & Shrock, 2002). This research study supports those findings in that all three teachers interviewed participated in environmental education experiences in college. All three participants possessed a high level of content knowledge as indicated by the fact that they all held a degree in their subject area.

Furthermore, the external barriers identified in this research study were consistent with the barriers identified in earlier studies. The focus of those studies was to identify the barriers unlike this study whose purpose was to identify how teachers overcame those barriers. This study reveals that barriers were overcome when teachers were given support and resources.

Personal Reflection Upon Contribution to Professional Practice. This research has had a profound impact on the researcher’s professional practice though not specifically as

it relates to environmental education. Throughout the process of completing this study, the researcher's life has changed dramatically in multiple ways. She is now a high school principal instead of an environmental educator. However, the findings of this study are still applicable to her professional practice for the barriers identified and overcome in relationship to environmental education are barriers that relate to innovative education in general. As an instructional leader, she now has the task of building capacity in teachers in order to increase teacher efficacy in the classroom. This research study has helped her to identify characteristics of innovative educators which have impacted her hiring practices. She now looks to hire teachers who are passionate about what they do and she also seeks teachers who have degrees in their content area or some other indicator of strong content knowledge.

In addition to helping her to identify characteristics of innovative educators, this research has also helped her know how to build capacity within teachers by identifying and working to remove barriers to their success. An obvious example includes making sure that teachers have the resources that they need, but a less obvious example includes working to find extra time for teachers to engage in professional collaboration and planning.

Lastly, this study has impacted the researcher's professional practice by teaching her the process of research. In fact, she has now determined that her future lies in research and has the goal of pursuing her doctorate. Though this has been an arduous process, it has given her the foundation knowledge needed to continue to explore educational issues through systematic research.

APPENDIX A

Interview Questions

General

1. What subjects and grade levels do you teach?
2. How would you describe the demographics of your current teaching assignment?
3. Which subjects do you teach where you integrate environmental issues?
4. What is your educational background?
5. Describe your undergraduate or graduate training in environmental education.

Developing Environmental Education Programs

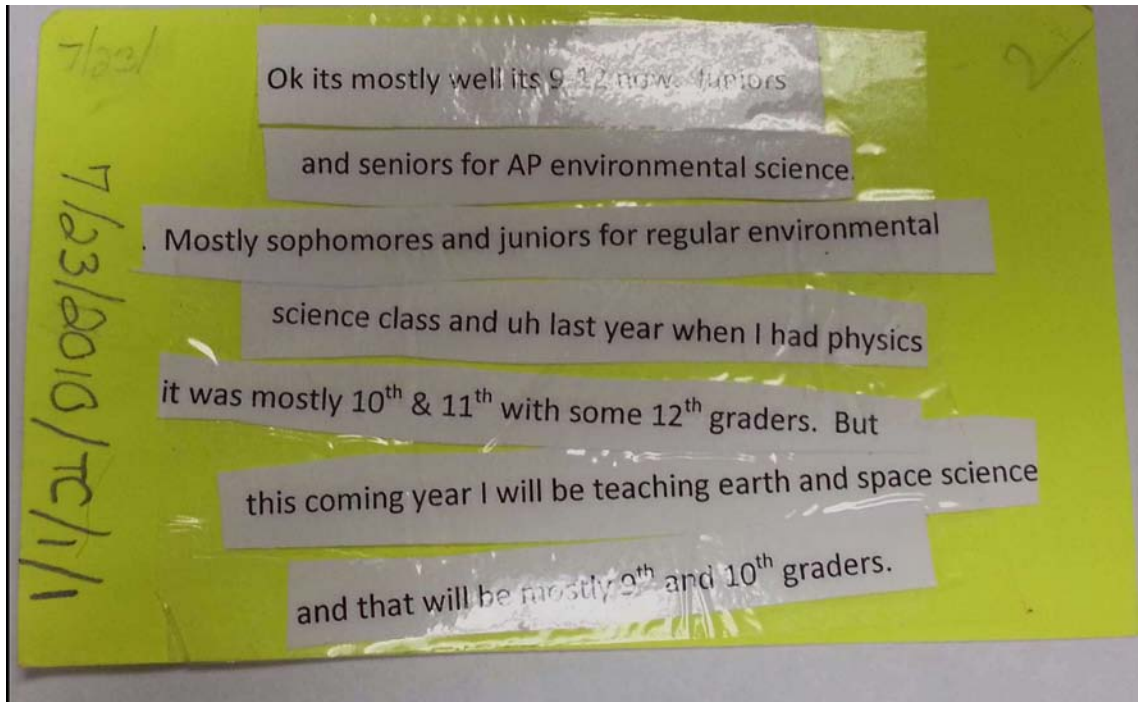
1. Describe how some examples of the lessons that you teach integrate environmental issues into the classroom content.
2. Describe examples of the environmental lessons which include hands-on and inquiry learning.
3. Describe the environmental lessons that you teach that require students to analyze environmental issues in relationship to their own school or community and then act based on that analysis.
4. Describe lessons that you teach outdoors or in the natural environment.
5. What steps did you take to develop your existing program?
6. What would you say provides the greatest motivation for including environmental issues into your curriculum?

Barriers

1. Give examples of barriers that you have encountered as you have attempted to incorporate environmental issues into your classroom.
2. What do you perceive are barriers that inhibit the teaching of environmental issues by other teachers?
3. Describe examples of the lessons on the environment that you teach that require additional funding/resources.
4. Describe examples of ways in which you overcome time constraints in order to teach environmental issues.
5. How do liability and safety issues restrict teaching the environmental issues?
6. How have you overcome the barriers that restrict the teaching of environmental issues to your students?

APPENDIX B

Coding



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