A STUDY OF ENVIRONMENTAL EDUCATION IN MISSOURI: A SURVEY OF PROJECT WET FACILITATORS' UNDERSTANDINGS OF ENVIRONMENTAL EDUCATION

A Dissertation
Presented to
The Faculty of the Graduate School
University of Missouri-Columbia

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Philosophy

By

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AUGUST 2007

The undersigned, appointed by the Dean of the Graduate School, have examined the dissertation entitled

A STUDY OF ENVIRONMENTAL EDUCATION IN MISSOURI
A SURVEY OF PROJECT WET FACILITATORS'
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Presented by Blaise Edward Long

A candidate for the degree of Doctor of Philosophy

And hereby certify that, in their opinion, it is worthy of acceptance.

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Very special thanks to my wife, Mary, for all her time, effort, and support. Without her, I do not know where I would be. We have dreamt of this day for a long time and are thankful for its arrival.

Acknowledgements

Words cannot express the gratitude felt for the individuals who contributed to this dissertation and the preceding journey.

Thanks to the dissertation committee, Dr. John W. Alspaugh (Emeritus), Dr. Richard D. Robinson, Dr. Mark Volkman, Dr. Jan Weaver, and especially Dr. Lloyd H. Barrow for their commitment to education and assistance throughout my dissertation.

Thanks to the Missouri Department of Natural Resources, Project WET and Mr. Joe Pitts for their cooperation with the survey.

Thanks to the validity panel, pilot study members and Dr. Richard Wilke for their contributions to the survey development.

Thanks to all the faculty, staff and students in the science education department at MU, especially Chia-Yu Wang, for the generous sharing of their time and knowledge.

Abstract

The National Environmental Education Act of 1990 served as a federal mandate to encourage states to develop environmental education (EE) plans. Missouri's governor authorized the creation of an EE task force in 1993. The recommendations of the state EE task force included the participation of both the formal and nonformal sectors of education at all levels. Unfortunately, the recommendations of the task force were never realized. The lack of participation by the formal education systems left the majority of the responsibility of creating an environmentally literate state to the nonformal sector.

The Missouri Department of Natural Resources (DNR) is one of the state's nonformal, natural resource agencies involved with EE. The agency sponsors a national EE curriculum, Project WET (water education for teachers). The DNR state coordinator for Project WET is responsible for providing workshops for individuals interested in obtaining the WET curriculum and trains Project WET facilitators (PWF) to assist in this effort. More than 300 PWF have been trained in Missouri and have provided workshops for over 7,000 Missouri educators. However, there has not been a formal assessment of PWF understandings about EE. An instrument was developed to assess the understandings of PWF concerning the principles, practice and skills involved in EE. The instrument was used to answer the research questions. Are there differences between formal and nonformal PWF's understandings about EE? Are there differences in their preparation? Is there a correlation between these factors?

Contrary to previous research on formal and nonformal educators, PWFs are a homogeneous group as evident by their mean scores on constructs of the survey. There were no statistically significant differences between formal and nonformal PWF in their undergraduate and graduate preparation in EE. There are several factors which may account for these findings, such as; the limitation of self-reporting surveys, the nature of PWF and the similarities in their facilitator training. Despite the general findings of this study, there were some noted differences between formal and nonformal educators on specific items on the survey. Suggestions for the Project WET program based on this study and recommendations for future research are also included.

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Chapter 1

Introduction

The National Environmental Education Act of 1990 served as a federal mandate to encourage improvements in Environmental Education (EE) at all levels: local, state and national. Governor Mel Carnahan, in response to this federal law, created the Missouri Environmental Task Force with the signing of Executive Order 93-39 on September 23, 1993. This task force was "charged with the responsibility of developing a comprehensive environmental education plan for Missouri" (Kissinger et al., 1994. p.3). The comprehensive plan emphasized creating an environmentally literate Missouri citizenry, including students in grades K-12, higher education students and adults. The task force was co-chaired by representatives from the Missouri Department of Conservation (MDC) and the Missouri Department of Natural Resources (DNR). The 57 member task force represented both public and private sectors of the state. The Missouri Department of Elementary and Secondary Education (DESE) was represented on the task force, as well as many other state agencies such as: Soil Conservation Service, the Army Corps of Engineers, Department of Agriculture, House of Representatives and the Missouri Department of Economic Development. Monsanto Company, Metropolitan Energy Center, Missouri Oil Council, Missouri Botanical Gardens, and Heartland All Species Project were some representatives from the private sector. State educational organizations, higher education institutions, local school districts, and classroom teachers were

also members of the task force. The recommendations of the task force to accomplish the goal of environmental literacy in the state were to:

- Establish an Environmental Education Coordinating Council (EECC) to include a Technical Advisory Committee and Office of Environmental Education.
- Integrate components of environmental literacy into state curriculum framework and provide curriculum materials and resources to support the teaching of EE.
- Modify teacher certification requirements to include EE courses for all certified teachers.
- Implement a teacher in-service program to include teacher education workshops, grants, and an EE certification program.
- Include environmental courses as a curriculum requirement at all institutions of higher education.
- Support nonformal EE programs.
- Secure funds to implement the EE plan.

The task force adopted a framework for environmental literacy to include pre-K through grade 12, higher education, and nonformal education. The framework reflects the previous comprehensive understandings concerning EE outlined by the Tbilisi Declaration (UNESCO/UNEP, 1978).

A DNR internal audit report was conducted by Pitts (2002, p.5) on the implementation of the recommendation of the Governor's task force. He summarized what had happened since the task force report was released:

- "The EECC had not been created.
- A Technical Advisory Committee does not exist.
- The Office of Environmental Education (OEE) is currently housed in the MDC.
- No discrete funding source is available for funding the grants program.
- The DESE's involvement in the writing of the curriculum has been limited to the involvement of participants in the MDC and DNR sponsored courses and workshops, rather than the direct influence of DESE. There has been no formal DESE involvement in efforts to provide in-service workshops, grants or environmental certification.
- Some teacher education programs include EE course work, but this is based on a faculty member's individual interest and effort.
- There is no comprehensive effort to make EE courses part of the curriculum for undergraduate course work at institutions of higher education.
- Coordination and utilization of all available nonformal environmental resources has not been realized to its full potential."

The Governor's task force recommended that EECC be created by an act of legislation, which would "assure an enduring attention to environmental education" (Kissinger et al., 1994. p.19). However, there was no state legislation to establish and support an EECC; consequently, it has been difficult to coordinate efforts between government agencies, educational institutions and private organizations. The Governor's task force recommended the

establishment of the OEE and outlined its role to "identify the needs and suggest priorities for EE in Missouri" (Kissinger et al., 1994. p.22). The OEE members working in cooperation with DESE and institutes of higher education were to "Design, promote, offer and coordinate pre-service and inservice environmental education programs and workshops for both formal and nonformal education communities …to assess the status of environmental literacy in the state's students, teachers and citizens on a regular basis" (Kissinger et al., 1994. p.23). The OEE members were to periodically report to the EECC. Without the authority of the EECC to compel all state entities to cooperate, the OEE is limited in its efforts to carry out its prescribed functions within MDC. MDC's and DNR's efforts include the use of the Project's curriculum (Project WET, Project Learning Tree, and Project WILD) to train inservice teachers, nonformal educators, and workshop facilitators in the use of these materials. While these efforts have been successful in reaching a large number of teachers and nonformal educators (Pitts, 2002), they fall short of the vision of the Governor's task force for an environmentally literate society.

Need for Study

Since the State of Missouri has not established an EECC as recommended by the Governor's task force (Kissinger, et al., 1994), the coordination of efforts has been left to individual organizations. The lack of commitment by the Missouri DESE, which continues the perception that EE is separate from K-12 education (Wells & Fleming, 2002), as well as the lack of commitment by institutions of

higher education in the development of teachers and citizens who are environmentally literate (Pitts, 2002) has left the majority of training of environmental educators to natural resource agencies (Wade, 1996). The DNR and the MDC are responsible for the training of a large portion of the environmental educators in the state of Missouri. However, “to date no instrument has been developed and no comprehensive assessment has been done to assess the status of [facilitators’] environmental literacy” (Pitts, 2002, p.6).

The establishment of a statewide, experienced-based environmental certification program was recommended by the task force. Missouri Environmental Education Association’s (MEEA) experienced-based certification program does not formally assess a facilitator’s or participant’s knowledge of the principles of environmental literacy (personal correspondence, T. Marcinkowski, December 16, 2005): “only competency-based programs include some form(s) of assessment of what participating formal/non-formal educators "take away" from those structured professional development opportunities” (p.4). The EE certification process in Missouri implies a one-size-fits-all curriculum for training educators, which may not be responsive to the needs of both nonformal (non-teachers) and formal (teachers) educators. “Many nonformal educators have a natural resource background, but don’t understand the educational side of EE” (Wells & Fleming, 2002, p.28). The Missouri participants in the Environmental Education and Training Partnership’s (EETAP) state certification development program also stated “the background, training and intentions of both types of

educators differ" (Wells & Fleming, 2002, p.29). Training teachers in formal school situations and training nonformal environmental educators who occasionally visit formal classrooms are actually very different approaches" (p.38). Nonformal educators are trained as resource professionals and are well prepared to care for resources. Resource professionals are important links between resources and the public. "More than ever, helping youth and adults develop an environmental/ conservation ethic and gaining public support are essential skills for these professionals" (Bainer et al., 2000, p.37). Magill (1992) found resource professionals to be minimally trained or not inclined to use basic education principles. An EETAP (2006) study suggests the language of natural resource professionals is quite different from the language of the classroom. The language of the natural resource professional is content oriented, while the needs of teachers are more process focused. The report suggests the training of nonformal and formal educators should be structured differently. A study to determine the formal and nonformal educators' understanding of the practice of EE would be beneficial to the certification program.

Missouri's involvement with EETAP, a U.S. Environmental Protection Agency (EPA) funded organization, helps in the building of a statewide comprehensive EE program. EETAP's final project report (Wells & Fleming, 2002) cites Missouri as one of nine states, which include the "Projects" as part of their state initiatives. Research, including assessment and evaluation, was also included as a needed component of a comprehensive program for Missouri. The EETAP report (Wells & Fleming), states "many of the misperceptions about EE and its role in

educating an environmentally literate populace may indeed be the results of this lack of attention to research. National research in environmental education is a strategy and agenda for evaluation studies. It is critical that states (along with higher education institutions) become players to help develop this focus" (p. 27). The collaborative effort of the governor's task force produced a comprehensive plan for EE in the state of Missouri, but it lacked the research focus that had been emphasized in the EETAP final report. There has not been any published research specifically related to the Project WET program (personal communication with Project WET national headquarters, January 19, 2006).

In his national report, Coyle (2004) noted, "the environmental education field could benefit from a more comprehensive, systematic and formal assessment of the state of environmental education practice in America, controlled studies of the complex relationships between certain types of environmental instruction and learning strategies, and more thorough evaluation is needed of what appear to be the most promising programs for creating bonafide environmental literacy" (p.18). The "Projects" are considered some of the most promising programs in EE, (Heimlich, et al., 2004; Marasco & Heimlich, 2006; Wade, 1996).

The field of EE has undergone a process of defining and redefining itself since the original Tbilisi Declaration (UNESCO-UNEP, 1977) which outlined the goals for EE. Research on factors contributing to responsible environmental behavior, or REB (Zelezny, 2002; Marcinkowski, 2002; Hungerford & Volk, 2001), have helped define curriculum and program goals for EE (Hungerford & Volk, 2001). This research has constructed a theoretical model for formal EE, but the

nonformal side of EE has had limited research (Knapp, 2002). The development of REB is not considered a high priority of nonformal sites (Simmons, 2001b), nor is it considered feasible (Knapp, 2001) due to time constraints. However, more research is needed to assess practice (Smith-Sebasto, 2001) and environmental knowledge of educators (Knapp, 2001). Studies have been conducted concerning the attitudes and efficacy of Project workshop participants (Krantz, 2002), but few studies have examined who facilitators are (Greene, 1992). If REB is the goal of EE, "it must be guided by research that clearly identifies the areas of need as well as most appropriate direction for progress" (Smith-Sebasto, 2001, p. 320). A cohesive vision of practice is required in order to ensure the success of EE.

A literature review of Project Wet was a difficult task for several reasons. The WET program in Missouri has never been a topic of study (Pitts, January 28, 2006), nor have there been any national studies specific to WET (personal correspondence with WET national office, January 19,2006). A list of studies was sent by the WET national office concerning the 'Projects' (Project Wild and Learning Tree), but these articles were difficult to find and none concerned WET specifically. Coyle (2004) noted this inaccessibility: "The field [EE] needs a thorough and up-to-date compilation of unpublished or minimally published research found in doctoral dissertation, master's thesis and other smaller site-specific research projects" (p. 9).

Context of the Study

The need for an environmentally literate society was recognized by the Governor's Task Force, but failed to become a reality because of the lack of follow-through by the policy makers. Earlier attempts for an environmentally literate society, Nature Study, Outdoor Education, and Conservation Education failed because of the lack of teacher education, the quality of instructional materials and the lack of a clear understanding of EE. These failures resulted in criticisms of EE. Some criticisms levied against EE are: instructional materials are factually inaccurate and one-sided; environmental educators engage in the process of misrepresentations and indoctrination; EE is issue-driven rather than information-driven; EE is devoted to activism rather than knowledge; and EE is anti-anthropocentric (Smith, 2001).

EE has come a long way in defining itself and addressing these criticisms. The Project WET program and curriculum along with Project Learning Tree (PLT) and Project Wild are a reflection of these current understandings concerning EE (NAAEE, 2004b). The 'Projects', all sponsored and developed by the Council for Environmental Education (CEE), play a major role in EE in the state of Missouri. State coordinators for the 'Projects' provide workshops for educators wanting to obtain the curricula and train facilitators to assist in providing these workshops. Therefore, it is critical for these facilitators to have an accurate understanding about EE to insure the field's integrity. However, there has been no formal assessment of the facilitators of the 'Projects', including Project WET facilitators

(PWF) according to the state coordinator for WET (Pitts, 2002). This situation prompted the interest in this study.

The purpose of this study was to determine if the PWFs understood the principles of EE, practiced established teaching strategies, and taught the skills required for an environmentally literate citizenry. PWFs need these qualities to insure Project WET workshop participants receive proper training in the WET curriculum to avoid any criticism of the program and avoid the previous shortcomings of EE.

The concepts involved in EE and contained in the WET curriculum are complex, requiring years of study to comprehend the material and teaching strategies sufficiently enough to teach them. An extended workshop to train facilitators on the WET curriculum would not meet the needs of PWF without some prior education. Therein lays the problem. PWF attended degree programs in natural resource management, parks and recreation, or teacher education programs. The preparation of these individuals is quite different. This study investigated if there are differences in the number of undergraduate credits in ecology, social science, economics and political systems taken by the PWF? Also, are there differences in the number of graduate credits in EE completed by PWF? Is there a relationship between PWF college preparation and their understandings about the principles, practice and skills involved with EE?

The results of the study will be useful in providing feedback to the WET program and the training of its facilitators. This exploratory study may also prove useful for future research of the WET program and other 'Projects' curricula.

Definition of Terms

Action learning: Following direct, personal involvement in a local environmental issue, students reflect upon and adopt personal values that relate to that issue (ELAC, 1995).

Active PWF: Facilitators who have conducted one or more workshops and/or have helped make arrangements for a workshop (personal communication, Joe Pitts, April 25, 2007).

Advocacy: The act of persuading or insisting for a particular cause or point of view (ELAC, 1995).

Assessment: The process of collecting, synthesizing and interpreting information to aid in the decision-making process (ELAC, 1995).

Attitudes: Social groups and individuals need to acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection.

Authentic assessment: Any form of alternative assessment that incorporates a real-life context in the assessment process (ELAC, 1995).

Awareness: Social groups and individuals need to acquire an awareness of and sensitivity to the total environment and its allied problems and/or issues.

Both: Respondents to the PWF survey who reported working in both the formal and nonformal sectors of education.

Cognitive knowledge: The knowledge of ecology; environmental problems and issues; and environmental action strategies (ELAC, 1995).

Cognitive skills: The skills for dealing with action strategies including: Identification, investigation and analysis of issues (ELAC, 1995).

Ecological foundations: The basic knowledge of the principles of ecology (a branch of science concerned with the interaction of organisms, including people, and their environment) (ELAC, 1995).

Ecology: The study of the relationships between organisms and their environment (ELAC, 1995).

Environment: The study of everything which surrounds and influences organisms, including people, during their life spans (ELAC, 1995).

Environmental action: A behavior, initiated by an individual or group, intended to influence the outcome of an identified environmental problem or issue (ELAC, 1995).

Environmental Education (EE): The process of helping students learn about both the natural and human built environments, and developing the skills and attitudes so that they will engage in inquiry, problem-solving, decision-making and action to assure environmental quality (ELAC, 1995).

Environmental Education Curriculum Plan: A cross-disciplinary K-12 environmental education instructional plan, including content to be taught as well as scope and sequence (ELAC, 1995).

Environmental literacy: Environmentally knowledgeable and skilled in working, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment (ELAC 1995).

Environmental problem or issue: A problem is the practice or the result of a practice which presents a threat, or is harmful to, the environment. An Issue arises because two or more vested interest groups hold conflicting views regarding an environmental problem and/or its solutions (ELAC, 1995).

EE provider: Any individual, program or organization that provides environmental education in a formal or nonformal setting (ELAC, 1995).

Environmental sensitivity: The positive attitude and values for the prevention and remediation of environmental problems and issues (NAAEE, 2004a).

Formal educators: Teachers in a public or private Pre K- 12 institution (ELAC, 1995).

Integrating environmental education: Using environmental education in a class or discipline in a focused manner, while also meeting the other objectives set for the course (ELAC, 1995).

Interdisciplinary: A teaching method/strategy that uses more than one discipline to examine a theme or issue (ELAC, 1995).

Level of preparation: The sum of undergraduate and graduate EE course work completed and EE workshops and conferences leading to the development of an EE educator.

Nonformal educator: Someone who provides educational services but is not part of the formal education system. For example, an interpreter working at a nature center, a forest ranger visiting a school, and an agency employee providing EE to the general public are all considered nonformal educators. For the purpose of this study, non-formal education and informal education are considered synonymous, i.e., all the types of educational programming that are separate and distinct from formal K-12 education (ELAC, 1995).

Outdoor Education: "Means learning in and for the outdoors. It is a means of curriculum extension and enrichment through outdoor experiences. It is not a separate discipline with prescribed objectives, like science and mathematics; it is simply a learning climate offering opportunities for direct laboratory experiences in identifying and resolving real-life problems, for acquiring skills with which to enjoy a lifetime of creative living, for building concepts and developing concern about man and his natural environment, and for getting us back in touch with those aspects of living where our roots were once firm and deep" (Smith et al., 1972, p20).

Participation: Social groups and individuals are provided with an opportunity to be actively involved at all levels in working toward resolution of environmental problems and/or issues. (UNESCO-UNEP, 1978)

Project Learning Tree (PLT): An environmental education curriculum developed by the American Forest Foundation and the Western Regional Environmental Education Council in 1977 to assist elementary and secondary

teachers in the implementation and integration of concepts pertaining to the environment. (Krantz, 2002).

Project WET (Water Education for Teachers): An international, interdisciplinary, water education program for formal and nonformal educators of students ages 5 to 18. The goal of Project WET is to facilitate and promote awareness, appreciation, knowledge, and stewardship of water resources through the development and dissemination of classroom-ready teaching aids and through the establishment of state and internationally sponsored Project WET programs. The centerpiece of the Project WET program is the Project WET Curriculum and Activity Guide (Watercourse Council for EE, 2003). This collection of over 90, broad-based water resource activities was developed, field-tested, and reviewed by over 600 educators and resource managers working with 34,000 students nationwide. Project WET has partnerships in 48 states, the District of Columbia, and the US Territories as well as international programs in Mexico, Canada, the Philippines and the Peace Corps. Since 1995, over 140,000 educators have been trained at locally sponsored Project WET workshops (EETAP, 2006).

Project Wild**:** Project Wild is an interdisciplinary, supplementary environmental and conservation education program for educators of kindergarten through high school. Project Wild is based on the premise that young people and educators have a vital interest in learning about our natural world. The program emphasizes wildlife because of its intrinsic and ecological values, as well as its importance as a basis for teaching how ecosystems function. In the face of competing needs

and pressures affecting the quality and sustainability of life on earth, Project WILD addresses the need for human beings to develop as responsible citizens of our planet. Since Project Wild was first introduced in 1983, more than 900,000 educators in the United States, Puerto Rico, and the District of Columbia have participated in Project Wild workshops. Project Wild's reach extends to international partners in Canada, India, Iceland, Japan, Sweden, and the Czech Republic who provide Project Wild training in their countries. These educators in turn have provided instruction using Project Wild to more than 48 million youth. (EETAP, 2006)

Sensitivity: Social groups and individuals need a variety of experiences in, and acquire a basic understanding of, the environment and its associated problems and/or issues.

Standard: A statement of what a learner should know or be able to accomplish at a specified grade level. (ELAC, 1995).

Teaching method/strategy: A carefully devised plan of action to accomplish a goal or objective (ELAC, 1995).

Skills: Social groups and individuals need to acquire skills for identifying and solving environmental problems and/or issues.

Socio-political foundations: A basic knowledge of societal, cultural, economic and political systems, from local to national and global levels (ELAC, 1995).

Assumptions

1. The constructs of the instrument, principles, practice and skills are an accurate measure of an individual's knowledge about environmental education.
2. Respondents accurately reported their responses.
3. Respondents' responses have limited bias.
4. Participants understood the intention of the survey.

Limitations

1. The methodology of mailed surveys limits the findings to self-reporting.
2. The time of year the survey was sent may have affected responses and response rates.
3. The involvement of DNR and the state coordinator for Project WET may have contributed to bias responses.
4. Two of the 77 respondents were considered non-active, but were not removed from the data set before being submitted for analysis. There was no way to identify these individuals after the surveys were received from DNR.
5. The results of this study are not generalizable beyond Missouri PWF.

Summary

The Governor's task force wrote a comprehensive plan for environmental literacy in Missouri. Unfortunately, the plan proposed by the task force has not been realized. The nonformal sector of the state, the DNR, MDC and MEEA has

assumed the dominant leadership role for the training of Missouri educators in EE. The Project WET facilitators play an important role in the instruction of environmental educators. A formal assessment of these facilitators concerning their understanding of EE could be beneficial to the WET program and the state in building a comprehensive EE plan.

Chapter One is a general introduction of the study. It provides a discussion of the current situation of EE in the state of Missouri and the need for an assessment of PWF in light of the importance of the role they play in the development of an environmentally literate citizenry. The chapter includes the context of the study, definitions of terms, assumptions and limitations of the study. Chapter Two is a review of the related literature. The review focuses on the history of EE as it relates to the current practices, background on Project WET and other institution involved in EE and a discussion about the nature of PWF.

Chapter Three outlines the research methods and procedures, research questions and hypotheses, selection of subjects, the instrument, collection of data, and analysis. The results of the research are contained in Chapter Four. Chapter Five contains a summary of the study and the major findings, a discussion of the results, as well as suggestions for the Project WET program and future research.

Chapter 2

Review of Related Literature

Introduction

This chapter begins with a historical perspective of EE because of the implications for Project WET and environmental literacy. The efforts of many stakeholders, state departments of education, institutes of higher education, government agencies, and independent organizations are required to create an environmentally literate citizenry. The relationship and involvement of these stakeholders are discussed in this chapter, as well as specifics related to Project WET and nonformal educators.

Historical Background of Environmental Education

"Where a historical perspective is included, it is generally affirmed that environmental education is about 30 years old" (Marsden, 1997, p.6). The origin of the term EE is still a matter of discussion (Disinger, 2001). L.H. Bailey, a pioneer of nature study in schools, was said to have considered using the name, but rejected the idea on the basis of its impreciseness and theoretical tone (Bailey, 1905). Kirk (1983, in Disinger, 2001) and Sterling (1992) report Thomas Pritchard suggested using the term EE at a 1948 meeting of the International Union for the Conservation of Nature. Brennan (1979) was credited with the use of the term EE in a 1964 address to the American Association for the Advancement of Science, but acknowledges his use of the term as synonymous for conservation education. The coining of the term EE is open for discussion, but

environmental educators would agree that EE evolved from nature study, conservation education and outdoor education (Disinger, 2001, Marsden, 1997, Scmeid, 2005).

Nature Study

Nature Study was a progressive education movement in the United States in the early twentieth century (Mitchell, 1922). The progressive, child-centered philosophy of European educators Rousseau, Pestalozzi, and Froebel spread to the United States as part of the Oswego movement (DeBoer, 1991). Froebel (1782-1826), the founder of kindergarten, influenced Nature Study (Mitchell, 1922, Marsden, 1997) since his education ideas centered on nature as the "house of God and it was by going out into nature that the spiritual communion with the Creator and a love a nature could be realized" (Mitchell, p.3). Bailey (1905) took a more secular view saying, "nature study is putting the child into intimate and sympathetic contact with the things of the external world" (p.14). This contrast in viewpoints between Froebel and Bailey was indicative of the difference in world views because of Darwin's publication of the Origin of Species (1859). The theory of evolution challenged the authoritarian humanistic view of the world.

The fundamental assumptions of humanism: man is extra-natural; society is a purely human invention; ethical ideas can be passively received; faith based, not based on observation and reason; and conservation of old cultural ideas and

ways of education, (Munson, 1903) were challenged by contemporary writers of the era.

Contrary to humanism, Realism reflected the dominate mood of the mid to late 19th century (Lye, 2005). The following tenants characterize realism. It is faithful to our experience of life; contextualized and rooted in the concrete; brings us close to material existence, not distorted by ideology; and uses the language of ordinary life. The writings of William Wordsworth, William Dean Howell, Rebecca Harding Davis, and Mark Twain are representative of realism. The writings of Henry David Thoreau and John Muir were also influencing American society and challenging the humanism view.

Munson's (1903) book Education Through Nature Study addresses the issues of humanism and classical studies. Classical studies required the disciplined reading of classical works and mathematics to train the mind in the form of drill and practice and memorization at the elementary level. Science was seen as "crass and materialistic" (DeBoer, 1991, p.3). "Nature, the senses, is considered vulgar" (Munson, 1903, p.229). The "Back-to-Nature Movement" promoted by Munson (p.3) is seen as a societal need for change in education, "It is in these centers of population, amid the nervous stress of highly developed commercial life and of a highly complex social life, that the need for a return to nature is more strongly felt" (Munson, 1903, p.28). DeBoer (1991, p.3) confirms this mentality, "In large [industrialized] society, however, independent thought had replaced authoritarian dictates of church and government, and it was time for education to reflect this change."

The 24th edition of the Handbook of Nature Study (Comstock, 1939) was a collection of leaflets from the Agricultural Extension Program at Cornell University, where Nature Study was defined as a "natural science from an ecological rather than anatomical point of view" (p.1). The aim of Nature Study was to cultivate the powers of observation and the building of understanding through investigations. The leaflets were stand-alone lessons without reference to other leaflets. The purpose of the Handbook was to acquaint teachers with sufficient information to gain enough confidence to teach the topic comfortably. The handbook addressed three difficulties facing the teachers of Nature Study: (a) appreciation for the subject; (b) increase teacher's knowledge to promote increased interest in teaching Nature Study; and (c) providing a valuable resource for teachers as a time saving device.

Mitchell (1922), a graduate student at Harvard University, outlined the decline of Nature Study in his doctoral thesis which stated the following: "For at least the last two decades the leaders in Nature Study were also the leaders in the progressive thought concerning elementary schools" (p. 22). However, new ideas were entering the field of elementary education and drawing numbers of supporters away from Nature Study. One new idea, which received general agreement, was the emphasis on the practical. Science should have a practical bearing on the student's life. The development of a general power of observation was not deemed possible; therefore, science education should be restricted to practical aspects of life. Another view was to adapt subject matter to specific grade levels, which was a weakness in Nature Study. Project-based learning

was also being discussed (Mitchell, 1922). Project-based learning focuses on the activity, while Nature Study focused on observation. The focus changed from seeing to doing. Doing meant creating interesting projects/lessons/activities, etc. to illustrate physical laws. "Science deals with principles, Nature Study deals with experience" (Mitchell, 1922, p.10). Mitchell states that there are two reasons Nature Study persisted in some places: "capable leadership and favorable environment" (p.10). Large cities lacked a favorable environment, but in a state like California with a natural environment that attracted outdoor life, the curricula experienced growth. William T. Harris promoted Nature Study at Harris Teacher College, St. Louis, Missouri, where museums were used to enhance Nature Study. Curricula in the St. Louis area had already adapted a more practical approach to Nature Study, emphasizing the urban environment.

The enthusiastic wave of the ideas of Nature Study spread quickly and without forethought. Those in authority included Nature Study in the curriculum and mandated its teaching without any formal training (Mitchell, 1922). Munson (1903, p. 23) identified the same problem, "the proper teaching of Nature Study requires training. Without proper training, Nature Study became 'asking the child what they already knew', which lead to pure intuitive thinking, the antithesis of scientific attitude". Frustrated teachers trained in traditional science, took a more comfortable position or lacked "the spirit of inquiry necessary in Nature Study" (Mitchell, p.11). Administrators and teacher supervisors also had little training in the proper presentation of Nature Study; consequently, they were of little help.

Students were also frustrated with the science they were receiving. Subsequently, Nature Study was discarded as a passing fad.

The lack of suitable textbooks was also a problem, “Scientists were too busy with college work and too skeptical of Nature Study to devote time to writing text” (Mitchell, 1922, p.11). This left the authorship of Nature Study books to those of inferior ability, who possessed little knowledge of subject matter. These inferior books “caused a decline in interest in the subject which they thus discredited” (Mitchell, 1922, p.11). Consensus on the aims of Nature Study, even among supporters was never attained. The methodology of Nature Study was never accurately outlined, but left to the discretion of the teacher. The breadth of topics to be covered was overwhelming for many elementary teachers, “Criticism of Nature Study was that it was disconnected, desultory, and unsystematic” (Nature Study Review, 1922, p.131). Improvements were made to the science curricula between the years of 1905-1915. Curricula became more prescriptive which provided untrained teachers more support. Schools that were successful had leaders who were knowledgeable and planned the schoolwork, so topics were not duplicated year after year. “Nature Study was also successful when the teacher was adequately prepared, but this was rare” (Mitchell, 1922, p.12).

Outdoor Education

The 1920’s were a turning point in science education. The progressive era’s emphasis on problem solving, real world experiences of interest to students and the introduction of the scientific method by Dewey changed the focus of education (Atkin & Black, 2003). For the first time, the population in the United

States exceeded 100 million and over 50% lived in urban areas. The number of people from foreign descent reached 34.7% (U.S. Census Bureau, 1920). The number of students graduating high school increased from 22,000 in the 1880's to 592,000 in 1929 (National Center for Educational Statistics, 1930). These changes in social demographics placed new emphasis on education. The migration of the population from rural areas to the cities and the increase in the number of immigrants placed different requirements on schools. The advancements made in science and technology were influencing the everyday lives of people. The new demand for consumer products such as automobiles and household appliances, as well as the advent of immunization for childhood disease required a new type pf science. This new science was not based on biology and nature, but on physical science (Atkin & Black, 2003). Another benefit of this new physical science was that it was more straightforward than biology because it contained more easily controlled variables (DeBoer, 1991). Atkin's recollection of his early years in school during the 1930's was that there was no real science in grade school until seventh grade, when he had a specially designated teacher for science. Atkin's science class emphasized using science to solve problems in daily life. The students were taught how to wire series and parallel circuits, as well as the workings of a hot water heating system and hot-air heating systems relating these to convection currents. It may be inferred from these statements that physical science became a requirement for seventh grade in preparation for the high school science curricula consisting of biology, chemistry and physics, while the elementary grades focused on the health,

hygiene and enculturalization of immigrants in the cities from inside and outside the country.

Some of the aspects of Nature Study survived in outdoor education. Camping and other extended outings were once part of Nature Study and became incorporated into outdoor education. In the early 1900's, this type of education experience moved into different arenas. The Boy Scouts, Girl Scouts and Campfire Clubs originated in the 1910's. Church groups and other sponsors organized summer camps for children to experience the out-of-doors. Outdoor Education began to be seen as a way to spend leisure time in a healthy environment. Activities in the outdoors offered a wide range of opportunities from hiking to canoeing, archery to bird watching. These activities focused on teaching in, about and for the outdoors have been the focus of two diverse backgrounds, those in the field of education and those in the field of leisure service (Ford, 1981).

Outdoor Education became recognized after L.B. Sharp wrote the first dissertation (1930) on camping education (Ford, 1981). Sharp's research came from his experience as director of New York City's camps for underprivileged children. "Sharp sought to establish a philosophical base for education in camp life through a determination of the values in camping and their relation to the general aims of education" (Ford, 1981, p.29).

The W.K. Kellogg Foundation funded a school camping program in 1940. Dr. Julian Smith, principal of Lakeview High School, led the development of the Battle Creek, Michigan Outdoor Education Program, a model for state outdoor

education programs. The Michigan State Legislature was so impressed with the program that it passed a bill permitting school districts to own and operate their own outdoor education centers (Ford, 1981). The philosophy of outdoor education grew from these initial programs.

> "Outdoor education means learning in, about and for the outdoors. It is a means of curriculum extension and enrichment through outdoor experiences. It is not a separate discipline with prescribed objectives, like science and mathematics; it is simply a learning climate offering opportunities for direct laboratory experiences in identifying and resolving real-life problems, for acquiring skills with which to enjoy a lifetime of creative living, for building concepts and developing concern about man and his natural environment, and for getting us back in touch with those aspects of living where our roots were once firm and deep" (Smith et al., 1972, p.20).

Ford (1981, p.8) adds to this definition with his 14 concepts for Outdoor Education. "Concept 7: enhances the goals of conservation through ecological exploration of the interdependence of living things…and development of a land ethic. Concept 8: the major emphasis in education should be the teaching of attitudes, appreciation, understanding and expression. Concept 9: Outdoor Education provides the opportunity to acquire basic skills, attitudes and appreciation of leisure time pursuits".

This expanded definition includes leisure pursuits of Health, Physical Education, and Recreation. Various departments in higher education and government agencies were incorporating Outdoor Education into their programs and approaching Outdoor Education from this perspective. The consideration of Outdoor Education as enrichment to curriculum and not a separate discipline has implications for EE. Outdoor Education, Conservation Education and EE are similar in many respects (Smith et al., 1972). The commonality of these

programs, which affects a fuller implementation into a curriculum is its vision as a supportive role, supplemental to the curricula.

Conservation Education

Conservation movement's roots are found in federal resource agencies and private organizations that first peaked from 1890 to 1915 (Schmied, 2005). President Theodore Roosevelt formed the National Conservation Commission in 1908 under the direction of Gifford Pinchot, chief of the Division of Forestry. The Commission's task was to inventory the nation's natural resources (Owen, 1971). The inventory was employed to re-designate the use of over 500 million acres of land to parks, national forests, and watershed reserves. Conservation agencies were created in forty-one states. The popular works of Muir and Audubon generated public interest in conservation and led to the creation of the Sierra Club and National Audubon Society. However, few educational programs resulted from the conservation movement because of skepticism (Schmied, 2005). This skepticism arose from the perceived relationship between federal agencies, business interests, and radical ideas of conservation groups.

The second wave of the conservation movement came in the 1930's due to responses to two national disasters, one economic and the other natural. President Franklin Roosevelt's attempts to create jobs and pull the nation out of the Depression resulted in the creation of the Public Works Administration (PWA), the Civilian Conservation Corp (CCC), and the Tennessee Valley Authority (TVA) (Owen, 1971). The PWA was responsible for the completion of

many natural resource development programs. The CCC (1933-1949) engaged almost 2.5 million young men in national park, forest, and stream improvement projects. The benefits were not only to the environment, but "improved the health, skills and self-respect of the enrollees, while decreasing delinquency" (Owen, p.7). The TVA (1933) integrated the resource development of an entire river basin.

The dust bowl of the 1930's promoted the creation of the Soil Conservation Service, but also aroused the public and education's interest in Conservation Education. The Educational Policies Commission (1935, in Schmeid, 2005, p.5) of the National Education Association stated "general knowledge of appropriate remedial and preventive conservation procedures are among the marks of the educated citizen…the schools may well assume considerable responsibility for checking the heritage of the nation made by ignorance, indifference, carelessness, and unbridled selfishness". The nation began to focus on education as a solution to natural resource problems (Schmied, 2005). Resource education programs flourished in the schools in the late 1930's taught by state and federal resource agency personnel, rather than teachers.

A third wave in the conservation movement came under the President John F. Kennedy's administration (Owen, 1971). The status of the natural resources was analyzed by 500 of the nation's leading conservationists. The result was the focus of attention toward the preservation of wilderness, expansion of outdoor recreation, development of the water resources of all river basins, action against all forms of pollution, and the development of alternative substitutes for resources

in short supply. This wave of the conservation movement did not have the same impact on education as the previous waves had. An even greater movement was on the rise that challenged the philosophical base of simply conserving natural resources (Schmied, 2005). Major ecological disasters of the 1960's, such as the MV Torrey Canyon oil spill, Agent Orange, DDT and Times Beach, as well as the general prevalence of social unrest, gave rise to the EE Movement.

"EE represents an incomplete merger of the concepts of Nature Study, Conservation Education, and Outdoor Education and tempered with environmental activities" (Schmied, 2005, p.7). "It may therefore be inferred that the resurgence of environmental education in the late 1960s and early 1970s was more of a relabeling exercise than a dramatic innovation: a new "word" rather than a new philosophy (Marsden, 1997, p.13). "On the other hand, it can equally be argued these years did indeed see the emergence of a radically different emphasis in environmental education. Its proponents viewed the 'modern' version as involving a necessary and long overdue rebalancing process; for while hitherto education *for* the environment had been present, it had been given a low profile relative to education *about* and education *in* the environment"(Marsden, 1997, p.13).

Environmental Literacy

The primary goal for EE in Missouri was a comprehensive plan to create an environmentally literate citizenry for all Missourians (Kissinger et al., 1994). The

Environmental Literacy (EL) Initiative Center for Environmental Studies at Brown University defines EL as:

> "Environmental literacy includes the wide range of skills, and competencies that people have to seek out, comprehend, evaluate, and use environment and environmental health information to make informed choices, reduce health risks, improve quality of life and protect the environment. To varying degrees, an environmentally literate person is able to participate, in the ongoing public and private dialogues about the environment, health, science, policy and politics. Environmental literacy evolves over one's lifetime and is impacted by a range of factors, educational, psycho-social and cultural factors as well as type and kind of community networks (social capital) (Zarcadoolas, 2006, p.1) ".

Volk (2001) identifies the primary goal of EE is responsible environmental behavior, which can be defined by the critical educational components. The critical components of EE as outlined by Hungerford and Volk (2001b) are:

1. Teach environmentally significant ecological concepts and the environmental interrelationships that exist within these concepts.
2. Provide carefully designed and in-depth opportunities for learners to achieve some level of environmental sensitivity that will promote a desire to behave in appropriate ways.
3. Provide a curriculum that will result in an in-depth knowledge of issues.
4. Provide a curriculum that will teach learners the skills of issue analysis and investigation as well as provide the time needed for the application of these skills.
5. Provide curriculum that will teach learners the citizenship skills needed for issue remediation as well as the time needed for the application of these skills.

6. Provide an instructional setting that increases the learner's expectancy of reinforcement as well as the time needed for the application of these skills.
7. Provide an instructional setting that increases the learner's expectancy of reinforcement for acting in a responsible way; i.e., attempt to develop an internal locus of control in learners.

The importance of EL is highlighted by a National Science Foundation report (2003, p.1): "In the coming decades, the public will more frequently be called upon to understand complex environmental issues, assess risk, evaluate proposed environmental plans and under-stand how individual decisions affect the environment at local and global scales." Coyle (2005) believes Americans are by and large either uninformed or misinformed about the challenging environmental choices. The recent Roper-Starch report (2000) estimates that only 1 to 2% of adults in America could be considered environmental literate. The outlook for future generations being environmentally literate is disturbing according to Louv (2005), who sees negative pattern changes in young people's relation to nature and the outdoors. Children are becoming more "wired" than ever before. Old patterns of children spending hours playing outdoors are becoming extinct due to a combination of electronics, cyberspace and parental efforts to keep children safely indoors.

America's environmental footprint is growing (Coyle, 2005). "The United States is the top consumer of world resources due to consumer packaging, energy use, water usage, size of homes and vehicles. The United States comprises 4% of the world population, yet consumes 25% of the world's energy.

The majority of Americans (66%) believe that technology will be the panacea for society's ills; they believe solutions to environmental problems can be solved by technology. This optimism is unrealistic. "Environmental problems will require a mix of technological, political, legal, and personal knowledge and commitment to improving the environment" (p.4). Environmental problems will become the American agenda, for no other issue will remain unaffected by the crisis of resources, population and climate change (Orr, 1992).

Environmental literacy is based on the belief that we educate citizens so they are capable of making quality decisions (Simmons, 2001a). "To educate effectively, it also assumes that those who teach are themselves environmentally literate and knowledgeable about how to teach EE." (p.68)

Professional Environmental Education Organization Background

The National Association for Environmental Education (NAEE) organization began in 1971. The founding members were community college educators desiring to "develop instructional materials for use in community colleges" (Disinger, 2001, p.1). However, membership quickly grew from areas of formal and nonformal orientations. Environmental activists saw this educational venue as an opportunity to disseminate their pro-environmental messages. Governmental agencies in environmental and resource management issues saw the organization as a means to further their objectives. Businesses and industries also obtained membership in the hopes of clarifying or justifying their positions on environmental issues. Eventually, the original founders, unable to

maintain the original focus, dropped out and the name was changed to North American Association for Environmental Education (NAAEE). Today, this organization's leadership is dominated by environmental organizations, but the membership is predominately elementary and secondary educators, whose interest is in practice rather than politics (Disinger, 2001). Disinger further notes that teachers' ethical and professional responsibilities prevent them from being propagandists, neither pro nor anti-environmentalists or development. The teacher is obligated to present information from all sides of an issue. The NAAEE has adopted these ideas in two publications relevant to this study, Guidelines for Learning (PreK-12, 2004) and Guidelines for Resource Material (1994).

The NAAEE Guidelines for Learning (PreK-12, 2004) are expectations for performance and achievement for grades four, eight, and twelve. This publication also defines the aims of EE. The aims of EE were formulated from the Belgrade Charter (UNESCO-UNEP, 1976) and the Tbilisi Declaration (UNESCO-UNEP, 1978), with later refinements from other world conferences on the environment. EE includes awareness, sensitivity, attitudes, skills, and participation.

The ultimate goal of EE is environmental literacy, or EL (Kissinger, 2001, Volk, 2001). EL is based on essential underpinnings. These principles are: systems, relationship of parts; interdependence, humans as part of nature; integration and infusion, cross disciplinary; real world, direct experience with the total environment; and lifelong, skill development for current and future use.

Missouri Environmental Education Association

The Missouri Environmental Education Association (MEEA) began in 1993 as the result of an ad-hoc committee consisting of members from DNR, MDC and the Conservation Federation of Missouri Education Committee. MEEA was formally created in 1995 and officially launched at the first Missouri Environmental Education Conference hosted in 1996 by DNR and MDC (Pitts, 2002). MEEA represents a grassroots, not for profit organization of individuals, institutions, organizations and business/industry whose vision is to develop environmentally responsible citizens in Missouri (MEEA, 2006). MEEA's mission is to provide professional development and networking opportunities for its members. MEEA joined the EETAP program in 2001 as a means to fulfill their mission. Efforts in the EETAP program resulted in the MEEA Certification Program, a voluntary program for formal and nonformal educators to attain a certain level of proficiency in the field of EE (MEEA, 2005). Participants in the certification program are required to complete requirements in five categories: instructional workshops, out-of-door experiences, knowledge of resources and facilities, teaching, and action partnership. Category 1 requires attending seven workshops. Three of the workshops must be selected from workshops offered by the DNR and MDC involving the Projects; WET, WILD and Learning Tree (the 'Projects').

The MEEA certification program is one of eight state models developed under the guidance of the EETAP program. EETAP is a program at the University of

Wisconsin Stevens Point, sponsored by a grant from the EPA, and it provides guidance to individual states on their EE efforts. Ruskey and Wilke (1994) developed a model to assist states in achieving EL. The model consisted of 16 components (Appendix A). Surveys were mailed to state EE leaders in 1995 (Kirk et al., 1997). The initial survey reported twelve states with 8-12 of the 16 components in place. In 1995, Missouri had only 2 of the 16 components, which included objectives and funding sources, and four components in the development stage (e g. inservice, State EE Board, interagency committee, and state EE association). The Wilke (2001) survey reported a total of 334 components in place for all 50 states compared to 263 components in 1995. Missouri's four developing components now total six. Missouri ranks 23rd among all states in the total number of the components attained. The inservice component is mostly addressed by natural resource agencies (Wells & Fleming, 2002).

Missouri's certification program is an experienced-based program. Certification programs in Utah, Texas, and Kentucky are competency-based. "The difference between experienced-based and competency-based assessment may seem to be cosmetic to some, but it can be quite significant" (personal correspondence, Tom Marcinkowski, December 16, 2005). The competency-based certification programs have formal assessment strategies as a component of their state certification (Kentucky, 2005, Utah, 2005). The experienced-based certification program sponsored by MEEA has established criteria for workshops and requires 190 hours of participation for certification, but does not require a

formal assessment of participants. A formal assessment would provide valuable information on what is being learned as well as what is being taught.

Project WET

Project WET (Water Education for Teachers) is a nonprofit program for K-12 educators. The foundation for WET was the Watercourse program. The North Dakota State Water Commission established the original Watercourse program in 1984. The U.S. Department of Interior funded a multi-state pilot initiative through Montana State University in 1989 to introduce the program to the states of Montana, Idaho and Arizona. In 1990, the Council for Environmental Education (CEE) became an official co-sponsor and the regional Watercourse program became the national Project WET program (CEE, 2003). "The Project WET program and its corresponding CEE programs, Project Wild and Project Learning Tree are among the most long-lived and successful efforts in environmental education" (p. i). The CEE-sponsored Projects are organized similarly. The national program recognizes state coordinators, who are responsible for sponsoring workshops to train educators in the 'Projects' curriculum. Projects' curriculums are only available to individuals who participate in the required workshops. State coordinators are also responsible for training facilitators to assist in providing curricula workshops throughout the state.

Project WET in Missouri

The Missouri DNR became the official sponsor of Project Wet in 1995 and hosted the first facilitator training for WET that same year. WET training was offered to the MDC educational consultants the following year. The MDC Office of Environmental Education also sponsors Projects WILD and Project Learning Tree. The first joint Project WET, WILD, and Learning Tree facilitator training was held in 1998 and remains the present model for facilitator training (Pitts, 2002). The DNR and the Missouri State Coordinator for WET have played an active, influential role in the development of EE in Missouri. More than 300 Project Wet facilitators (PWF) have been trained according to the state coordinator and more than 7,000 educators have attended Project WET workshops (personal interview with Joe Pitts, March 7, 2006). All of the PWF in the state of Missouri have been trained by the DNR state coordinator for WET (personal correspondence with Joe Pitts, April 25. 2007). Facilitators in this study are classified as formal, nonformal or both.

The DNR was involved in the creation of MEEA and served on the EETAP committee, which established the environmental certification program in Missouri (EETAP, 2006).

Project WET Curriculum

The Project WET curriculum is a highly rated resource for environmental educators (NAAEE, 2004b). The curriculum is used extensively throughout all sectors of education (Heimlich, 2004; Wade, 1996) and is considered valuable by

educators (Marasco & Heimlich, 2006). The WET curriculum was written for grades K-12 and is "a collection of water-related activities that are hands-on, easy to use and fun" (CEE, 2003, p. iii). The goal of Project WET, as stated in the introduction of its curriculum and activity guide, is "to promote awareness, appreciation knowledge and stewardship of water resources, which can encourage a personal, lifelong commitment of responsibility and positive community participation" (CEE, 2003, p. i). The WET curriculum was written following a framework outlined by NAAEE for EE standards. The framework aligns with the critical components addressed by Hungerford and Volk (2001). A reference chart is included in the WET curriculum, along with an activity guide which defines the components and references each component to a specific activity within the guide. The curriculum was written to assist students in developing the ability to make informed decisions about environmental issues and instill confidence and commitment to take responsible action (CEE, 2003). Activities in the WET curriculum are aligned with the NAAEE Guidelines for K-12 learners (2004a), and goals for EE. Each activity outlines the intended grade level, lesson objectives, and types of assessments. The activities are written using a variety of teaching strategies consistent with constructivist pedagogy. The first five activities of the WET curriculum are used to introduce educators and students to these teaching strategies. A variety of assessment strategies are outlined in the first activity, followed by an activity intended to assess students' prior knowledge, experience and interest. Cooperative learning strategies are presented in the next activity, followed by an activity designed to

develop REB skills. These activities at the beginning of the curriculum are intended to develop strategies and skills to be used by the teacher and students in subsequent Project WET activities. Reference sections are included at the end of each introduction activity for further review. An educator's understanding of these tenets should ensure the intended use of the curriculum is achieved.

Similar curriculum was written for science teachers during the Golden Age of Science. This science curriculum combined "some of the best materials in history with the latest in content and pedagogy" (Bybee, 1997, p.13). The curricula was funded by government agencies and written by scientists and curriculum developers. The success of these teacher-proof curricula was limited, because the power to maintain the status quo was underestimated and other components of the education system were ignored. 'Golden Age' reformers of the 50's and 60's ignored the infrastructure of policy and programs that resulted in limited use of the curriculum.

The 'Projects' curricula faces similar challenges as the Golden Age of Science curricula. The 'Projects' curricula contain excellent content and practice for teaching about the environment, but lack the support of the policy makers in the state of Missouri and at the national level. Missouri policy makers missed a golden opportunity to create an environmentally literate citizenry when it failed to act on the Governor's task force recommendations (Kissinger, 1994). Without the support of state government, Missouri DESE, and higher education, the 'Projects' curricula will be limited in their success. Likewise, national policy in the

form of No Child Left Behind (NCLB) has limited current instruction at the elementary level to reading, writing and math (Bayer, 2004).

Missouri school programs are based on state standards (Show-Me Standards), Grade Level Expectations (GLE's) and the Missouri Assessment Program (MAP) tests. The 'Projects' curricula has been correlated to the Show-Me standards and disseminated with the curriculum guides, but the 'Projects' have not been aligned with the new Missouri GLE's (personal communication, Joe Pitts, March 27, 2007). The MAP test contains some ecological knowledge assessments, but this testing format would be difficult to assess REB. The WET curriculum activities involving environmental issue problem solving, evaluation and action, and critical components of environmental literacy are probably not part of state assessment.

A one-day, six-hour long workshop is required for educators wishing to obtain the Project WET curriculum in Missouri. The state coordinator for WET and trained facilitators sponsor these workshops. The workshops introduce educators to the features and activities of the curriculum. Workshops have been found to be an effective strategy for training participants in the use of activity-based materials such as WET (Krantz, 2002). Workshops have a significantly positive effect on the attitudes toward teaching about the environment and feelings toward teaching EE (Krantz, 2002). Teachers rate workshops as having the greatest value for enhancing practice, but "the majority of teachers are more inclined to adapt activities rather than use them directly" (Wilke, 1995, p.117). Krantz's (2002) Missouri study showed self-efficacy increased with the number of

workshops attended, but the length of workshops, 6 or 12 hour, had no significant effect on participants' attitude or self-efficacy.

Workshops were found to be the majority of inservice EE training for teachers and were limited to the Project's resources taught by natural resource agencies (Wade, 1994). She also found that the majority of state Project coordinators believed the facilitators of workshops were more knowledgeable about content than pedagogy (Paul & Volk, 2002). Wade (1996) noted the fast-food approach to inservice training in EE, using spoon-fed packaged activities, treated teachers as curricula consumers rather than professionals. Paul and Volk contend that a six-hour workshop cannot provide a firm foundation in EE or its associated teaching strategies, which requires extensive training.

Nonformal Environmental Educators

Nonformal environmental education focuses on education about the environment that takes place at settings such as parks, zoos, nature centers, community centers, youth camps, etc., rather than in a classroom or school. Any organized educational activity about the environment that takes place outside the formal education system is considered nonformal (NAAEE, 2004b).

Nonformal and formal environmental educators have the same general goal, environmental literacy (NAAEE, 2004b), but there are important differences between these two types of educators. Knapp (2001) outlines three clear contrasts. First, time to attain behavior change; a sub-goal of EE (Hungerford & Volk, 2001) is a constraint experienced by nonformal educators. The settings for

nonformal educators may only allow 1 hour to ½-day sessions, which is not adequate time for "people to attain the sensitivity, knowledge, and attitudes necessary for a positive environmental ethic" (p. 327).

A second contrast is the lack of research-based models for nonformal environmental educators. Nonformal educators lack a research-based environmental curricula and methodology for enhancing environmental objectives. A third contrast is the lack of evidence to support the viewpoint that nonformal experiences are capable of changing the REB of participants.

The inherent differences between formal and nonformal education should not be seen as limitations, but opportunities for partnership between the various sectors to attain the similar overall goal of environmental education: environmental literacy. "A critical obstacle for environmental education has been the lack of cooperation between environmental educators, formal and nonformal" (UNESCO-UNEP, 1995, p.41). However, the differences between formal and nonformal educators may not be as wide as expected, because many nonformal educators have had some experience at the classroom level, which is a requirement for employment in the educational sector of a nonformal agency (personal correspondence with Joe Pitts, April 25, 2007).

Nonformal environmental education sites can provide opportunities for learning, which are different from the traditional school environment. The less restrictive environment of nonformal sites can provide a motivational element (Emmons, 1997) and an appropriate teaching strategy for EE. Nonformal sites can accommodate a variety of different learning styles as visitors move through

exhibits at their own pace (Melber & Abraham, 1999). The variety of nonformal education sites provides opportunities for real world experiences and can serve as primary resources for classroom teachers. Nonformal sites offer professional development workshops to help teachers strengthen their science skills and provide website activities for students (Melber & Abraham, 1999).

The effectiveness of outdoor science instruction is well documented (Cronin-Jones, 2000). "Outdoor activities requiring direct involvement with the natural environment help students learn more about environmental science topics than indirect or non-interactive experiences such as videotapes, readings or discussions" (p.10). Most of the off-campus environmental science instruction used "built" settings, such as museums and zoos, more than natural outdoor areas (Simmons, 1993). The use of non-traditional sites for teaching science is limited by lack of planning time, lack of skills and lack of knowledge regarding teaching in the outdoors, as well as liability and safety concerns (Melber & Abraham, 1999). Investigations of environmental issues were a concern for elementary teachers. Elementary teachers questioned the developmental appropriateness of issue investigation and wanted to avoid controversial topics for fear of reprisal from parents and administrators (Christenson, 2004).

The success of EE requires the cooperation of both formal and nonformal educators (Bainer, et al., 2000; Bennett & Matthews, 2005; Knapp, 2002; Simmons, 1998; Taylor, 2006) if the goal of EL for all citizens is to be reached. The client population and educational environment is different for each type of educator and requires different instructional strategies. However, the primary

goal for EE remains the development of responsible environmental behavior, regardless of the educational setting (Simmons, 2001). The differences between nonformal and formal educators have been organized into a comparison chart in Figure 1. The chart is designed around ecological terminology and uses this as a metaphor for the EE community. Nonformal and formal educators are different species which occupy different niches and habitats in the community and have different survival strategies, but have a common goal.

Continuing the metaphor, formal and nonformal educators need to co-evolve into a symbiotic relationship of mutualism. Each sector of EE must assume its realized niche, so as to reduce competition and allow the most efficient use of limited resources.

A recent survey (Marasco & Heimlich, 2006) concerning the usability of Project WET Curriculum by educators, facilitators, and coordinators is relevant to this PWF study. The WET curriculum rated a 6.39 mean score on objectives and a 5.79 on assessment with a 6 being the desired score in the Marasco study. Questions in the practice section of the PWF survey ask about using objectives and a variety of assessments. Since users in the Marasco study rated the objectives and assessments in the WET curriculum as near excellent, PWF should score high on these items. Questions relating to multiple perspectives presented and students see many sides of environmental issues in the Marasco study received mean scores of 7.77 and 8.56 respectively on a scale of 1-11 with 11 being excellent. Respondents to the PWF survey may not score as well on the items addressing these concepts.

Species

	Nonformal	Formal
Population	Biodiversity- all types and ages of learners	Monoculture- one age group, Similar culture
	Voluntary	Compulsory
	Limited knowledge about population	Knowledge of population
	Assess knowledge, interest, and needs at beginning	Mandatory assessment
	Informal formative	Informal formative, summative
Habitat	Diverse public locations	Specified public location
	Unstructured climate	Structured climate
	Short time period	Extended time period
	Standards, GLE's , MAP	Standards, GLE's, MAP
	Secondary site	Primary site
	Knowledge evolving and contextual	Knowledge static, unrelated
Niche	Complimentary	Primary
	Flexible	Set curriculum
	Contemporary	Traditional
	Manage resources	Manage populations
	Contextual teaching	Sequential teaching
Strategies	r-strategies	k-strategies
	Nonhierarchical	Hierarchical
	Learner centered	Teacher/text centered
	Direct experience	Direct instruction
	Low learner expectations	Higher learner expectations
	Promote, market, disseminate	Transfer knowledge
	EE knowledge, awareness	EE responsible behavior
	Promote population questions	Promote population answers
	Active engagement	Passive participation
	Collaborative, social	Competitive, individual

Figure 1 The Ecology of Environmental Educators

Teacher Education Programs

Numerous studies have shown the amount of time teachers spend teaching about the environment increases with the amount of preservice training they receive (Lane et al., 1994, Wilke, et. al. 1995). Wisconsin (Kurosawa & Coble, 2006) and Kentucky are two states that require demonstration of competency in EE as part of initial teacher certification. A study by Bayer (2004) indicates the majority of elementary teachers acknowledge that they were not well prepared in their preservice courses to teach science. Only 7% of Deans of Education surveyed by Bayer (2004) were confident that good science education was part of the curriculum. More specifically, the McKeown-Ice (2000) study concluded that preservice teacher education programs are not systematically preparing future teachers to effectively teach about the environment.

Several authors (Heimlich, 2004; Powers, 2004; and McKeown-Ice, 2000) identified possible reasons for EE being excluded from the teacher education curriculum. A national study on teacher preparation (Heimlich et al., 2004) reports the barriers to EE as a lack of mandates from national and state organizations. EE is not a requirement for state certification, nor is it a requirement of the National Council for Accreditation of Teacher Education (NCATE). Space in the curriculum was also stated as a major reason for exclusion of EE. Powers (2004) identified faculty opposition when a new course is suggested into an already crowded curriculum. Students do not have time to take another elective course. Students are not likely to see EE in their internships, either. Also, a large percentage of colleges and universities lack a

faculty member specializing in EE (McKeown-Ice, 2000). More than 85% of elementary preservice programs reported they had no faculty specialized in EE (Roper-Starch, 2000). The institutions that do offer EE in the teacher education program offer it because a faculty member has an interest in the subject (McKeown-Ice, 2000).

When EE is taught in a teacher education program, it is most frequently integrated into the science methods course (Heimlich et al., 2004; McKeown-Ice, 2000). The 'Projects' curriculum was the most frequently used resource in the teacher education programs (McKeown-Ice, 2000). Overall, the use of EE resources is very low in teacher education programs (Heimlich et al., 2004) with the 'Projects' curriculum being the most recognized.

Teacher Inservice

"By far, the most frequent course of curriculum failure is inadequate teacher training" (UNESCO, 1997, p. 26). This statement made at the UNESCO International Conference reflects a continuous problem in the field EE. Munson (1903) identified this problem and Mitchell (1922) confirmed the lack of proper teacher training as a reason for the failure of the Nature Study curriculum. History will repeat itself if EE curriculum implementation is omitted from mandated in-service training (Ruskey, 1995).

National and state surveys conducted in EE report the majority of teachers spend less than one hour a week on the environment (Ruskey). The percentage of teachers incorporating EE decreases across the grade levels. Only 44% of

high school teachers compared to 83% of K-4 teachers include environmental topics in their curricula (Archie, 2001). Recycling and solid waste management are the only topics taught on a regular basis.

A survey by Wade (1996) focused on the status of teacher in-service education of EE in the United States. Most EE in-service programs consist of the use of well-known, centralized curricula, managed by natural resource agencies and delivered by in-service providers who are more skilled in science than pedagogy. The most widely attended in-service programs in the United States are the 'Project' workshops. These workshops are most likely to be designed and presented by natural resource agencies. The MDC and the DNR provide the majority of in-service opportunities in EE for Missouri (Wade, 1996). Nationally, 54% of 'Project' facilitators are employed by state natural resource agencies, while only 3% work for the state education agencies (EETAP, 2006) and the average number of facilitators per state is 37.7.

The primary audience of state EE programs is the K-12 classroom teacher. However, funding for training teachers is a limiting factor in the amount of training conducted (EETAP, 2006). An earlier EETAP study by Wells and Fleming (2002) suggested the language of natural resource professionals is quite different from the language of the classroom. The language of the natural resource professional is content oriented, while the needs of teachers are more process focused.

Higher Education

The Missouri Governor's task force's on EE recommendation for higher education was "to make available graduate and undergraduate courses that relate to the objectives of environmental literacy" (Kissinger, 1994, p.30). "There is no comprehensive effort at this time toward implementation of this objective in Missouri" (Pitts, 2002, p.14). A barrier to EE in Missouri is a lack of formal acceptance by higher education and the lack of research supported by institutions of higher education (Wells & Fleming, 2002). EE has not been institutionalized at most Missouri colleges and universities, which is made apparent by the small number of institutions offering majors, minors, specializations, or concentrations in EE (McKeown-Ice, 2000). Institutions of higher education's failure to take a leading role in EE have placed the burden of creating an environmentally literate population on other sectors of education.

State Department of Education

State Departments of Education's acceptance of EE is lacking and EE is not viewed as a tool in K-12 education, but considered fluff or an add-on (Wells & Fleming, 2002). EE is not a high priority among most state education agencies and is left to other state agencies, such as natural resource departments. This is largely due to funding (Wade, 1996). Some state education departments have made EE a priority in K-12 education. The California Department of Education funds the California Regional Environmental Education Community network (CREEC), which provides educators with access to high quality EE resources to

enhance environmental literacy (Mann, 2006). Wisconsin's school districts must develop a written sequential curriculum plan for subject areas including EE, and the state regularly assesses environmental literacy (Kurosawa, 2006).

The state of Missouri's DESE was mandated by the Outstanding Schools Act, Section 160, RSMO Supp., 1993 to develop performance standards (Show-Me Standards) from which curriculum frameworks would be written. EL standards were to be incorporated into these standards according to the 1993 Governor's task force. Environmental Standards have been incorporated into the Show-Me standards, because many of the developers of the standards were participants of MDC and DNR workshops, not because of efforts by DESE (Pitts, 2002). DESE contributed funds for the correlation of Project Wet to the Show-Me standards and endorsed the 'Projects' (Pitts, 2002), but EE is still considered separate from K-12 education in Missouri (Wells & Fleming, 2002).

Summary

The history of EE provides insights for the current practice in the field. Nature Study was an educational response to the needs of an industrial society. Nature Study persisted in places where there was leadership; however, leadership is lacking in the political and state education agencies of Missouri. The failure of Nature Study was due to the lack of formal training and suitable textbooks. The Project Program provides workshop and a highly regarded curriculum. A good EE program is needed now more than ever as indicated by the environmental

problems faced by society today and the lack of connection between humans and the natural world.

The WET Curriculum and Activity Guide is a widely used resource in higher education methods classes and the professional development of teachers and nonformal educators (Heimlich et al., 2004; Wade, 1996). The NAAEE recognizes the WET curriculum as an outstanding EE resource (NAAEE, 2004b). The WET curriculum is only available to individuals who have completed the WET workshop. Comstock's (1939) Handbook of Nature Study, a collection of stand-alone lessons, are similar to WET, but lacked a systematic approach. The WET curriculum has been cross-referenced with planning charts, making the resource very user friendly. The WET curriculum has been correlated to the Missouri state standards at all grade levels and subject areas. The WET curriculum addresses the same difficulties as Comstock's handbook: appreciation for the subject; increase in teacher knowledge; and a time-saving resource. Consensus on the aims of EE, unlike Nature Study, has also been reached.

Outdoor Education's contribution to EE was the view of education as developing a concern about the natural environment and an emphasis on teaching attitudes, appreciation and understanding. These qualities are the basis for and are articulated in the WET curriculum, as well as the advanced ideas of environmentally responsible behavior outlined in the Tbilisi Declaration (1998). The idea of EE being an extension of the general curricula and not a separate discipline was established by Outdoor Education.

Conservation Education's roots are found in natural resource agencies, who were also the designers and developers of the 'Projects' curricula. Conservation procedures were among the marks of the educated person and resource education programs were taught by resource agency personnel. However, Conservation Education, like present day EE, suffered from skepticism concerning resource agencies and their agendas as well as misconceptions these agency personnel may have fostered.

The 1993 Missouri Governor's Task Force on EE constructed a workable, explicit plan for environmental literacy for all Missourians, but the plan has not been realized on many fronts. The state of Missouri has not passed formal legislation creating a state environmental education coordinating council, nor has it sustained support by the state board of education or institutions of higher education. DNR, MDC, and MEEA are primarily responsible for the progress made toward an environmentally literate Missouri citizenry. DNR and MDC provide training in the 'Projects' which accounts for a substantial amount of the EE in universities, colleges, K-12 and nonformal settings. MEEA, working with EETAP, has promoted a statewide comprehensive plan for EE which includes an EE certification component. The certification component requires completion of the 'Project' workshops as a major category. The goal of the MEEA EE certification is to identify professionals that are knowledgeable about the principles, practice and skills involved in EE.

Chapter Three

Methodology and Procedures

This chapter contains the research questions and hypotheses, a discussion of the research method used in this study, the development of the survey, procedures for collection of data and analysis, and a summary of the chapter.

Research Questions and Hypotheses

The purpose of this study was to compare formal, nonformal and both PWFs readiness as environmental educators and the influence of their preparation on their understanding of the principles, practice and skills involved in teaching about the environment. The research questions and hypotheses for this study are:

1. Are there differences between formal, nonformal and both PWFs understanding of the principles, practice and skills of environmental education?

H_o1 There is no statistically significant difference between formal, nonformal or both PWFs understanding of the principles of environmental education.

H_o2 There are no statistically significant differences between formal, nonformal or both PWFs in the practice of teaching environmental education.

H_o3 There are no statistically significant differences between formal, nonformal or both PWFs in the skills taught to learners in environmental education.

H_o4 There are no statistically significant differences between formal, nonformal or both PWFs in the total score on statements concerning principles, practice and skills in environmental education.

2. Are there differences between formal, nonformal or both PWFs undergraduate preparations in EE?

H_o5 There are no statistically significant differences between formal, nonformal or both PWFs undergraduate preparations in EE.

3. Are there differences between formal, nonformal or both PWFs in the number of postgraduate courses?

H_o6 There are no statistically significant differences between formal, nonformal or both PWFs in the number of postgraduate courses completed.

4. Are there correlations between the PWFs preparation and the total score on statements concerning the principles, practice, and skills of EE?

H_o7 There is no statistically significant relationship between PWFs preparation and the total score on statements concerning the principles, practice, and skills of EE.

Survey Research

This study utilized a cross-sectional mailed survey research (Creswell; 2005). Survey research is appropriate when examining current attitudes and practices of individuals. Surveys are useful when comparing groups and measuring the needs of a program (Cohen & Manion, 1985). “Surveys provide a speedy and economical means of determining facts about people’s knowledge, attitudes,

beliefs, and behaviors" (American Statistical Association, [ASA], 2006, p. 2). Mailed surveys have the advantage of reaching a geographically dispersed population, are economical and produce large quantities of data (Creswell, 2005).

The population for this study will be the facilitators in the Missouri PW program. The facilitators have voluntarily been trained by the state PW coordinators to assist in providing workshops for individuals desiring access to the PW curriculum. PW workshops are also required for environmental education certification in Missouri. The number of PW facilitators trained in Missouri is over 300, as reported by Joe Pitts, state coordinator for PW. Workshop participants number about 7,000 (personal interview, March 7, 2006). Surveys were mailed by the DNR Project WET state coordinator to 312 facilitators in the state of Missouri, who had received training. The list of names for mailing was generated from those who had received training to become WET facilitators. The survey was sent to all who had received WET training to increase the sample size (Cohen & Manion, 1985). Of the 312 surveys mailed, 27 were returned for out of date addresses. The target population was thought to be 160 facilitators (Joe Pitts, personal communication, November 17, 2006) who actively provided workshops and/or have helped arrange for a workshop (Joe Pitts, personal communication, June 28, 2007). Therefore, the targeted population was determined to be 160 active WET facilitators. There were 75 active respondents providing a return rate of 46.97. Included were two responses considered non-active but could not be identified from th e77 returned

surveys. The first limitation addresses this matter. A second mailing was not conducted due to available resources. Follow-up phone calls were made to non-respondents to determine if there were any differences between the non-respondents and the survey respondents. The state PW coordinator sent a list of 12 non-respondents names and phone numbers. These individuals were contacted by this researcher and asked a shorten version of this survey; 1/2 of the survey questions were asked. Questions for the phone survey were selected from the results of the mailed survey; they were those deemed most important to answering the research questions.

The response rate is a critical component of survey research. A response rate of 50% or better ensures more confidence in generalizing the results to the population. A response rate of 40% may be considered acceptable, especially in exploratory surveys like this study (Creswell, 2005). To increase the response rate, several strategies were employed. The design of the questionnaire was easy to follow, included clearly worded instructions, completion could be accomplished in 30 minutes, and completing the survey could be seen as a learning process (Cohen & Manion, 1985). Four other factors affect response rate: initial mailing, the cover letter, follow-up letters, and incentives. The survey (Appendix B) was mailed in mid-October with a self-addressed, stamped envelope for respondent's reply. The cover letter is a major component of the mailed survey (Creswell, 2005). It contained these elements: importance of participation, purpose of study, assurance of confidentiality, sponsorship, and completion time and returns. The PWF are a volunteer group of individuals and

were encouraged to respond for program improvement. This survey of PWF is a joint venture of the Missouri Department of Natural Resources (DNR) and a Midwestern research extensive institution. Cover letters (Appendix 2) by both the DNR and the researcher were sent with the survey to encourage participation. A Project WET CD provided by DNR was offered as an incentive gift for those who replied within a two-week designated period.

Survey Development

The survey was developed utilizing the MEAA certification goals. One of the goals outlined in the certification program, which pertains to this PWF study, was: "to provide a standard that identifies professionals who have demonstrated a thorough knowledge of environmental education, principles, practices, and skills" (MEEA, 2005, p.1). EE principles, practices, and skills became the framework for constructing this survey. Different sources were used to develop each section of the survey and are described below.

The statements in the principles of the EE section were generated from a collection of readings (Hungerford, et al., 2001) which traced the development of the principles from the Tbilisi Declaration (UNESCO, 1977) through present day understandings concerning EE. The guiding principles presented in the Tbilisi Declaration have been operational through the years by research, curriculum development, and practice to provide a general outline of the principles of EE. A review of Hungerford's Essential Reading in Environmental Education (2001)

was used for this section. Agreement with these statements by survey respondents indicated their level of understanding about the principles of EE.

The statements used in the practice section were formulated from the Project Wet Curriculum and Activity Guide (CEE, 2003), that is used in both facilitator and training workshops. The Project Wet curriculum is considered aligned with the principles of EE and current philosophies of teaching, and is a highly rated resource for educators (NAAEE, 2004d). An analysis of the curricular units provided the statements included in this section. Agreement to the statements in this section would help in assessing facilitators' understanding of the practice of teaching about the environment and the influence of their preparation on their practice.

The statements in the skills section of the survey were developed using the NAAEE's Guidelines for Learning (Pre K-12) (2004a) and additional frameworks were included in its appendix. The skills of inquiry, issue investigation, value clarification, and environmental action are components of EL and needs to be explicitly taught for students to become environmentally responsible citizens. The teaching of these skills by PWF was measured in this section.

Items in Section lll of the survey were modified from the National Environmental Literacy Assessment Project (Wilke, et al., 1995) and provide information regarding teacher preparation. Questions concerning an individual's undergraduate, graduate, and workshop or conference experiences were included. Respondents also rated the value of these experiences.

The final section of the survey contains demographic questions, which indicate teaching site, age groups taught, conference/workshop attendance, and gender. All of these factors may play a role in determining respondents' knowledge and practice of environmental education.

Validity

A survey was specifically developed for this study. A new instrument requires validity (McMillan, 2000). Validity implies the use of information from research be used in a proper way, which requires expert judgment (McMillan, 2000). A request was made to a national leader in the field of environmental education and the Missouri state coordinator for Project WET for names of possible validity panel members. A letter was sent to twelve individuals along with the research questions and the survey for their input. Reviewers were requested to judge the ability of the instrument to answer the research questions. A total of six responded. The validity panel's feedback was used to construct the final survey items and organize the instrument. Comments ranged from notes on grammatical errors to a matrix for evaluations of the components of the instrument. The modifications made the instrument more understandable to respondents, and the resulting data could be more appropriately used to answer the research questions.

A pilot study was conducted using members of the MEEA certification committee. The members were asked to complete the survey and comment on the effectiveness of the questions. Three members responded for an analysis of

the results from which some inferences could be drawn (Dillman, 1978). The pilot study ensures that the data collected will be more than a set of numbers, but will be able to provide statistical and practical information concerning the PWF (McMillan, 2000). The reliability of the instrument was enhanced by input from the validity panel and pilot study group. The changes made to the instrument from the suggestions of these individuals aligned the items with the constructs. The cooperation of DNR and the incentive gift helped with motivating respondents to return the survey. Respondents' comments written on the survey were evidence of their effort. The items for the final survey were randomly presented without the three contexts being identified.

The non-respondents who participated in the phone survey were nonformal (6) and formal (2), with equal numbers for gender. Most (75%) had over 10 years experience as educators and were equally represented in the group levels taught. Six (75%) were trained in all the 'Projects' curriculum, with one trained in WET only, and one trained in WILD and PLT only. All nonformal educators received more than 10 undergraduate credits in basic ecology, while the two formal respondents received 1-3 credits or 4-6 credits. Most of the respondents (75%) had taken graduate coursework in EE. All respondents to the phone survey had attended conferences and half-day workshops; half had attended 10 or more. Only 5 of the 8 respondents had attended extended workshops and the numbers of workshops attended were 5 or less. Therefore, responses to the telephone survey were similar to respondents' answers allowing the findings to be generalized to the Missouri PWF population (Appendix E).

Reliability

Spearman-Brown prophecy coefficient was used to measure the instrument's reliability based on split-halves (George & Mallery, 2003). All items in the three constructs, (principles, practice, and skills) were randomly assigned to two groups of 15 each and analyzed using SPSS version 11.0. SPSS takes the first half of the items as the first split form, and the second as listed in the dialog box as the second split form (Garson, 2006). Reliability using the Spearman-Brown prophecy was .924. Therefore, the survey was considered to be reliable.

Data Analysis

The completed surveys were returned by the respondents to DNR in the self-addressed, stamped envelope provided with the mailed survey. The return address portion of the cover letter, used to send the incentive gift was detached from the survey before the surveys are forwarded to the researcher. This assured anonymity. Each survey was marked with the date received and an identification number. Surveys received before the two week return deadline received their gift in the mail. Survey identification numbers were used to check for accuracy of data entry and referencing of comments to demographic data (Wilke, 1995). Comments and 'other' categories were entered into a word processing file. Numerical data was entered into a Statistical Package for Social Sciences (SPSS) Windows 11.5 version data base for analysis. Data was checked for missing scores and outliers. ANOVA tests were used to compare formal, nonformal and both facilitator mean scores for testing Ho1, Ho2, Ho3, of

the survey framework. Mean scores for each item were exported to an Excel file for figuring a grand mean. Total scores for the principles, practice, and skills sections were used for testing Ho 4. Crosstabs were used for testing Ho 5, and Ho 6. Pearson Correlation (r) was used for Ho 7.

Bias

Several forms of bias may have existed in the responses on the instrument. The respondents may have answered the items to please the state coordinator, which is known as the Hawthorne effect. Respondents' answers may have exhibited "self-lifting" bias, making themselves to appear in a more positive light. Demographics items were placed at the end of the survey to counteract this affect. "Response set" or "Habit Bias" may have been exhibited when respondents answered a series of questions with like responses. A select, limited number of items and a change in the format were used to offset this bias (ASA, 2006, McMillan, 2000).

Summary

The Project WET curriculum is a highly rated resource for teaching EE (NAAEE, 2004d) and contains well developed lessons for conducting quality education, but requires the understanding of the essentials of EE to be facilitated to its potential. An assessment of PWF understanding of EE could identify the strengths and weaknesses of the facilitators to improve instruction and the Project WET program.

The PWF are responsible for the education of significant numbers of participants in 'Project' workshops. Therefore, their understanding of the principles, practice, and skills of EE is critical. To date, there has been no formal assessment of the PWF knowledge and practice concerning EE. This instrument intends to assess PWF in these areas.

The survey also includes questions about preparation experiences in EE. Assumptions can be made about the differences in preparation for formal, nonformal and both facilitators and the influence of coursework and workshops on their understandings about EE, but this instrument could provide quantitative data to test these ideas. The analysis of the data could also suggest areas of preparation which need improvement or the emphasis of particular aspects of instruction for different groups of facilitators, nonformal or formal. Inclusion of the 'both' group of facilitators could also provide insight for program improvement.

Chapter 4

Introduction

This chapter is divided into two sections, descriptive statistics of the sample and inferential analysis of the data.

Descriptive Statistics

A total of 77 active PWF returned useable surveys, of which 27 (35%) were formal educators, 38 (49%) were nonformal educators and 12 (16%) reported having worked in both formal and nonformal sectors (Table 1). The data from one (1.2%) respondent was not used in the calculations, because the scores were identified as outliers, which would skew the data. Two respondents did not mark a type of educator, but noted they were retired. The type of educator they were was determined by their worksite and other factors. The number of useable surveys was 77.

Table 1

Number and Percentage of Respondents by Type and Gender

	Female		Male		Total	
	n	%	n	%	n	%
Formal	20	26	7	9	27	35
Nonformal	23	30	15	20	38	49
Both	8	10	4	5	12	16
Total	51	66	26	34	77	100

The majority of PWF (79%) have been teaching for over 10 years. Most of the PWF (64%) have received training in facilitating all the Project workshops (WET, WILD and PLT) with 5 (15%) of the formal educators, 5 (13%) of the nonformal educators and 1 (8%) of both receiving additional training in Project Leopold and Investigating and Evaluating Environmental Issues and Actions (IEEIA) (Table 2). The number of respondents participating or planning to participate in the MEEA certification program was 12 (18%). Four formals, seven nonformals and 1 both facilitators are in the certification program with 1 nonformal and 1 both educators having obtained certification. The PWF respondents have conducted approximately 244 Project WET workshops. The number of facilitated workshops is an approximate number, because some respondents provided a range instead of an exact number. The average was used in the cases who reported a range of workshops facilitated.

PWF consider themselves informed about EE. Nearly 70% of formal educators, 65% of nonformal and 75% of both reported being very or greatly informed about EE. Most PWF were readily able to find and obtain education instructional materials with 67% of formal, 68% of nonformal and 75% of both being considerably or greatly able to find instructional materials on the environment. However, fewer PWF reported being familiar with the NAAEE national standards, with 22% of formal, 16% of nonformal and 42% of both being considerably or greatly familiar with these standards.

Table 2

Comparison of Formal, Nonformal and Both PWF on Demographic Items

Number of Years in Teaching (n), Including the 2005/06 Year

	1-5		6-10		11-15		16-20		20 +		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Formal	1	1	3	4	7	9	7	9	9	12	27	35
Nonformal	8	10	3	4	7	9	8	10	12	16	38	49
Both	1	1	1	1	3	4	3	4	4	7	12	16
Total	10	12	7	9	17	22	18	23	25	35	77	100

Predominate Group Level Taught

	K-5		6-8		9-12		Higher Ed.		Adult		All		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Formal	5	7	4	5	9	12	9	12	0	0	0	0	27	35
Nonformal	9	12	8	10	3	4	7	9	4	5	7	9	38	49
Both	3	4	4	5	2	3	2	3	0	0	1	1	12	16
Total	17	23	16	20	14	19	18	24	4	5	8	10	77	100

Table 2 Continued

Training as a Facilitator

	WET Only		Wild/ PTL		All		All+Leo IEEIA		Other		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Formal	4	5	1	1	18	23	4	5	0	0	27	35
Nonformal	5	7	4	5	23	30	5	7	1	1	38	49
Both	2	3	1	1	8	10	1	1	0	0	12	16
Total	11	14	6	7	49	64	10	13	1	1	77	100

How Informed Are You About EE

	None		Somewhat		Generally		Very		Greatly		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Formal	0	0	1	4	7	26	15	56	4	15	27	35
Nonformal	0	0	3	8	10	26	20	53	5	13	38	49
Both	0	0	0	0	3	25	5	42	4	33	12	16
Total	0	0	4	5	20	26	40	52	13	17	77	100

Table 2 Continued

To What Extent Are You Able Obtain EE Instructional Material

	None		Somewhat		Moderate		Very		Greatly		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Formal	0	0	3	11	6	22	12	44	6	22	27	35
Nonformal	1	2	1	3	10	26	19	50	7	18	38	49
Both	0	0	0	0	3	25	4	33	5	42	12	16
Total	1	1	4	5	19	25	35	45	18	23	77	100

To What Extent Are You Familiar with the NAAEE Standards

	None		Somewhat		Moderate		Very		Greatly		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Formal	6	22	7	26	8	30	4	7	2	7	27	35
Nonformal	10	26	16	42	6	16	4	11	2	5	38	49
Both	3	25	3	25	1	8	5	42	0	0	12	16
Total	19	24	26	34	15	19	13	17	4	5	77	100

Nearly 70% of the formal, 76% of the nonformal and 75% of both PWF have completed four or more undergraduate credits in principles of ecology, with 50% of the nonformal and both having completed more than 10 credits. Nearly 67% of the formal, 74% of the nonformal and 58% of both PWF have completed more than four credits of undergraduate coursework in basic knowledge of social, economic, and political systems (Table 3). However, only 45% responded to having coursework specifically related to EE. The PWF respondents, formal (n=10), nonformal (n=18) and both (n=7), who had undergraduate coursework in EE, identified it primarily as infused into the curriculum (49%), rather than a separate course (22%) or a unit (10%). The inclusion of EE into undergraduate coursework was mixed with 20% involving issues, 7% practicum, 5% methods courses, 5% foundations and 63% a combination of these four approaches. The undergraduate experience was reported by 37% formal respondents, 23% nonformal respondents and 16% of both respondents as having little or no value in preparing them to integrate EE into their teaching (Table 4).

Formal PWF were more likely to have completed graduate hours in EE (80%) than nonformal PWF (60%) or both (58%), with 37% of the formal educators having completing 10 or more credits. In contrast 30% of nonformal respondents have completed 10 or more credits in EE and 25% of both respondents (Table 3). Four (15%) of the formal facilitators considered their graduate coursework as having little or no value in preparing them to teach EE, compared to 15 (43%) of nonformal educators and four (36%) of both educators (Table 4).

Table 3

A Comparison of Formal, Nonformal and Both Undergraduate and Graduate Credits

Number of Undergraduate Credits Relating to Ecology

	0		1-3		4-6		7-9		10+		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Formal	3	11	5	18	4	15	8	30	7	26	27	35
Nonformal	5	13	4	10	6	16	4	10	19	50	38	49
Both	2	17	1	8	2	17	1	8	6	50	12	16
Total	10	13	10	13	12	16	13	17	32	42	77	100

Number of Undergraduate Credits Relating to Social, Economic and Political Systems

Formal	3	11	6	22	9	33	5	18	4	15	27	35
Nonformal	5	13	5	13	5	13	15	39	8	21	38	49
Both	2	16	3	25	2	16	3	25	2	16	12	16
Total	10	13	14	18	16	21	23	30	14	18	77	100

Number of Graduate Credits Related to Environmental Education

Formal	5	19	5	19	4	15	3	11	10	37	27	35
Nonformal	15	39	7	18	2	5	2	5	12	32	38	49
Both	5	42	1	8	2	16	1	2	3	25	12	16
Total	25	32	13	17	8	10	6	8	25	32	77	100

Table 4

Comparison of the Value of Educational Experiences Between PWF

Value of Undergraduate Credits in Preparing to Teach EE

	No Value		Little Value		Moderate Value		Considerable		Great Value		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Formal	3	11	7	26	10	37	6	22	1	9	27	35
Nonform	1	2	7	18	17	45	10	26	3	8	38	49
Both	0	0	2	16	2	16	6	50	2	16	12	16
Total	4	5	16	21	29	38	22	29	6	8	77	100

Value of Graduate Credit in Preparing to Teach EE

Formal	3	12	1	4	7	27	7	27	8	31	26	36
Nonform	15	43	0	0	5	14	8	23	7	20	35	49
Both	3	27	1	9	1	9	3	27	3	27	11	15
Total	21	29	2	2	13	18	18	25	18	25	72	100

Value of Conferences and Workshops in Preparing to Teach EE

Formal	0	0	0	0	4	15	11	41	12	44	27	35
Nonform	1	2	0	0	10	26	16	42	11	29	38	49
Both	0	0	0	0	3	25	6	50	3	25	12	16
Total	1	1	0	0	17	22	33	43	26	34	77	100

Formal PWF reported using the Project WET curriculum often (50%) or regularly (23%), while nonformal reported 54% and 22% usage, and both reported 33% and 33% respectively. Comments were made on the survey concerning the value of the WET curriculum. “WET is a wonderful project” (a

both respondent #17). “I use Project WET regularly and like it. There is a lot I can use with little additional work” (# 23, a both respondent). “The projects are very well done and very useful to educators. I encourage my preservice and inservice teachers to take them” (# 36 both). Respondent #40, a formal educator, used Project WET in their confirmation class to teach moral issues and # 48 (nonformal) used the WET curriculum with emotionally disabled students.

Total mean scores and standard deviations on the survey items are reported in Table 5. The total mean score on all sections of the survey was higher for formal PWF than nonformal or both. PWF generally scored higher on the principles and practices sections than on the skills section.

Table 5

Descriptive Statistics for Main Effects

	n	M	SD	Minimum	Maximim
Participants					
Formal	27	3.15	.41	1.60	4.00
Non-Formal	38	3.05	.35	1.10	3.90
Both	12	3.06	.35	1.10	3.70
Measures					
Principles	77	3.26	.33	2.10	3.90
Practices	77	3.24	39	2.40	4.00
Skills	77	2.76	.63	1.10	3.90
Total	231	3.09	.26	1.10	4.00

Mean scores on the principles section were close with only a .02 difference between the groups of PWF (Table 6). Formal educators scored higher than other PWF on the practice and skills sections. Mean scores on the skills section were lower than other sections for all groups.

Table 6

Means and Standard Deviations for Measures of Principles, Practices, and Skills by Type of Participant

	Principles	Practice	Skills	Total
Participants				
Formal	3.25 (0.42)	3.34 (0.42)	2.87 (0.63)	3.15 (0.41)
Non-Formal	3.26 (0.29)	3.17 (0.38)	2.72 (0.61)	3.05 (0.35)
Both	3.27 (0.17)`	3.25 (0.27)	2.66 (.75)	3.06 (0.35)
Total	3.26 (0.33)	3.24 (0.39)	2.76 (0.63)	3.09 (0.26)

The survey respondents were asked to identify the number of undergraduate and graduate credits earned in preparation for being educators in EE. The mean scores and standard deviations for all levels of preparation are reported in Table 7.

Table 7

Comparisons of courses taken by PWF

		n	M	SD
Undergraduate Credits: Ecology				
	Formal	27	2.41	1.36
	Nonformal	38	2.74	1.50
	Both	12	2.67	1.61
	Total	77	2.61	1.46
Undergraduate Credits: Societal, Economic and Political Systems				
	Formal	27	2.04	1.22
	Nonformal	38	2.42	1.32
	Both	12	2.00	1.41
	Total	77	2.22	1.30
Graduate Credits in EE				
	Formal	27	2.30	1.58
	Nonformal	38	1.71	1.75
	Both	12	1.67	1.72
	Total	77	1.91	1.69

Inferential Statistics

A one-way ANOVA was used to compare the mean scores on the demographic items. There were no statistically significant differences between formal, nonformal or both on how informed PWF considered themselves to be (F value = 1.08, p = .35). PWF were not statistically significantly different to the extent they were able to find and obtain EE instructional material, (F=.93, p=.40). There were no statistically significant differences, (F= .86, p=43), between formal, nonformal or both PWF to the extent that they were familiar with the NAAEE national standards for EE (Table 8). Mean scores for all PWF were lower for knowledge of the NAAEE standards, than other demographic items, but not significantly. However, there were significant correlations between how informed PWF consider themselves and the extent they were able to find EE materials,(r=.395, p=.00). There were also significant correlations between how informed PWF consider themselves and their familiarity with the NAAEE standards (r=.356, p=.002). Respondents who considered themselves informed about EE reported being more able to find EE materials and had knowledge of national standards. There is a significant correlation between the numbers of workshops facilitated by a PWF and the years of educator experience (r =.255, p=.025) (Table 9).

There was no significant difference in mean scores between PWF facilitators trained in all the Projects (3.63) and those receiving additional training in IEEIA and Leopold (3.73 , t= .29,p=.76). Mean scores in the skills section were 2.77 for

respondents trained in all the Projects and 2.95 for those trained in the Projects, IEEIA and Leopold.

Table 8

Comparison of Mean Scores on Demographic Items

	SS	df	MS	F	p
How Informed Do You Consider Yourself to be About EE					
Between Groups	1.284	2	.642	1.08	.35
Within Groups	43.348	73	.594		
Total	44.632	75			
To What Extent Are You Able to Find and Obtain EE Materials					
Between Groups	1.481	2	.740	.93	.40
Within Groups	58.649	74	.793		
Total	60.130	76			
To What Extent Are You Familiar with the NAAEE Standards					
Between Groups	2.433	2	1.217	.86	.43
Within Groups	104.554	74	1.413		
Total	106.987	76			

Table 9

Correlations of Demographic Items (n=77)

		Able to find Materials	Knowledge of Standards	Number of Workshops
Informed About EE	Pearson r	.40	.36	.11
	p =	.00	.00	.33
Years of Experience	Pearson r	.21	.23	.26
	p =	.07	.05	.03

There is a significant ($p<.01$) positive correlation between scores on the constructs of the survey. PWFs had higher mean scores on the principles and practice sections than the skills section. There was significant relationship between principles, practices and skills plus practices and skills scores (Table 10).

A two-factor analysis of variance (Table 11) shows that there is no significant difference between groups of PWF. However, there is a significant difference in mean scores on measures of the survey; the principles, practice, and skills sections. This indicates that the mean scores on the skills section (Table 6) are significantly different from the principles and practice section scores. A Tukey test (Table 12) was used to determine if these multiple comparisons have honestly significant differences (HSD). Differences were due to the skills section. No interaction was found for group and measures.

Table 10

Correlation Matrix for Within Subjects Measures

Measures	Principles	Practices	Skills
Principles	1.000	.639**	.365**
Practices		1.000	.534**
Skills			1.000

** $p< .01$

Table 11

Two Factor Analysis of Variance With One Between Subjects Factor (Participants) and One Within Subjects Factor (Measures)

	SS	df	MS	F
Between Subjects				
Rows	.168	2	.084	.608
Within Subjects				
Columns	12.164	2	6.082	26.954**
S/P	10.236	74	.138	
P x C	.435	4	.109	.489
(C x S) / P	49.413	222	.223	
Total	72.436	228		

P=Principles, C=Practice, S=Skills ** p < .01

Table 12

Tukey's Contrasts for Measures (Principles, Practices and Skills)

Measure	Principles	Practices	Skills
Principles		.02	.50**
Practices			.48**
Skills			

* P < .05 HSD = .182 ** p< .01 HSD = .229

A one-way ANOVA was used to compare the mean scores on the undergraduate and graduate preparation of formal, nonformal and both PWF. The ANOVA values are presented in Table 8. There were no statistically significant differences in the mean scores in undergraduate preparation in ecology for formal, nonformal and both educators, (F=.405, p=.67). Means for undergraduate courses in societal, economic and political systems were formal, nonformal and both were not significantly different (F=.885, p= .42). The difference in mean scores for graduate credits in EE, formal, nonformal and both were not significantly different (F=1.09, p=.34). There was not any significant difference between formal, nonformal and both PWF in their undergraduate preparation relating to basic knowledge of the principles of ecology, nor were there any significant differences in the number of undergraduate credits earned in the basic knowledge of societal, economic and political systems, from local to national and global levels: therefore, hypothesis 5 was not rejected. Likewise, hypothesis 6 was not rejected, because there were no significant differences between the formal, nonformal and both PWF in the number of graduate credits earned related to environmental education (Table 11).

Table 11

Analysis of Variance for the Preparation of PWF

		SS	df	MS	F	p
Undergraduate Credit Ecology	Between Groups	1.758	2	.879	.405	.67
	Within Groups	160.55	74	2.170		
	Total	162.31	76			
Undergraduate Societal, Economic and Political	Between Groups	3.021	2	1.510	.885	.42
	Within Groups	126.22	74	1.706		
	Total	129.24	76			
Graduate Credit in EE	Between Groups	6.252	2	3.126	1.090	.34
	Within Groups	212.11	74	2.866		
	Total	218.36	76			

The data was further analyzed to determine if there were correlations between any of the PWF preparation as it related to scores on sections of the survey. The

groups of PWF, formal, nonformal and both were analyzed together. The preparation variables included: undergraduate credits in ecology; undergraduate credits in social science, economics and political systems; graduate credits in EE; number of conferences attended; number of half-day workshops attended; and number of extended workshops attended. These variables were correlated with the mean scores for subsections of the survey, principles, practice, and skills. Results of the correlation analysis are shown in Table 12.

Table 12

Correlation of Preparation in EE and Total Mean Scores for PWF

		Undergrad credits ecology	Undergrad credits societal, economic and political systems.	Graduate credits in EE	Confer ences	half day work shops	extended work shops
Principles	Pearson (r)	.216	.111	.282	.118	.172	.114
	Sig. (1-tailed)	.060	.336	.013	.309	.135	.323
	N = 77						
Practice	Pearson (r)	.057	.039	.247	.189	.222	.254
	Sig. (1-tailed)	.622	.736	.030	.100	.053	.026
	N = 77						
Skills	Pearson (r)	-.004	-.008	.243	.119	.179	.209
	Sig. (1-tailed)	.975	.945	.033	.301	.118	.068
	N =77						

There were significant positive correlations between PWF's graduate preparation and scores on the constructs of the instrument. Extended workshops

also had a significant relationship to scores on the practice section of the instrument.

Summary

This chapter contains the descriptive and inferential analysis of the data obtained from the survey. Results of the two-factor analysis of variance between formal, nonformal and both groups of PWF on the constructs of understanding about EE revealed no statistical significant differences between groups. However, the two-factor analysis of variance between measures resulted in significant differences in mean scores for the skills section of the survey. Statistical significant differences existed between formal and nonformal PWF on specific items in the practice sectional, particularly writing objectives, and assessments (Appendix D). Significant differences also existed on demographic items included in the survey. No significant differences existed between mean scores on college credits taken by nonformal or formal PWF (hypotheses 5, 6).

A statistically significant positive relationship was found between the postgraduate preparation of PWF educators and total scores on statements concerning the understanding of the principles, practice, and skills of EE (hypothesis 7). Graduate credits had a significant correlation on scores for each construct of the survey. Extended workshops had a significant relationship with total scores on the practice section.

Hypothesis		Not Reject (NR) Rejected (R)
H_o1	There is no statistically significant difference between formal, nonformal or both **PWF** understanding of the principles of EE.	NR
H_o2	There is no statistically significant difference between formal, nonformal or both PWF in the practice of teaching EE.	NR
H_o3	There is no statistically significant difference between formal, nonformal or both PWF in the skills taught to learners in EE.	NR
H_o4	There is no statistically significant difference between formal, nonformal or both PWF in the total score on statements Concerning principles, practice and skills in EE (Table 9).	NR
H_o5	There is no statistically significant difference between formal, nonformal or both PWF undergraduate preparations in EE.	NR
H_o6	There is no statistically significant difference between formal, nonformal or both PWF in the number of postgraduate courses completed (Table 10).	NR
H_o7	There is no statistically significant relationship between PWF preparation and the total score on statements concerning principles, practice, and skills of EE (Table 11).	R*

* Hypothesis rejected for graduate preparation and practice scores

Figure 2 Summary of Hypothesis Decisions

Chapter 5

Summary of the Study, Discussion, and Recommendations For Future Research

Introduction

This chapter contains an overview of the study. This chapter also contains summary of the findings and a discussion relating to other research findings. Finally, this chapter contains recommendations for future research.

Overview of Study

Environmental literacy was established as a goal for all Missouri citizens by the governor's task force on EE (Kissinger, et al., 1994). Unfortunately, the recommendations of the task force were not realized (Pitts, 2002), leaving the majority of EE in Missouri as the responsibility of natural resource organizations (EETAP, 2006; Heimlich, et al. 2004; Wade, 1996; Wells & Fleming, 2002). The Missouri DNR sponsors the Project WET program, which is one of three national CEE 'Project' curricula. The 'Projects' (WET, WILD, PLT) are considered a valuable resource for EE (Marasco & Heimlich, 2006; McKeown-Ice, 2000; NAAEE, 2004b; Paul & Volk, 2002) and represent a significant component in Missouri's EE certification program (MEEA, 2006).

The Project WET state coordinator oversees the training of facilitators, who provide workshops for educators desiring to obtain the WET curriculum. PWF

come from the nonformal and formal sectors of EE. Research shows there is a difference between formal and nonformal educators and educational sites (Emmons, 1997; Hungerford & Volk, 2001; Knapp, 2001; Simmons, 2001). Magill (1992) found resource professionals to be minimally trained or not inclined to use basic education principles. An EETAP (2006) study suggests the language of natural resource professionals is quite different from the language of the classroom. The language of the natural resource professional is content oriented, while the needs of teachers are more process focused. The report suggests the training of nonformal and formal educators should be structured differently. Nonformal sites provide a less restrictive environment (Emmons, 1997) and a variety of real world experiences (Melber & Abraham, 1999). However, the goal, environmental literacy, is the same for both groups (NAAEE, 2004b). The success of EE requires the cooperation of formal and nonformal educators (Bainer, et al., 2000; Bennett & Matthews, 2005; Taylor, 2006).

To date, there has been no assessment of PWF knowledge concerning EE (Pitts, 2002). There has been no research specifically concerning Project WET (personal communication with Project WET headquarters January 19, 2006). Research on environmental educators is needed. "More research is needed concerning educators' ecological literacy as well as how best to produce ecologically literate educators" (Smith-Sebasto, 2001 p. 315). Studies have been conducted concerning the attitude and efficacy of Project Wild and PLT workshop participants (Krantz, 2002), but few studies have examined facilitators (Greene,

1992). A cohesive vision of the practice in EE is required (Smith-Sebasto, 2001), because “even after twenty-five years of experiences in EE, children still do not know much about the environment” (Independent Commission on Environmental Education, ICCE, 1997, p. 7). Educators need to know precisely the needs of learners to make the shift from unsustainable behaviors to ecologically sustainable behaviors (Smith-Sebasto, 2001). Teachers in formal and non-formal settings are instrumental in shaping the characters and behaviors of tomorrow's citizens (NAAEE, 2004a).

The survey of PWF was developed as a cooperative effort between the DNR and a Midwest research extensive institution to assess PWF understanding of the principles, practice, and skills involved in EE. The Missouri Project WET state coordinator provided a list of PWF names and address and surveys were mailed to individuals along with a self-addressed, stamped, return envelope. The DNR provided an incentive gift for those who responded within the two-week period. Of the surveys mailed, 77 were valid returns with 24 returned as undeliverable and one considered unusable. The response rate of 48% was based on 160 respondents, which is the number of active PWF according to the state coordinator for WET (personal correspondence with Joe Pitts, November 10, 2006; June 28, 2007). A response rate of 50% or more is considered adequate for exploratory research (Creswell, 2005). Content and construct validity was established by a panel of six national environmental educators and representatives from Project WET. A pilot study was conducted using members

of the MEEA certification committee. A follow-up phone survey of 12 non-respondents was also conducted to determine whether non-respondents were different from respondents. The resulting scores for nonrespondents were not statistically different from respondents (Appendix E).

The survey consisted of five sections with 10 questions in each section. Besides the sections of principles, practice and skills, a section on EE preparation and a section on demographics were included. The survey sections were designed to answer these research questions:

1. Are there differences between nonformal, formal, and both PWF understanding of the principles, practice, and skills of EE?
2. Are there differences between the preparation of nonformal, formal and both PWF?
3. Is there a correlation between the preparation of PWF and scores on statements concerning the principles, practice, and skills of EE?

Summary of Findings

This study of PWF found there were significant positive correlations between mean scores on constructs of the survey and there were significant differences on the measures of the survey, the principles, practices and skills scores. This study also found there were significant positive correlations between mean scores on constructs of the survey and graduate credits in EE and the principles, practices and skills scores on the survey. This study found there were no

statistically significant differences in the undergraduate preparation in ecology and social, political, and economic systems of PWF.

The PWF are well educated in the Projects' curricula with 62% having participated in facilitator training for all the Projects and an additional 14% received training in the Leopold and IEEIA programs. The voluntary nature of participation in these workshops and facilitator training suggests an interest in EE and the possible reason for the homogeneous scores between groups pf PWF. Conferences and workshops are a significant part of preparation of PWF. The 77 PWF respondents to the survey attended over 918 conferences, half-day workshops and extended workshops. While there was no significant correlation between conference and half-day workshop attendance and the mean scores on the principles, practice and skills sections of the survey, formal, nonformal and both facilitators valued workshop experience more than their undergraduate and graduate preparation in preparing them to teach EE. Extensive training in the Projects and participation in conferences and workshops may explain the lack of differences between groups of this study compared to previous studies.

Mean scores on ANOVA test comparing formal, nonformal and both PWF on the principles, practice and skills of EE were not significantly different between groups, however within measure scores differed significantly. The preparation of nonformal and formal PWF was not statistically correlated with mean scores on the principles, practice, and skills sections, except for graduate preparation. The findings of this study showing no differences in mean score between formal,

nonformal and both educators on the constructs of the survey may have been the result of the common workshop experiences of PWF.

The demographic section provided information on the facilitators as recommended by Greene (1992). The majority of PWF are nonformal and female. Most have been teaching over 10 years and consider themselves informed about EE. Formal educators are more familiar with national EE standards and are able to locate EE resources more readily than nonformal educators. The majority of PWF have received training in all the 'Projects' (WET, WILD, PLT) and have facilitated over 244 Project WET workshops. Nearly 75% of PWF have completed 4 or more undergraduate credits in basic ecology and 65% have 4 or more credits in social, economic and political systems. Over 50% have 4 or more graduate credits related to EE.

The preparation of PWF in basic ecology, systems related to EE and EE contradicts the findings of other studies concerning EE in institutions of higher education. These findings are in contrast to the Wells & Fleming (2002) study which found a lack of formal acceptance by higher education as a barrier to EE in Missouri, and the McKeown-Ice (2000) study which revealed EE has not been institutionalized at most Missouri colleges and universities. This is apparent by the small number of institutions offering majors, minors, specializations, or concentrations in EE. PWF were able to overcome these barriers and find courses related to EE. Studies conducted on teacher preparation programs were similar to the studies on higher education. The McKeown-Ice (2000) study

concluded that preservice teacher education programs are not systematically preparing future teachers to effectively teach about the environment. More than 85% of elementary preservice programs reported they had no faculty specialized in EE (Roper-Starch Worldwide, 2000). Formal PWF were able to find and enroll in courses related to basics in ecology and social, economic, and political systems.

Discussion

The findings of this study refute earlier EE research. The Magill (1992) study reported resource professionals were not inclined to use basic education practices. The Wells and Fleming (2002) study found nonformal educators to have a natural resource background, but they did not understand the educational side of EE. The Project WET curriculum, as well as the other Project's curricula, was written as resources for educators to teach about the environment. The curricula provide educators with the strategies necessary to teach effectively. Nonformal PWF's training and use of the Project's curricula may have aided them in overcoming their lack of experience in education. Knapp's (2002) research suggested nonformal educators lacked a research based environmental curricula and methodology for enhancing environmental objectives. The Project WET curriculum has been recognized as an outstanding resource (Krantz, 2002; NAAEE 2004b) and can provide nonformal educators with a curriculum and methodology for nonformal teaching about the environment. The EETAP (2006)

report suggested the training of nonformal and formal educators should be structured differently, but the findings of the study of the PWF suggest otherwise. Extensive training in the use of the Projects' curricula can provide the necessary understandings about EE with an emphasis on skill development ..

Past studies on environmental educators (Bainer, et al., 2000; EETAP, 2006; Knapp, 2001; Simmons, 2001; Smith-Sebasto, 2001) have focused on the differences between nonformal and formal educators. These differences are inherent in the preparation and settings where educators find themselves, but as this study found, nonformal, formal and both PWF understandings of EE are statistically similar, as was their preparation.

There were no statistically significant differences between formal, nonformal or both PWF on the principles, practice and skills sections of the survey. These findings can be explained in a variety of ways: 1) the respondents are very homogeneous in their background and orientation; 2) the survey questions failed to discriminate responses; 3) forms of response bias were evident; or 4) all of the above.

PWF are trained using the same curricula. The majority of PWF have attended training workshops for all three of the 'Projects' curricula. The Projects curricula are highly rated (Heimlich et al., 2004; NAAEE, 2004b; Marasco & Heimlich, 2006) as evident by their extensive use. The Projects were all sponsored by CEE and written by nonformal and formal educators for formal and nonformal educators. The curricula contain up-to-date understandings

concerning the principles of EE as evident by alignment with national EE standards. The activities are designed to increase responsible behavior, the goal of EE (Hungerford & Volk, 2001; NAAEE, 2004a; Volk & McBeth, 2001). The curricula incorporates the modern educational practices (CEE, 2003), such as assessing prior knowledge, cooperative learning, and alternative assessments. Skill development is also a part of the Project WET curriculum (CEE, 2003) and these skills are consistent with the NAAEE's (2004a) guidelines for K-12 learners.

These factors and others may have contributed to the lack of significant differences in mean scores on parts of the survey. According to the state coordinator for WET (personal communication, Joe Pitts, April 25, 2007):

> "The lack of statistical difference between formal and non-formal is difficult to explain. I can offer [three] factors that in my opinion contribute to this finding.
> (A) They were all trained by the same person (me) and the training sessions were all consistent over time as to methods and practices in delivering the Project WET materials to the target audience.
> (B) Many of the nonformal folks were formal educators at some level prior to taking the nonformal job. For instance, I taught high school for 10 years before taking the nonformal job in DNR. One of the requirements of my job and some of the Department of Conservation jobs is to have classroom experience. I believe this may account (at least in part) for the similarities between your two study groups.
> (C) Many of those who were not formal educators have been practitioners of environmental education for the bulk of their careers. As you know, environmental education uses many of the same principles and practices as formal education."

Therefore, it is conceivable that there is no significant difference between formal, nonformal and both PWF understanding of the principles, practice and skills of

EE, since PWF have an interest in EE and have pursued this interest with educational opportunities, either in the formal or nonformal sectors.

The survey items were written in a short, precise manner that could be easily understood and answered readily. The sections included only 10 questions each for ease of completion. The number of sections was limited to shorten the length of the survey. Most questions were in a Likert format, which reduces the time for completion.

Bias may have existed in the responses to the Likert items in the sections on principles, practice and skills. The surveys were mailed by the DNR with a cover letter written by the state coordinator for WET in the hopes of encouraging a better response rate. This may have also encouraged respondents to answer the survey questions in a way they thought they would be expected to answer. Some of this attitude was evident in answers to the follow-up phone survey of non-respondents. Respondents to the phone survey and mailed survey also exhibited a response set behavior (ASA, 2006, McMillan, 2000). A response set behavior refers to respondents answering a series of questions with like responses. This behavior may have also contributed to a lack of differences between the surveys' construct scores.

An additional bias could have occurred because the mailing was to all trained PWF rather than active PWF. Since PWF are all volunteers, their active involvement tends to ebb and flow and no formal active list was available. Post analysis, the DNR acknowledged there are different levels of active involvement

based upon the number of Project WET sessions conducted and patterns over time.

The findings of the study may be the result of a combination of all these factors. The study of PWF used a self-reporting mailed survey design as a way of economically gathering large amounts of data for a diverse geographical population, which is appropriate for exploratory research (Bainer et al., 2000). Individual items (Appendix 4) were written and included in the survey to assess possible misconceptions of PWF concerning EE (EETAP, 2006). A common misunderstanding is about the primary purpose of EE, which is REB. The first item on the survey in the principle section assessed this idea. Ironically, the nonformal score for this item was slightly higher than the formal PWF. While not statistically significant, it does indicate that nonformal educators had a greater awareness of the primary goal of EE. Research on nonformal educators suggests time constraints do not allow for behavior change (Knapp, 2002) and the primary goal of nonformal sites is nature study (Simmons, 2002).

Item 5 of the principles section addressed a traditional misconception about behavior change. Traditionally, environmental educators thought an increase in knowledge would lead to a change in behavior. Research has proven this not to be true (Hungerford & Volk, 2001a). The components of REB include knowledge of natural systems and issues, problem-solving skills, attitudes and self-esteem (Simmons, 2002). Attention to all these components is required to change behavior. Nonformal PWF mean score on this item was lower than formal (not

significantly), indicating formal educators held a more traditional view. This is a dilemma since formal educators are in a better position to change behavior due to the extended time they have with students.

EE is criticized for being indoctrinating and being factually inaccurate (Hungerford, et al., 2001; ICEE, 1997; Smith, 2001). The importance of this subject for environmental educators is reflected in the number of survey items on this study. Item two in the principles section asked about the basis for EE materials being scientific. Item four in the principle section and item nineteen in the practice section refer to influencing others when analyzing issues. Formal, nonformal and both PWF equally thought EE materials should be based on scientific information. However, combined mean scores for the two items concerning influencing others' positions on issues were relatively low for formal and nonformal. This may be an area of concern, which may need to be explicitly emphasized in future facilitator training and workshops.

Statistically, the mean scores on the skills section were lower than the mean scores for principles and practice for PWF. This could indicate a disconnection between the goal of EE being REB and the actual practice of PWF. The questions in the skills section were developed from NAAEE's (2004a) Excellence in Environmental Education: Guidelines for Learning (PreK-12) publication and include teaching skills in issue investigation, action strategies, and evaluation. The mean scores for PWF on the demographic question 'To what extent are you familiar with the NAAEE standards' were low (1.44, SD 1.186). These skills are

critical for individuals to learn in order to change their behavior and become environmentally literate, actively involved citizens, committed to being a part of and making change (Hungerford & Volk, 2001). The "increase of knowledge → change in behavior" traditional model is insufficient in developing a responsible citizenry. Students must be taught the skills necessary to analyze issues and take appropriate actions for behavior to be modified. Traditional views of nature study, outdoor education, and conservation education must give way to a more current definition of EE (Disinger & Howe, 1990 in Wade, 1996). Activities in the WET curriculum include these skills, but PWF do not rate skill development as highly as other components of EE. Behavior change may not be a realistic goal for nonformal education sites with shorter contact time (Knapp, 2001), but creating an awareness and sensitivity to environmental issues may be possible. The extended time formal educators have with students could allow curriculum to focus on the primary goal of EE, REB.

Two survey items having significant differences were in the practice section. Item 16 focused on the use of a variety of assessments in EE, and item 17 focused on the alignment of assessments with objectives (Appendix 4). These differences were significant at the .01 level. These differences are predictable given that nonformal educators lack formal training in teaching practices (Bainer, et al., 2000; Paul & Volk, 2002). "These are areas of need and require appropriate direction for progress" (Smith-Sebasto, 2001, p.320). The WET curriculum contains objectives and aligned assessments for each activity, but

connections were not made by nonformal PWF between these objectives and the related survey items. Project Wet state coordinators, facilitators and workshop attendees rated the WET curriculum near ideal for objectives and assessment in a recent survey by Marasco & Heimlich (2006). If PWF lack a working knowledge of objectives and assessments, then how can they teach others? The answer to this question, and another appropriate direction for future PWF training, is collaboration among educators.

Research has shown that formal educators lack content knowledge (Melber & Abraham, 1999) and nonformal educators mostly deal with content (Paul & Volk, 2002; Wade, 1996). The merger of these two sectors of EE, formal and nonformal, working in collaboration could produce benefits to all involved (Bainer, et al., 2000). The findings of this study, including lack of understanding about objectives and assessments among nonformal PWF, coupled with the finding that most formal educators adapt resource material to their personal situation (Wilke, 1995), suggest future workshops be designed to allow the writing of lesson plans as a collaborative effort of nonformal and formal participants. Nonformal educators could provide input for the content of the lesson and formal educators could provide input for the design of the lesson, to include writing objectives with aligned assessments. However, this could be difficult to incorporate into a one-day, six hour workshop.

The 77 respondents to the PWF survey facilitated over 244 workshops, which is a credit to them and the state coordinator for WET. Workshops have been

found to be an effective strategy for training individuals in activity-based materials such as WET (Krantz, 2002). However, Paul & Volk (2002), and Wade (1996) believe a six-hour workshop is insufficient time to establish a firm foundation in EE and its associated teaching strategies. The WET curriculum poses new and complex teaching strategies and skills, which would be difficult to comprehend in a single session. One PWF survey respondent commented "If I'd only had a 6 hr. class, I wouldn't have used as much from WET as I can." The additional facilitator training allowed the respondent to use more of the activities. PWF have trained over 7,000 Missouri workshop participants (personal communication with Joe Pitts, January 28, 2006) over the past 11 years with these numbers still increasing. The question is, would these numbers have been as high if participants were required to attend a two-day workshop?

Teachers in the ELAC study (Wilke, 1995) reported time as a significant barrier to teaching EE. The cross-references and planning charts contained in the WET curriculum are a time saving feature for teachers. The WET curriculum has also been correlated with the Missouri state standards, which is beneficial to teachers when writing lesson plans. However, the WET curriculum has not been correlated with the Missouri Grade Level Expectations (GLE's). The GLE's provide a scope and sequence of topic coverage for teachers. The GLE's provide guidelines for teachers to know what topics to teach and at what grade level to teach them. This system should eliminate a duplication of subject matter. Duplication of subject matter was a criticism of predecessors of EE (Mitchell,

1922) and remains a criticism today (DeBoer, 1991; Hungerford, et al., 2001). The correlation of WET with Missouri GLE's could help eliminate some of the criticism of EE and be a timesaving incentive for teachers to use the WET curriculum.

Implications

1. The PWF in Missouri are well qualified to sponsor WET workshops because of their preparation and demonstrated knowledge of EE.
2. The survey instrument developed for this study is reliable from an internal consistency standpoint and the content is valid, but results should be used with caution due to self-reporting, the small population and bias.
3. Collaboration between formal and nonformal educators is critical to the success of EE. PWF training and workshops provide an excellent opportunity for sharing expertise between educators.

Recommendations

The recommendations for future studies include the following:

1. A survey of PWF on a national scale should be conducted using more discriminatory items. The PWFs of Missouri could be a unique population of facilitators, because state WET programs are different. A comparison between states and the strategies employed to train facilitators and conduct workshops may inform the national WET organization on best practice.

2. A qualitative study should be conducted to include interviews and observations of PWF training and WET workshops. Quantitative survey studies provide large amounts of data and are less expensive and time consuming than qualitative studies, but rely on self-reporting which can bias results. Face-to-face interviews and actual observation of facilitator training and subsequent facilitating of a workshop could provide more reliable data.
3. An assessment of individuals completing the MEEA certification process and their knowledge of the principles, practice, and skills associated with EE could benefit the Missouri's certification process. The Missouri's certification process is an experience-based program, rather than competency-based. A formal assessment of certified individuals could verify that the process is creditable.
4. A study of the practice of educators using the WET curriculum should be conducted. The WET curriculum is well-designed and requires the users to complete workshops before receiving the curriculum, but this does not ensure the curriculum is being used as intended. EE has been criticized for being indoctrinating, unscientific, and devoted to activism rather than knowledge of issues. Environmental educators need to be properly trained to ensure the environmental movement is not hindered by critics.
5. A correlation study should be conducted between the new Missouri Grade Level Expectations (GLE's) and specific WET activities. The Project WET

curriculum has been correlated with the Missouri 'Show-Me' standards, but not the Missouri GLEs. The GLEs are scope and sequence specific and if the WET curriculum were aligned with the GLEs, then the teacher selection of WET activities would be made easier and duplication of activities across grade levels would be limited. Duplication of activities is another criticism of EE.

6. A comparison study between PWFs and other groups of educators in their understandings about EE. The findings of this study suggest there are no significant differences between formal and nonformal PWF. Is this a unique situation due to the voluntary nature of PWF and their personal desire to learn and share knowledge about the environment?

APPENDIX A

Comprehensive State Level EE-Program and Funding Components

State	AK	IL	IA	KS	MN	MO	ND	SD	WA	WI
Master Plan		√			+		√		+	√
Bylaws		+√	+		√				+	+
In-service		√	√		+	√				√
Pre-service					√					+
Curriculum Guide		√		+	+				+	+
Objectives		√			+√	+√			+	
Grants Program			+		+					+
Assessment			√	+	√					
State EE Board			√		+	√			+	+
State EE Office			+		√				+	
State EE Center		√	√						+	+
Interagency Committee			√		+	√	√		+	+
State EE Association	+		+	+	+	√		+	+	+
Computer Network		√	√		√		√		+	√
Funding Sources		√	+		+	+	√		+	+
Trust Fund			√							

State Level EE Program and Funding Components (1995).
(+) Components are in place
(√) Components are being developed

APPENDIX B

Survey Cover Letters and Instrument

September 12, 2006

Dear Project WET Facilitator:

Enclosed please find a ***Project WET Facilitator Survey*** relating to environmental education. The Department is cooperating with a doctoral study sponsored by the University of Missouri to assess the preparation of environmental educators in Missouri.

Missouri Project WET could gain valuable information from this study. I would like to take this opportunity to personally ask you to take a few moments from your busy schedule to complete and return this survey instrument. Each facilitator who returns a survey with a signed permission form (see enclosed survey) will receive a Project WET gift. Please be assured that your identity will not in any way be connected to your completed survey document.

I look forward to seeing the results of this survey in the not too distant future. Please feel free to call me if you have questions about participating in this survey.

Sincerely,

FIELD SERVICES DIVISION

Joe Pitts, Environmental Education Specialist
State Coordinator Project WET

Dear Project WET Facilitator:
Because of your training as a Project WET Facilitator, we are soliciting your input to inform environmental education activities in Missouri. The attached instrument is designed to assess the preparation of environmental educators in Missouri. It is not a test or an individual evaluation, but can tell us how effective training of Project WET facilitators has been. Results of the survey may be used to guide future preparation of Project facilitators. You do not need to be actively teaching Project WET or other environmental education to complete the assessment.

Your participation in the assessment is strictly voluntary, with no penalty for refusal to participate. All answers will be kept in confidence and only seen by the researchers. Your names will not be entered with the data. The report will not contain any identifying information that could be linked to individual participants. Results will be reported in such a way as to maintain the anonymity of the employer and participant.

Please complete the survey to the best of your ability. The estimated time to finish the instrument is 20-30 minutes. Please feel free to write related comments on the survey. Comments, qualifying answers and general comments or recommendations for improving the survey are encouraged.

If you have any questions about this research project, please feel free to contact Blaise Long at 970.867.5453 or Dr. Lloyd Barrow at 573.882.7457. For additional information regarding participation in research, you may contact the University of Missouri Internal Review Board (which oversees research on human subjects) at 573.882.9585.

We deeply appreciate your cooperation with this project.

Blaise E. Long
University of Missouri
Doctoral Candidate
Education

Dr. Lloyd H. Barrow
University of Missouri
Professor Science

Please return the completed instrument in the enclosed self-addressed, stamped envelope by : .
Include your mailing address here to receive your gift. Note: This information will only be used for this purpose. This portion of the survey will be removed at the Department of Natural Resources before it is sent to the researcher.

Project Wet Facilitator Survey

Project WET Facilitators play a key role in the training of environmental educators in the state of Missouri. The Project WET program and facilitator training provide the knowledge for leading workshops, but it will be useful to formally assess your personal understanding of the principles, practices and skills involved in environmental education The purpose of this survey is to assess your preparation and understanding about environmental education. Your reflective consideration and honest responses will be greatly appreciated.

Section A: Principles and Practice

Directions: Please circle the number that best represents your response to each statement

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree

1. The primary purpose of environmental education is for individuals to develop a responsible environmental behavior.
   1 2 3 4 5

2. Environmental education materials need to be based on accurate science information.
   1 2 3 4 5

3. As an educator, it is my responsibility to provide for and encourage sensitivity toward the natural environment.
   1 2 3 4 5

4. It is important for me as an environmental educator to keep my own position on an issue from influencing others.
   1 2 3 4 5

5. If knowledge about the environment is increased, then there will be a change in behavior.
   1 2 3 4 5
6. Teaching about the environment is more effective when integrated with other subject areas.
   1 2 3 4 5

7. I have adequate ecological knowledge to teach about the environment.

1 2 3 4 5

8. I have adequate knowledge of the social sciences to teach about environmental issues.

1 2 3 4 5

9. I am personally committed to participating in change that encourages sustainability.

1 2 3 4 5

10. It is my responsibility to help students believe in their ability to positively influence outcomes of environmental problems and issues.

1 2 3 4 5

11. It is important to provide students with outdoor experiences.

1 2 3 4 5

12. I use students existing knowledge and experiences to focus my teaching about the environment.

1 2 3 4 5

13. Direct, first-hand experience is the most effective way to teach about environmental topics.

1 2 3 4 5

14. I have received training in writing quality objectives for teaching environmental lessons.

1 2 3 4 5

15. Cooperative, small group learning is an instructional strategy I use regularly.

1 2 3 4 5

16. I use a variety of assessments when teaching about the environment.

1 2 3 4 5

17. I make sure assessments are aligned with learning objectives.

1 2 3 4 5

18. In teaching about the environment, I engage students in learning through the investigation of environmental issues.

1 2 3 4 5

19. It is important not to influence others with my own values when teaching environmental issues.

1 2 3 4 5

20. It is important for individuals to be actively involved in the resolution of environmental problems.

1 2 3 4 5

Section B: Skills

Directions: Please use the following scale as they relate to the skills learners should be taught though environment education to answer the next set of statements.

"I".... 1 = Never; 2 = Seldom; 3 = Often; 4 = Regularly; 5 = Always

1. Have learners develop questions that help them learn about the environment.

1 2 3 4 5

2. Assist learners in designing simple investigations concerning environmental issues.

1 2 3 4 5

3. Provide opportunities for learners to gather and organize data to find answers to questions.

1 2 3 4 5

4. Have learners evaluate sources of information.

1 2 3 4 5

5. Require learners to clarify personal value positions.

1 2 3 4 5

6. Analyze environmental issues from all perspective.

1 2 3 4 5

7. Have learners apply ecological concepts to predicting ecological consequences.

1 2 3 4 5

8. Have learners identify multiple solutions.

1 2 3 4 5

9. Have learners plan for individual or group action.

1 2 3 4 5

10. Have learners evaluate the outcomes of action strategies.

1 2 3 4 5

11. How often do you use Project WET curriculum in your work.

1 2 3 4 5

Section C: Environmental Education Preparation

For the following items, please check (√) your choice

1. How many undergraduate credits did you earn relating to basic knowledge of the principles of ecology?
   _____ 0 _____ 1-3 _____ 4-6 _____ 7-9 _____ 10 or more

2. How many undergraduate credits did you earn in basic knowledge of societal, economic and political systems, from local to national and global levels?
   _____ 0 _____ 1-3 _____ 4-6 _____ 7-9 _____ 10 or more

3. Did any of your undergraduate education include coursework specifically related to environmental education?
   _____ yes _____ no _____ not sure

3a. If yes, was the instruction you received provided as a :
   ____ whole courses dedicated to EE ____ infused into course ____ course unit(s)

3b. Of these courses, did they include: ____ foundations of EE ____ methods in planning/teaching/ assessing EE ____ practicum/field experience in EE ____ environmental issues

5. Rate the general value of your undergraduate education experience for its effectiveness in preparing you to integrate environmental education into your teaching.

__no value __little value __moderate value __ considerable value __great value

7. How many graduate credits related to environmental education have you taken?
_____0 _____1-3 _____4-6 _____7-9 _____10 or more

8. Rate the general value of any graduate educational coursework for its effectiveness in preparing you to teach environmental education.

__no value __little value __moderate value __considerable value __great value

9. Please provide the number of environmental education conferences or workshops you have attended.
(a) conferences ____
(b) 1-2 day workshops ____
(c) Extended workshops ____

10. Rate the general value of the workshop or conference experiences for their effectiveness in preparing you to teach environmental education.

___no value __little value __moderate value __considerable value __great value

Section D: Demographics

Please place a check (√) in front of the answer you select. Please use these definitions:

Formal Educator: An educator in a school, primarily in a classroom.

Nonformal educator: An educator in a setting other than a school.

1. I am currently a ____ formal educator ____ nonformal educator ____ both

2. How many years have you been an educator, including this year?

___ 1-5 yrs ___ 6-10 yrs ___ 11-15 yrs ___ 16-20 yrs ___ over 21 yrs.

3. With what group level do you predominantly work?

____ elementary ____ middle/jr. high ___ high school ____ higher ed. ____ adult

4. How informed do you consider yourself to be about environmental education?
___ not at all informed ___somewhat ___generally ___very ___greatly informed

5. To what extent are you readily able to find and obtain environmental education instructional material?
___none ___somewhat ___ moderate ___considerable ___ great

6. To what extent are you familiar are you with the North American Association for Environmental Education (NAAEE) standards?
___none ___somewhat ___ moderate ___considerable ___ great

7. Are you participating or do you plan to participate in the Missouri Environmental Education Associations environmental education certification program?
____ yes ____ no

8. Are you trained as a facilitator in: Check all that apply?
____ WET only ____ Wild ____ PLT other: _____

9. How many six-hour or longer Project WET workshops have you facilitated or co-facilitated? _____

10. What is your gender? ____ female ____ male

Comments or Questions: (you may use the back of this page)

Thank you for your time. A summary of the report may be obtained by contacting the Project WET state coordinator.

APPENDIX C

Matrix for Analysis of Hypotheses

Ho 1	Section I	Items 1-10
Ho 2	Section I	Items 11-20
Ho 3	Section II	Items 1-10
Ho 4	Sections I, II	Items 1-20, 1-10
Ho 5	Section III	Items 1-6
Ho 6	Section III	Items 7-10
Ho 7	Sections I, II, III	Items 1-20, 1-10, 1-10

Matrix for Analysis of Hypotheses

APPENDIX D

Item Analysis

Survey Section Questions	Group	N	M	S.D	F	p
Principles 1. The primary purpose of environmental education is for individuals to develop a responsible environmental behavior.	formal	26	3.35	.629	.106	.899
	nonformal	38	3.42	.599		
	both	12	3.42	.900		
	Total	76	3.39	.655		
Principles 2. Accurate scientific information should form the basis for all environmental education materials.	formal	27	3.89	.320	.679	.510
	nonformal	38	3.87	.343		
	both	12	3.75	.452		
	Total	77	3.86	.352		
Principles 3. As an educator, it is my responsibility to provide for and encourage sensitivity toward the natural environment.	formal	27	3.63	.492	.782	.461
	nonformal	38	3.42	.758		
	both	12	3.42	.900		
	Total	77	3.49	.700		
Principles 4. It is important for me as an environmental educator to keep my own position on an issue from influencing others.	formal	27	2.56	1.311	.441	.645
	nonformal	38	2.79	1.044		
	both	12	2.50	1.314		
	Total	77	2.66	1.177		
Principles 5. If knowledge about the environment is increased, then there will be a change in behavior.	formal	26	3.12	.816	.280	.757
	nonformal	38	3.11	.831		
	both	12	2.92	.793		
	Total	76	3.08	.813		
Principles 6. Teaching about the environment should be integrated with all subject areas.	formal	27	3.41	.572	.715	.492
	nonformal	38	3.21	.811		
	both	12	3.42	.793		
	Total	77	3.31	.730		
Principles 7. I have adequate ecological knowledge to teach about the environment.	formal	27	3.07	1.072	.716	.492
	nonformal	38	3.24	.714		
	both	12	3.42	.669		
	Total	77	3.21	.848		
Principles 8. I have adequate knowledge of the social sciences to teach about environmental issues.	formal	27	2.89	.892	1.545	.220
	nonformal	38	2.76	.852		
	both	12	3.25	.622		
	Total	77	2.88	.843		
Principles 9. I am personally committed to participating in change that impacts the environment	formal	27	3.30	.669	1.523	.225
	nonformal	38	3.53	.557		
	both	12	3.58	.515		
	Total	77	3.45	.597		
Principles 10. It is my responsibility to help students to believe in their ability to positively influence outcomes of environmental problems.	formal	27	3.70	.542	1.545	.220
	nonformal	38	3.42	.642		
	both	12	3.42	.996		
	Total	77	3.52	.681		

Practice11. It is important to provide students with outdoor experiences.	formal	27	3.81	.483	2.759	.070
	nonformal	38	3.95	.226		
	both	12	3.67	.492		
	Total	77	3.86	.388		
Practice 12. I use students existing knowledge and experiences to focus my teaching.	formal	27	3.44	.698	.388	.680
	nonformal	37	3.38	.594		
	both	12	3.25	.622		
	Total	76	3.38	.632		
Practice 13. Direct first hand experience is the most effective way to teach EE.	formal	27	3.63	.492	1.126	.330
	nonformal	38	3.42	.642		
	both	12	3.58	.515		
	Total	77	3.52	.576		
Practice 14. I have received training in writing objectives for EE.	formal	27	2.74	1.095	.290	.744
	nonformal	38	2.58	1.244		
	both	12	2.83	.937		
	Total	77	2.68	1.141		
Practice 15. Cooperative small group learning is a strategy I use regularly.	formal	27	3.37	.792	1.645	.200
	nonformal	38	3.03	.753		
	both	12	3.25	.754		
	Total	77	3.18	.773		
Practice 16. I use a variety of assessments in EE.	formal	27	3.52	.643	4.488	.015
	nonformal	37	2.97	.726		
	both	12	3.25	.866		
	Total	76	3.21	.754		
Practice 17. I make sure assessments align with objectives.	formal	27	3.52	.700	4.197	.019
	nonformal	36	3.03	.696		
	both	12	3.42	.669		
	Total	75	3.27	.723		
Practice 18. I engage students in investigations of Environmental issues.	formal	27	3.19	.834	.174	.840
	nonformal	37	3.22	.672		
	both	12	3.33	.651		
	Total	76	3.22	.723		
Practice 19. It is important not to influence others with my own values.	formal	27	2.56	1.155	.068	.934
	nonformal	38	2.63	1.217		
	both	12	2.50	1.168		
	Total	77	2.58	1.174		
Practice 20. It is important for individuals to be actively involved in the resolution of environmental problems.	formal	27	3.30	.669	.049	.952
	nonformal	38	3.32	.574		
	both	12	3.25	.754		
	Total	77	3.30	.630		

Skills1. Have learners develop questions that help them learn about the environment.	formal	27	2.70	1.031	.692	.504
	nonformal	38	2.63	.942		
	both	12	3.00	.739		
	Total	77	2.71	.944		
Skills 2. Assist learners in designing simple investigations concerning environmental issues.	formal	27	2.74	.859	.057	.944
	nonformal	38	2.79	.704		
	both	12	2.83	1.115		
	Total	77	2.78	.821		
Skills 3. Provide opportunities for learners to gather and organize data to explain answers to questions.	formal	27	3.19	.557	.256	.774
	nonformal	38	3.05	.837		
	both	12	3.08	.793		
	Total	77	3.10	.736		
Skills 4. Have learners evaluate sources of information.	formal	27	3.00	1.144	.649	.526
	nonformal	37	2.73	.932		
	both	12	2.67	1.231		
	Total	76	2.82	1.055		
Skills 5. Require learners to clarify personal value positions.	formal	27	2.89	.974	3.321	.042
	nonformal	38	2.24	1.051		
	both	12	2.33	1.073		
	Total	77	2.48	1.059		
Skills 6. Analyze environmental issues from more than one perspective.	formal	27	3.15	.989	1.418	.249
	nonformal	38	3.05	.899		
	both	12	2.58	1.240		
	Total	77	3.01	.993		
Skills 7. Have learners apply ecological concepts to predicting ecological consequences.	formal	27	3.15	.949	.835	.438
	nonformal	38	2.95	.837		
	both	12	2.75	1.138		
	Total	77	2.99	.925		
Skills 8. Have learners identify multiple solutions.	formal	27	3.26	.712	1.352	.265
	nonformal	38	2.97	.854		
	both	12	2.83	1.115		
	Total	77	3.05	.857		
Skills 9. Have learners plan for individual or group action.	formal	27	2.74	.859	.274	.761
	nonformal	38	2.71	.956		
	both	12	2.50	1.243		
	Total	77	2.69	.963		
Skills 10. Have learners evaluate outcomes of action strategies.	formal	27	2.59	1.047	.158	.854
	nonformal	38	2.68	.989		
	both	12	2.50	1.243		
	Total	77	2.62	1.039		

APPENDIX E

Item Analysis Nonrespondents

	D4_1 *	N	Mean	Std. Deviation
How many years have you been teaching, including the 2005/06 year	formal	2	3.50	.707
	nonformal	6	3.50	1.761
What group level do you predominantly work with?	formal	2	3.00	1.414
	nonformal	6	3.17	1.835
Are you trained as a facilitator in Project Wild or Project Learning Tree (PLT): check all that apply	formal	2	5.50	.707
	nonformal	6	4.33	1.633
How many six-hour or longer Project Wet workshops have you facilitated or co-facilitated?	formal	2	7.00	7.071
	nonformal	6	5.17	5.456
Gender	formal	2	1.50	.707
	nonformal	6	1.50	.548
Principles 2. Accurate scientific information should form the basis for all environmental education materials.	formal	2	3.50	.707
	nonformal	6	3.83	.408
Principles 4. It is important for me as an environmental educator to keep my own position on an issue from influencing others.	formal	2	3.00	1.414
	nonformal	6	3.00	.894
Principles 5. If knowledge about the environment is increased, then there will be a change in behavior.	formal	2	2.00	.000
	nonformal	6	3.33	.516
Principles 9. I am personally committed to participating in change that impacts the environment	formal	2	3.50	.707
	nonformal	6	3.67	.516
Principles 10. It is my responsibility to help students to believe in their ability to positively influence outcomes of environmental problems.	formal	2	3.00	.000
	nonformal	6	3.83	.408
Practice11. It is important to provide students with outdoor experiences.	formal	2	3.50	.707
	nonformal	6	3.83	.408
Practice 12. I use students existing knowledge and experiences to focus my teaching.	formal	2	3.00	.000
	nonformal	6	3.17	.753
Practice 14. I have received training in writing objectives for EE.	formal	2	3.00	1.414
	nonformal	6	3.00	1.095
Practice 17. I make sure assessments align with objectives.	formal	2	3.50	.707
	nonformal	6	3.17	.983
Practice 18. I engage students in investigations of Environmental issues.	formal	2	3.50	.707
	nonformal	6	3.50	.548
Skills 2. Assist learners in designing simple investigations concerning environmental issues.	formal	2	2.50	.707
	nonformal	6	2.83	.983
Skills 4. Have learners evaluate sources of information.	formal	2	3.00	.000
	nonformal	6	2.67	1.366
Skills 6. Analyze environmental issues from more than one perspective.	formal	2	2.50	.707
	nonformal	6	3.50	.548
Skills 8. Have learners identify multiple solutions.	formal	2	2.00	.000
	nonformal	6	3.17	.753
Skills 9. Have learners plan for individual or group action.	formal	2	2.00	.000
	nonformal	6	3.00	.894
How many undergraduate credits did you earn relating to basic knowledge of the principles of ecology?	formal	2	2.50	.707
	nonformal	6	12.17	14.261
Did any of your undergraduate education include coursework specifically related to environmental education?	formal	2	1.50	.707
	nonformal	6	.83	.753
How many graduate credits related to environmental education have you taken?	formal	2	1.00	1.414
	nonformal	6	3.17	2.714
Please provide the number of environmental education conferences or workshops you have attended. (a) conferences ____	formal	2	9.50	7.778
	nonformal	6	18.33	30.421

* Note: There were no both respondents

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VITA

Blaise Edward Long was born at McCord Air Force Base near Tacoma, Washington on June 27, 1952. His father made a career out of the military, allowing the family, 5 girls and 2 boys, to travel and live in many places including Hawaii, Canada, and Japan. After graduation with degrees from MU, Blaise continued his travels during his educational career teaching in rural Missouri, inner city, on a Native American Indian Reservation and a boarding school for Native Alaskans in the interior of Alaska.

Blaise has also taught in a variety of subject areas. He holds teaching certificates in 4 states 3 subject areas. He has also earned the administrative certification.

Blaise returned to MU to earn his doctorate degree so he could share his knowledge and experiences with other teachers. He currently lives in Colorado, where he teaches high school and enjoys playing with his grandchildren. He also enjoys hiking and fishing in the mountains.