A Q METHODOLOGY STUDY OF BELIEFS AMONG ENVIRONMENTAL EDUCATORS IN TWO NATIONS

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TABLE OF CONTENTS

Chapter Page

Chapter Page

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

CHAPTER I

INTRODUCTION

Humankind lives in a global age. Environmental problems have become an international concern, and these problems are becoming increasingly more complex and hazardous. The importance of gaining the knowledge necessary for developing an environmental and social ethic conducive to the improvement and maintenance of the environment is crucial for children to become effective citizens in the 21st century. Each person who is responsible for educational policy or its implementation impacts the global community. Educators are entrusted with the responsibility of teaching young people who will become the succeeding generations of citizens required to make informed decisions regarding critical environmental issues.

Students educated today must solve problems that previous generations have been unable or unwilling to do, such as stabilizing world population; protecting biological diversity; conserving soils; managing renewable resources more effectively; and using energy with greater efficiency. The skills, aptitudes and attitudes necessary to repair the damage done to the Earth in the last 200 years of industrialization requires an ecological concept of citizenship necessary for the resolution of environmental problems (Orr, 1994).

Since the 1960s, the phrase environmental education has been a curricular buzzword. According to the 1990 administrator to the U.S. Environmental Protection Agency, "The public . . . has come to an unprecedented awareness of the threats to our environment" (Gigliotti, 1990, p. 9). Gigliotti stated, however, that the educational system has produced a citizenry that is "emotionally charged but woefully lacking in basic ecological knowledge" (p. 9). Gigliotti's viewpoint was supported in the 1997 NEETF (National Environmental Education and Training Foundation)/Roper Survey which found that, although the majority of Americans support environmental protection, only one third (33%) of adult Americans have a passing understanding of basic environmental information, such as the fuel that produces energy for the nation and leading causes of pollution. The national survey found that 95% of adult Americans believe that environmental education should be taught in schools. These ecologically concerned citizens, however, lacked the knowledge and conviction of their own roles in environmental problems and have been unwilling to make personal sacrifices for the sake of the environment. Simply providing knowledge may not alter attitudes or change belief structures that will alter lifestyles.

Critics of environmental education believe that many of the materials lack balanced scientific presentations of environmental issues. Also embroiled in the controversy concerning environmental education is the belief of many environmental educators that children should be encouraged to take political action on behalf of the environment (Schmidt, 1996). Without a cohesive frame of reference, environmental education remains multifaceted, unorganized, fragmented, and ineffective (Ramsey, Hungerford, & Volk, 2001).

Environmental education varies widely in content and quality because of the lack of common agreement about what constitutes quality in environmental education. The quality of environmental education is being questioned by those most responsible for the growth in the field (Hungerford, 1996). Curricula vary widely, primarily because, in the United States, it is devised by states, schools, and educators rather than by federal authority. Critics complain that incomplete scientific information about everything from global warming and endangered species to pesticides and population growth is being taught to American children. Environmental educators counter that most schoolchildren are being taught sound lessons on nature and the effects of human activity on the environment (Schmidt, 1996). In the past, the United Kingdom has struggled to come to a conclusion regarding the purpose of environmental education (Lucas, 1982). Recently, in spite of perceived importance, environmental education remains at the status of personal concerns because of insufficient management support and pressure to cover National Curriculum subject content (Littledyke, 1997).

Rationale for the Study

People have altered the systems on Earth to a point of crisis. Approximately 80% of European forests have been damaged by acid rain. Daily, the human population increases by 250,000 and 15 million tons of carbon dioxide is added to the atmosphere along with 2,700 tons of chlorofluorocarbons. At death, human bodies often contain enough heavy metals and toxins to be classified as hazardous waste (Orr, 1994). An increasing number of reports on the ecosystems of Earth indicate that over the long term they are in decline (Bowers, 1993). Many experts fear an eventual breakdown of the very

systems that support life on Earth (Braus & Wood, 1994). The most formidable challenge facing humankind is finding ways of ameliorating the planetary crisis. In 1972 the United Nations Conference on Human Environment (UNCHE), recognizing the increasing environmental degradation, stated that education should play a role in improving and protecting the environment for present and future generations.

Environmental education, based on life experiences, should begin during the very early years of life because these experiences play a critical role in shaping life-long attitudes, values, and behavior toward natural environments (Tilbury, 1994, Wilson, 1994). Kellert (1985) studied second, fifth, eighth, and eleventh grade students in Connecticut and found that the period from second to fifth grades was characterized by increases in emotional concern and affection for animals. The period from grades 8 to 11 was characterized by the expansion of ethical and moral concerns. Some educators believe that raising environmental awareness of the population is a central element for developing a sustainable environment, and that unless this is done between the ages of 2 and 16, it is too late (Organisation for Economic Co-operation and Development, 1995). Producing environmentally literate students capable of making sound decisions concerning environmental issues is one of the critical responsibilities of the educational system. Schools, however, educate students as if no planetary emergency existed (Orr, 1994).

A growing backlash against environmental education has critics angry about the way environmental issues are taught in U.S. schools, asserting that doomsday visions of the future and biased and incomplete scientific information are being taught to children concerning everything from global warming to population growth. Environmental

educators counter with support for teaching practices, stating that the majority of schoolchildren are being taught sound lessons on nature and the effects of human activities on the planet (Schmidt, 1996). Rather than being central to educational programs, most curriculum materials, however, are peripheral and do not contribute to resolving the planetary crisis. Educators have responded to the planetary crisis by identifying and describing contemporary problems such as the energy crisis and population growth. This has resulted in uncoordinated, disconnected education materials (Bybee, 1991).

Long-running polls in the United States and the United Kingdom have shown remarkable consistency in environmental attitudes. Polls have revealed stable majority support on critical issues such as level of concern, willingness to pay for improved products and services, regulation, and concerted international action (O'Riordan, 1995). Green debate and green action have created a climate of opinion conducive to progress in environmental education in the United Kingdom. Opinion polls revealed that public interest and concern related to environmental issues ranked second in a list of serious issues that concerned them. A survey showed that the environment was considered to be the most important world issue by over a third of young people between the ages of 11 and 16 (Sterling, 1991).

Eighty-four percent of individuals surveyed in a 1990 poll believed that pollution in the United States is serious and getting worse. Seventy-one percent agreed that the environment must be protected even if it means higher taxes (Berke, 1990). A 1992 survey of 1200 teachers in Ontario found that two-thirds of the respondents thought that a global perspective in education was important, and 40 percent had significantly altered

their teaching approach to incorporate such a perspective during the last two years (Pike, 1997-1998). A Columbia Broadcasting System (CBS) opinion poll, conducted in 1992, reported that two thirds of Americans believed that solutions to environmental problems must be found regardless of the cost (Fuller, 1992).

Research has revealed a high level of public support for environmental education. The NEETF/Roper survey conducted in 1997 found that 96% of parents surveyed agreed that environmental education should be taught in school. In many schools environmental topics have become a standard component. Students have been receiving more information about the environment than ever before. Educators have a wide range of environmental education information and curriculum materials available to them for use in their classrooms. Volk and McBeth (2001) found, however, that the field of environmental education is far from accomplishing its goal of environmental literacy. Although the educational system has successfully informed students about environmental problems, students have not been provided, however, with the understanding of what they need to do to solve these problems (deBettencourt, 1999).

Although widely used in nonformal contexts such as zoos and parks, curriculum and instruction in environmental education has lacked status in the United States schooling process. Legislation was enacted during the 1980s, which promoted environmental education within local school districts' curricula in Arizona, Florida, Iowa, Pennsylvania, and Wisconsin (Ramsey, Hungerford, & Volk, 1992). A 1993 survey found that 44 states had developed a curriculum guide for environmental education, but no state had implemented a K-12 integrated course of study (Simmons, 1996). More than 30 states require that environmental education be included in the curriculum (Environmental

Literacy Council, 1999). Yet, according to the Independent Commission on Environmental Education, children still lack knowledge about the environment (1997). In their national survey of high school students' knowledge about the environment, they found few could identify the consequences of environmental problems, although the majority could identify the sources.

A national public opinion poll conducted by Peter D. Hart Research Associates in 1992 found that young people have limited understanding of environmental issues, although they are more motivated and environmentally aware than their parents (Fuller, 1992). Environmental educators have been doing little to alter their focus or approaches in teaching. If environmental education is to create change that will have a positive impact, it will require a far more rigorous approach than has been traditionally used (Martin, 1990).

An important feature of environmental education is that it is concerned as much with affective matters as cognitive ones. Educators must consider the implicit or explicit values and beliefs espoused by the educational system. Beliefs refer to what people think the world is like, crucial for readers concerned with motivation or action. Beliefs partially determine the environmental policies people support and the environmental issues that people attend to and act upon (Kempton, Boster, & Hartley, 1996).

Rich (1990), in his study on ideological beliefs, stated that beliefs guide pedagogical decisions, which must be realized if the goal is to understand teachers and the processes of education. In an extensive analysis of belief literature, Pajares (1992) announced:

> Few would argue that the beliefs teachers hold influence their perceptions and judgments, which in turn affect their behavior in the classroom, or that understanding the belief structures of teachers and teacher candidates is essential to improving their professional preparation and teaching practices. (p. 307)

Educational research literature has been lacking in determining a working definition of teacher beliefs (Eisenhart, Shrum, Harding, & Cuthbert, 1988). Beliefs remain synonymous with terms such as attitudes, values, axioms, judgments, opinions, perceptions, ideology, conceptions, conceptual systems, rules of practice, practical principles, and repertories of understanding. Until researchers determine the meaning of belief and how it differs from similar constructs, coming to grips with teacher beliefs will not be possible (Pajares, 1992). Rokeach (1960, p. 33) defined beliefs as "what each person believes is true about the world and his or her place in it" and that beliefs are influenced by values which act as guiding principles, such as truth and peace (Rokeach, 1973, 1979). Kagan (1992) defined teacher beliefs as "the tacit, often unconsciously held assumptions about students, classrooms, and the academic material to be taught" (p. 65).

Research related to teacher beliefs is limited. Teacher practices, however, have been altered through information gained in research related to teacher belief elicitation, explorations and justifications (Vasques-Levy, 1993). For two decades beginning in the 1960s, Eisenhart et al. (1988), investigated literature on teacher belief systems, which found eleven teacher beliefs organized into three domains. The domains varied along the dimensions of responsibility, expertise, and control. Nelson (1993) conducted a study of environmental educators' beliefs and understandings through interviews to describe the nature of environmental education as understood by the educational community. The

results of the study showed that curriculum and instructional decisions were influenced by educators' beliefs and understanding concerning environmental education.

Teachers provide evidence of the way in which they view environmental education through their environmental beliefs, knowledge and skills, and their environmental programs (Robertson & Krugly-Smolka, 1997). Problems arise worldwide in the development of environmental education curricula because of the uncertainty about goals or what to build into a curriculum. This can result in failing to teach for goal-centered in-depth learning and the transfer of that learning, two major needs in environmental education (Hungerford & Volk, 2001).

Environmental education varies widely in content and quality, and theorists disagree about what constitutes environmental education and to what happens in environmental education in the classroom. Teachers' beliefs affect their behavior and choices of pedagogy, but there exists a lack of information regarding their beliefs about environmental education concepts. A focus has developed on the identification of environmental concepts in the field of environmental education, but a problem exists in the lack of information regarding educators' beliefs concerning concepts in environmental education.

Revealing educators' beliefs concerning concepts in environmental education, in particular those beliefs concerning concepts currently taught in classrooms and those concepts which are perceived as ideal in environmental education, aids in the development of environmental education curricula and instruction aimed at improving the gaps in classroom instruction. The results of the study also contribute to the planning of environmental education programs focused on the training of inservice and preservice

teachers. This study determined educators' beliefs concerning the concepts in environmental education in the United States and in the United Kingdom in classrooms from Infant through Primary (UK) and Kindergarten through High School (U.S.).

Statement of the Problem

Global environmental education is being promoted internationally. Education is acknowledged as an integral part of finding solutions to world environmental problems. Worldwide strategies and action programs designed to further environmental education globally have been developed, making invaluable contributions to the growth of global perspectives in environmental education. With conflicting definitions over what it comprises and what goals to attain, environmental education has been a widely discussed topic in the United Kingdom (UK) and the United States (U.S.) for the last 25 years.

Environmental topics have become a standard component in many schools in the United States since the first Earth Day in 1970. Virtually every text includes chapters on activities related to environmental problems, and students across the country have been receiving more information about the environment then ever before. All evidence indicates, in spite of the pervasiveness of environmental education, that students in schools today will be ill prepared to participate in future policy debates. Under-prepared teachers, inaccurate materials, and frivolous activities are some of the problems that undermine quality environmental education (deBettencourt, 1999). Some environmental educators believe that "we are not only failing to teach the basics about Earth and how it works, but we are teaching a large amount of stuff that is simply wrong" (Orr, 1992, p. 85).

Since the late 1960s and early 1970s, Environmental Studies in the United Kingdom have been introduced into many primary schools, and curriculum innovations were encouraged in environmental education for older pupils (Huckle, 1998). A growing consciousness and a need to learn more about the environment exist amongst the present generation of students (Potter, 1992). Guidance from the National Curriculum Council on environmental education, however, has been criticized as out-of-date. Environmentalists complain that the final report was a toned-down version of the original draft and not helpful to teachers (Blackburne, 1990).

> Environmental Education provides a concrete contribution to environmental responsibility among young people, as it is the case in other parts of the world. However, despite its acknowledged relevance, the current provisions for environmental education seen in various European countries today are not adequate or not sufficient. (ERCEE, 1994, p. 22)

Clay Scholenfeld, the editor of the Journal of Environmental Education, expressed the lack of a clearly defined and delineated substantive structure for environmental education as early as 1970. For the 1975 Belgrade International Workshop on environmental education, papers were prepared by recognized authorities. It was noted, after the papers were read, that still little consensus existed as to what an environmental educator should know or do and to what constitutes the domain of environmental education. The primary task of schooling is typically considered to be the promotion of citizenship education. The ability to prepare individuals to become citizens, or to function effectively in today and tomorrow is a goal of the formal education system, stated in America, 2000 (Disinger & Roth, 1992).

Judging from the research, environmental education lacks an organized, coordinated model (Bybee, 1991; Ramsey, et al., 1992). Historically, environmental

education has been constructed from a variety of sources, defined in a multitude of ways, and is seen as lacking in balanced scientific presentation of environmental issues (Bybee, 1991; Schmidt, 1996). According to many scientists and environmental educators, environmental education has either failed, or is failing, its mission to educate for ecological literacy (Bowers, 1993).

Environmental degradation is a worldwide problem with no clear boundaries. Increasing attention is being focused on international cooperation in solving environmental problems (Cruz, 1989; Perkins, Alexis & Bauer, 1986). Basic concepts of environmental education are generally applicable everywhere regardless of national, local and regional differences (UNESCO, 1990a). Researchers in the United States in comprehensive lists have identified these concepts, and underlying structures have been accumulated (Bowman, 1972; Townsend, 1982).

Most studies of environmental education focused on identifying the basic lists of environmental concepts or fundamental ideas necessary for curriculum development were conducted from the 1960s to the 1980s. These lists were compiled in studies by Visher (1960), White (1967), Ronfelt (1969), Roth (1969) Allman (1972), Isabell (1973), Rentsch (1973), and Brennan (1986). In 1976, the Subcommittee on Environmental Education of the Federal Interagency Committee on Education (FICE) presented a framework of fundamental environmental concepts. The collected concepts, or statements, represented the structure of environmental education by those researchers who developed them. No single list, however, encompasses all knowledge about the environment.

The identification of environmental education concepts has been a focus of countries in their development of environmental education. According to Saveland (1976), concepts need to be identified, and also arranged in some order, or structure. Saveland also pointed out that, if empirical data were gathered on concepts, they may represent western cultural biases. The Tbilisi Conference (UNESCO, 1980) in 1977 stated that:

> . . . no universal model exists for the incorporation of environmental education into educational processes. The approaches, procedures and progressive stages of integration must be laid down in the light of the specific conditions, ultimate aims and educational and socio-economic structures of each country. (p. 35)

Schools must educate to create informed citizens capable of making crucial decisions related to local and global environmental issues. Research efforts designed to ascertain the focus of environmental education programs related to the identification of environmental concepts is necessary for organization and classification of information for use in teacher training, student instruction, and curriculum development. These efforts are crucial if children are to build the knowledge and attitudes necessary to solve our global environmental problems.

This study uses the Q statements developed by Chou (1991) in which 120 faculty members each from The Ohio State University and the National Taiwan University were sampled. Chou's descriptive correlational study compared the perception of the structure of concepts held by university faculty in the United States and the Republic of China by determining the underlying constructs appropriate for environmental education (K-16). Chou assessed the perceptions of faculty members toward the basic concepts appropriate for environmental education to establish and compare the constructs underlying the

identified basic concepts. Further research was conducted to identify any statistically significant relationships existing between the underlying constructs and attribute variables such as age, sex and education.

Forty-two cards (Appendix A) displaying environmentally related concepts were used in the study, with participants directed to sort the cards into equal piles according to the sorting instructions. The environmentally related concepts were taken from 72 concepts derived from literature and evaluated by panels of six environmental experts and practitioners from both the United States and the Republic of China (Chou, 1991). Participants in the Chou study sorted the statements using one Condition of Instruction in order to determine the concepts appropriate for environmental education in levels K-16, according to faculty at The Ohio State University and the National Taiwan University. In Chou's study the key question, or condition of instruction, that the participants were to ask themselves was "What should our students know about the environment?" A mean score for each statement was obtained for both universities through the calculation of the sum of all responses on each statement (Chou, 1991).

This study extends and expands on the Chou study, in which the statements in the Q sort were classified and analyzed rather than the beliefs in totality of the participants who were involved in the study, as is traditionally done when using Q methodology. Q focuses on analyzing the correlations between persons and factors. When the focus of analysis is on the correlations between tests, as was done in the Chou study, it is known as "R" methodology. Forty public school teachers from the United States and the United Kingdom were invited to participate in this study, rather than university faculty, as were used in the Chou study.

Purpose of the Study

The purpose of this study is to determine the beliefs about environmental education concepts in the United States and the United Kingdom as held by educators teaching environmental education. A particular focus is given to educators' beliefs concerning concepts taught in their classrooms and those concepts which are perceived as ideal. The results are discussed considering the relationships among demographic information such as nation of training and experience (United Kingdom/United States), years of teaching experience, and gender.

Q methodology was used for this study because it is a means for examining human subjectivity, which in Q means a person's point of view. Q methodology uses the statistical application of correlational and factor analytical techniques of each persons' entire Q sorts of information as opinions. The resulting factors represent points of view in which the magnitude of that point of view is indicated by his or her loadings on that factor (Brown, 1980). Q was considered to be the statistical tool most conducive to revealing educators' beliefs concerning environmental education concepts.

Definition of Terms

For the purposes of this study, the following terms warrant clarification and are defined as follows.

Beliefs – In reference to teacher beliefs, described as the often unconsciously held assumptions concerning students, classrooms, and academic material (Kagan, 1992).

Concept – Simplified thinking by including a number of events under one general heading (Ary, 1985); a summary of the essential characteristics of a group of ideas and/or facts that epitomize important common features of factors from a larger number of ideas (Pella, 1966 as used by Roth, 1969).

Concourse – The flow of communication that surrounds a topic from which a sample of statements is subsequently drawn for the Q sort (Brown, 1980).

Condition of Instruction – A guide for sorting Q sample items, an explicit rule for example sorting statements from highest level of agreement to lowest level of agreement (McKeown & Thomas, 1988). Two conditions of instruction were used in this study: actual and ideal.

Environmental Education – A process of developing a world population that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, skills, attitudes, motivation, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones (Adopted at the 1977 United Nations Intergovernmental Conference on Environmental Education in Tbilisi, Georgia).

Factor Analysis – A method for classifying variables, which in a Q study are the Q sorts (McKeown & Thomas, 1988).

PQ Method 2.06 – A statistical program utilized for data analysis (Brown, 1993).

Q Methodology – A method for the scientific study of human subjectivity, meaning a person's communication of his or her point of view on any matter of personal and/or social importance (McKeown & Thomas, 1988).

Q Sample – A collection of stimulus items given to respondents for rank ordering in a Q sort (McKeown & Thomas, 1988).

Q Sort Technique – The process of rank ordering Q-sample statements along a continuum by a subject (McKeown & Thomas, 1988).

Subjectivity – A person's point of view on any matter of social or personal importance (McKeown & Thomas, 1988).

Teacher Beliefs – The often unconscious assumptions that a teacher holds about the academic material, classrooms, and students (Kagan, 1992).

United Kingdom – United Kingdom of Great Britain and Northern Ireland. Commonly called Great Britain or Britain. A country of Western Europe comprising England, Scotland, Wales, and Northern Ireland (The American Heritage Dictionary, 1997).

Variables – In Q method, the people performing the Q sorts, not the Q sample statements (McKeown & Thomas, 1988).

Assumptions

Assumptions inherent in this study include:

1. Q methodology is an appropriate means of measuring the participants' perception of the relative importance of beliefs in environmental education.
2. The list of statements developed by Chou (1991) represents the most comprehensive and useful set of environmental concepts available for this study.

3. The participants answered honestly, with the assurance of confidentiality.
4. The participants correctly completed the Information Sheet.
5. It is also assumed that data reported by participants is objective, valid, and reliable.

Limitations

This study was influenced by the following constraints:

1. The beliefs contained in the research instrument do not necessarily represent all of the useful beliefs that can be of value in environmental education.
2. The results of this Q study cannot be generalized in terms of induction, from the few (sample) to the many (population).

Research Questions

The research questions of this study are as follows:

1. According to educators, what beliefs emerge related to primary-12 classes in environmental education in the United Kingdom and United States?
2. In what ways do educators' perceptions of the actual and ideal primary-12 classes in environmental education in the United States and the United Kingdom differ?
3. In what ways can educators who hold such beliefs about environmental education in the United States and the United Kingdom be described using demographic attributes such as nation of training and experience (the

United Kingdom and the United States), age, years of teaching experience, environmental education training, education level and major, number of hours spent watching educational television, gender, level of environmental activism, major sources of environmental education information, and religion?

CHAPTER II

LITERATURE REVIEW

The purpose of this study is to determine the beliefs about concepts of environmental education in the United Kingdom and the United States as held by educators teaching environmental education. A particular focus involves educators' beliefs concerning concepts taught in their classrooms and those concepts which are perceived as ideal. Sequentially, this chapter reviews the literature related to defining environmental education, the research concerning environmental education beliefs, research concerning the content of environmental education, the foundations of environmental education in both the United States and the United Kingdom, the environmental practices in both nations, the historical global/international perspective related to environmental education, and Q methodology as it relates to this study.

Environmental Education Defined

Environmental education, because of its diversity, means different things to different people. Furthermore, the definition of environmental education changes as the perceptions of environmental problems change (Tilbury, 1993). The term environmental education triggers concepts of environmental science, ecology, outdoor education or issue instruction, all of which fit under the umbrella of environmental education

(Ramsey, 1992). According to Orr, "all education is environmental education. By what is included or excluded, students are taught that they are part of or apart from the natural world" (1994, p. 12). The origin of the term *environmental education* has been subject to discussion, but at least one report exists of its use in a 1948 presentation in Paris (Kirk, 1983). At the International Union for the Conservation of Nature and Natural Resources (IUCN) meeting, the national Deputy Director of The Nature Conservancy in Wales, Thomas Pritchard, suggested that the term be used for the educational approach synthesizing the natural and social sciences (Disinger, 2001). Another contention asserts that the term was said to be coined at a conservation and education conference in 1965 (Wheeler, 1975). A commonly accepted definition of environmental education states, "Environmental education is aimed at producing a citizenry that is *knowledgeable* concerning the biophysical environment and its associated problems, *aware* of how to help solve these problems, and *motivated* to work toward their solution" (Stapp, 1969, p. 54).

In 1970, as a necessary step in identifying the fundamental concepts for environmental management education, K-16, Roth modified the Stapp statement by referencing the biophysical and sociocultural environments and by stressing the management dimension. It read:

> Environmental management education is the process of developing a citizenry that is: knowledgeable of the interrelated biophysical and socio-cultural environments of which man is a part; aware of the associated environmental problems and management alternatives of use in solving these problems; and motivated to work toward the maintenance and further development of diverse environments that are optimum for living. (1970, pg. 65)

The director of the U.S. Office of Education's Office of Environmental Education, Walter Bogan (1973), stated that an acceptable definition for environmental education had not been found because of changes in its practical application and its theoretical foundation. He proposed two working definitions:

1. The process of environmental education helps the learner perceive and understand environmental principles and problems, and enables him/her to identify and evaluate the possible alternative solutions to these problems and assess their benefits and risks. It involves the development of skills and insights needed to understand the structure, requirements, and impact of interactions within and among various environmental amenities, subsystems, and systems, and
2. Environmental education is the process of inquiry into the specific and general environmental implications of human activities viewed from the perspective of social needs and values as they relate to general public policy (pp. 1-2).

The definition problem of environmental education may be rooted in the interdisciplinary nature of the field and that its practitioners typically approach it from a multi disciplinary standpoint. Logic leads them to approach it from the discipline from which they practice, and in effect, they continue to talk past one another rather than with one another. Progress was made during the 1990s when the National Environmental Education Advisory Council, the advisor to the U.S. EPA's Environmental Education Division, went on record with the following definition:

> Environmental education is a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address these challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action. (1996, p. 32)

According to the U.S. Office of Education, environmental education is not simply a course in school or a curriculum combining elements of the natural and physical sciences. It provides alternative ways of thinking, a synthesis of the humanities, languages, social sciences, history, economics, and religion as profoundly as it affects the natural sciences, giving an ecological perspective to every aspect of learning (1970). The most commonly accepted definition of environmental education was developed at the United Nations Educational, Scientific, and Cultural Organization (UNESCO) meeting in Belgrade, Yugoslavia in 1975. It reads:

> Environmental education should increase public awareness and knowledge about issues as well as provide the public with the skills necessary to make informed decisions and the motivation to take responsible actions. (National Environmental Education Advisory Council, 1996, p. 12)

The multitude of definitions of environmental education characterize changes within the field and offers a basis for understanding differences of opinion related to what environmental education should be in practice. Strong recommendations have been made against teaching toward the changing of learner behaviors in favor of efforts on the acquisition of knowledge (Independent Commission on Environmental Education, 1997). Environmental educators Robottom and Hart (1995) have argued that emphasizing behavioral modification by environmental educators contradicts the development of independent critical thinking, one of education's primary aims. Many other environmental educators believe that fostering responsible environmental behavior should be the overall

purpose of the field (Hungerford & Volk, 1990). Evidence exists that environmental education occasionally takes the form of preaching rather than educating. Environmental education is currently being charged with promoting environmental advocacy rather than educating, turning children into environmentalists who take action on complex issues that they do not understand (Sanera & Shaw, 1996).

Environmental education is process more than content and is infused into various curricula, particularly in the sciences. It is a process of moving toward stewardship view of the relationship of people with nature (Disinger, 1987). Environmental education is an integration of disciplines that synthesizes information, which can occur more readily than when disciplines are isolated (Roth, 1978). Cognitive understanding is not sufficient; affective and behavioral development is necessary to affect significant value, belief, behavioral, and cognitive shifts in individuals, enabling epistemological change (Naidoo, Kruger, & Brookes, 1990).

Necessary to the maintenance and improvement of environmental quality is the understanding of the complexities of the interrelationships with the environment. Whether in a formal or non-formal setting, educators must integrate all environmental concern areas, lessons, experiences, and activities into the curriculum and limited instructional time (Warpinski, 1979).

These precepts may be incorporated into teaching by considering three philosophical positions: imposition, infusion, and framing. The first, imposition, requires that the subject of environment, or a specific focus within the environment, be imposed on the existing curriculum. Resources such as a special curricular guide, a course of study, or other materials created for specific topics such as water quality, solid waste,

energy, rainforests, acid rain, and other environmental areas are often the most readily available to educators and the most simply introduced into the teaching/learning setting. These resources are often funded by government agencies, industry, specific issue-focused groups, or environmental groups, though many of these materials address topics in isolation. Environmental education suffers when these isolated topics do not address the complex nature of the total environment resulting from economic, physical, biological, social, and cultural interactions (Disinger & Floyd, 1990).

Infusion, the second philosophical position, involves incorporating environmental concerns into existing curricula and content. Infusion often involves creating opportunities to include environmental issues as the application of the field of study, such as math, physics, and biology. Numerous collections of activities for environmental education are available for the educator, and many resources provide educators with quick references for activities that incorporate environmental themes or topics into traditional disciplinary approaches. Philosophically, this approach attempts to infuse the knowledge, skills, attitudes, experience, and commitment into the mainstream of public schooling, resulting in informed decisions, responsible behavior, and constructive actions (Disinger & Howe, 1992). Discipline-oriented curriculum designers and teachers often rely on content other than their own area of expertise, causing infusion to flounder (Disinger & Howe, 1992).

The third philosophic approach promotes the elimination of arbitrary boundaries of traditional disciplines and creating a framework of study in which subject areas become related and integrated. This approach, known as framing, challenges old assumptions about teaching and learning and can best be accomplished when educators

and students investigate, interpret, explore, manage, discover and make decisions about larger encompassing studies. Based on their four-year study, Lieberman and Hoody (1998) support the use of framing. Using the environment as the integrated context for learning, teachers reported that they had a feeling of renewal for teaching. Students, in general, were found to improve cognitively, behaviorally and effectively. Framing, according to Heimlich (1992), can be especially effective in learning about global issues by creating a framework, which allows learning to be integrated within a student's life.

Environmental Education Beliefs

The World Commission on Environment and Development (1987) and the United Nations (1992) Conference on Environment and Development have advocated that environmental education should be a central component in formal educational institutions. This has been reiterated by the Council and the Ministers of Education of the European Community (1988) and the Department of the Environment in the UK (1994). There has been a resistance to fully implementing environmental education within the curriculum of schools and colleges despite this high level of support. Within the international community, issues have emerged about the aspects of thinking related to the environment. The nature, purpose and scope of the field of environmental education have been difficult to define since the early days when this area of the school curriculum was first specifically identified (Gayford, 1991, 1996).

People carry their beliefs and values with them wherever they go and communicate them to others regardless of their intentions to do so (Disinger, 2001). In 1983, Dobson and Dobson explained that, as personal understandings are incorporated

into a belief system, that system guides that individual's daily life. Pajares (1992) stated that understanding teacher beliefs, as well as teacher cognition, is required to understand teacher behavior. He also stated that:

> Clusters of beliefs around a particular object or situation form attitudes that become action agendas. Beliefs within attitudes have connections to each other and to other beliefs in other attitudes, so that a teacher's attitudes about a particular educational issue may include beliefs connected to attitudes about the nature of society, the community, race, and even family. (p. 319)

In research, beliefs may travel in disguise and remain synonymous with terms such as attitudes, values, judgments, opinions, ideology, conceptions and perceptions. Research related to teacher beliefs is limited. Teacher practices, however, have been altered through information gained in research related to teacher belief elicitation, explorations and justifications (Vasques-Levy, 1993). Fenstermacher predicted in 1979 that the study of beliefs related to teacher effectiveness would become the focus of research. The study of beliefs has become a focus, although minor, in teacher effectiveness research.

For two decades beginning in the 1960s, Eisenhart et al. (1988) investigated literature on teacher belief systems, which found eleven teacher beliefs organized into three domains. The domains varied along the dimensions of responsibility, expertise, and control. After designing and conducting an empirical study to confirm their literature review findings, it was found that the study results supported the literature review findings. Eisenhart et al. recommended that teacher beliefs be considered during reform design and educational research after finding that: (a) teachers want their students to progress and will accept ideas and innovations that allow them to maintain control, (b) innovations are more likely to be accepted if teachers obtain valued rewards or if

perceived obstacles are diminished, and (c) despite teaching experience, level, or location, teachers' beliefs tend to remain stable over time.

During the last part of the 20th century, the polarization of environmental worldviews in American society have led to differences of opinion concerning appropriate environmental education in grades K-12. The environmentalism of the 1970s resulted in a backlash against environmentalism in the 1980s, and the 1990s saw strong criticism against ways in which environment is presented in the classroom (Disinger, 2001). In 1995, the economist Jo Kwong charged that environmental education as practiced in elementary and secondary schools is often (a) based on emotionalism, misinformation and myths; (b) issue driven as opposed to information driven; (c) failing to teach about basic decision-making processes or economics; (d) preaches socially correct or politically correct lessons rather than teaching about lessons from nature; (e) devoted to politics and activism rather than to knowledge and understanding; and (f) teaches an anti-anthropocentric philosophy.

Teachers' environmental programs, along with their environmental beliefs, knowledge and skills provide evidence of the way they view environmental education, including the difficulties they perceive in providing their programs. Robertson and Krugly-Smolska (1997) interviewed three environmentally committed Ontario teachers as well as observed them in action as they offered environmental programs in their schools. The study was designed to determine teachers' beliefs about the environment, whether their views were represented in environmental programs, and what factors contributed to or hindered their expression of beliefs. The findings indicated that the difficulties teachers faced included: (1) constraints posed by time, materials and schedules, (2) confusion

about the nature of environmental education, and (3) the controversial nature of some areas of environmental education, and whether or not teachers should include them in their programs. This study also found that a discrepancy exists between the teachers' environmental education programs and the programs that environmental education researchers want teachers to provide. The teachers were not as knowledgeable and skilled as the theorists would have it. The study concluded that environmental education theory is not sufficiently grounded in teachers' experiences, nor is it in line with what teachers feel schools are capable of providing within the confines of the curriculum and the realities of the school day.

In the United Kingdom, the purpose of environmental education is often given as the promotion of green attitudes or environmentally friendly behavior. Environmental attitudes research has been conducted among the general public, and which has consistently shown that, along with those who profess an environmental concern, those having green attitudes fall into several groups (O'Riordan, 1981; Witherspoon & Martin, 1992). Among them have been those whose concern has been for environmental protection, especially of the natural environment, for its own intrinsic value or for its amenity value for people. Another group has been concerned with pollution issues such as nuclear waste, vehicle emissions, and Greenhouse gases, or those issues associated with the impact of pollution on human health and well being. Another group's concern has emphasized stewardship and living in harmony with the environment. Sometimes described as deep ecologists or dark green (O'Riordan, 1981), this group has focused on the interrelationships between human behavior and environmental consequences. Teachers are members of the general public and the attitudes they adopt are likely to

relate to this range of views and priorities and influence the way they function (Gayford, 1998).

In England, Littledyke designed a study to assess the relationships between experience, attitudes and practice in science and environmental education. One aim of the research was to identify key groups of teacher attitudes to environmental education. Relative to attitudes, he identified: (1) a range of attitudes to environmental issues which included concern, interest and understanding of environmental issues, and involvement in environmental action, and (2) a range of attitudes to environmental education which included an emphasis of personal responsibility, knowledge and understanding, ethics, economic issues, political issues, awareness of local issues and awareness of issues in other countries (pg. 6). Relative to other National Curriculum areas, however, most teachers rated the amount of teaching of environmental education as low due to lack of time, cited by 65.8 percent.

Gayford (1998) conducted research identifying the thinking of science teachers about environmental education. Specific aspects included teachers' awareness of the trends in environmental thinking in the international community; their understanding of the concept of sustainability and whether they included it in their teaching; whether they integrated economic, cultural and ethical aspects of environmental issues into their science teaching; and what they considered to the most important environmental issues to be included in their science programs (pg. 1). A shift occurred during the three-year study in the teachers' perceptions of the most important issues that affect the environment, and that there was an increasing awareness among the teachers of matters related to sustainability.

Beliefs Related to the Cognitive, Affective and Behavioral Domains

The operational objectives of formal educational systems tend to be based on the attainment of knowledge and skills related to the acquisition of information, understanding and skills. According to Disinger, social action on the basis of the resulting knowledge and skills gained has not been promoted in environmental education. Environmental literacy, however, as defined by the term's inventor, involves an action perspective (2001). Roth (1992) stated that:

> Environmental literacy is essentially the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems. (p. 4)

Some believe that for individuals to take action and act responsibly, knowledge of environmental concepts is not enough. Knowledge of issues and issue skill analysis must exist, as well as attitudes and values related to taking action (Howe & Disinger, 1988).

Science teachers have frequently been at the forefront of environmental education within their own institutions because of their natural tendency to take on the role (Goodson, 1993). The links have remained strong between environmental education and the knowledge and understanding of the natural environment, particularly ecology, because of its roots in curriculum subjects such as science and geography (Goodson, 1993). Increasingly, however, there is an acknowledgment that these perceptions should be widened to include problem solving and decision making (UNESCO-UNEP, 1978) and critical thinking (Fien, 1995). The development of certain types of skills, such as those referred to as "action competence" (Jensen & Schnack, 1997) and attitudinal

development (Gayford & Dillon, 1995) have also been advocated. Action competence has recently been heavily emphasized in environmental education.

A learning model presented by Eiss and Harbeck (1969) indicated that there are three domains that determine an individual's response to the environment. They are the affective, cognitive, and behavioral domains. Assumptions have been made, based on research, that more environmental information or knowledge is needed to change environmental behavior (Hungerford & Volk, 1990). According to Iozzi (1989b) focusing on the cognitive (knowledge) domain in environmental education is not sufficient to produce changes in attitudes and thus behavior, and therefore the key entry point for environmental education is via the affective (which he terms attitude) domain. Research has revealed, through a meta-analysis of environmental lesson programs that, out of 700 different programs in the United States, 543 programs addressed knowledge, 124 addressed attitudes, and 42 addressed behavior (Pomerantz, 1990-1992). The emphasis on providing basic knowledge of ecological principles results in little attention being given to values, the development of analytical skills and environmentally conscious behavior. Zimmerman (1996) examined the relationship between knowledge, affect, and environmental education over a 15-year period ranging from 1979-1993. Research on classroom-type settings and applications revealed an association between knowledge and affect, although it was unclear how attitudes influence knowledge acquisition and how knowledge influences attitudes.

Environmental attitudes based on different sources of information and attitudes toward specific environmental issues may be predicted by both cognition (beliefs) and affect (emotions or feelings). People's feelings and beliefs about the environment have

been studied to investigate the relationship between those feelings and beliefs and their resulting environmental attitudes. Research findings suggest that for environmental educators interested in changing environmental attitudes, emotions and beliefs, rather than knowledge, need to be targeted as sources of information on which to base their environmental programs (Pooley & O'Connor, 2000).

Historically, educators teaching environmental education have attempted to change the attitudes, values and behaviors of students. The assumption has been that there is a direct link between knowledge and understanding and attitudes and behavior. Evidence exists, however, that there is not a simple linear relationship between increasing knowledge, awareness raising, attitudinal change and behavior change (Gigliotti, 1992). More recent work indicates that researchers often confuse attitudes toward the environment, or environmental concern, with attitudes toward ecological behavior. When researchers adequately address the difficulties of performing different ecologically responsible behaviors into the design of the studies, attitudes have been found to be powerful predictors of ecological behavior (Kaiser, Wolfing, & Fuhrer, 1999).

Environmental education has been charged with assessing environmental issues, finding feasible solutions to problems and creating pro-environmental behavior (Magnus, Martinez, & Pedauye, 1997). The ultimate goal of most environmental education is believed to be the promotion of environmentally responsible behavior. Its immediate goal, however, is most often the cultivation of positive environmental attitudes, which will hopefully lead to a change in behavior (McAndrew, 1993).

Sociological and Cultural Influences on Beliefs

Public attitudes toward environmental protection and management have been influenced over the years by social, political and economic factors. Environmental concern has spawned international treaties concerning the protection of the global environment, created regulatory agencies, spurred the formation of a variety of interest groups and stimulated a technological drive toward more efficient use of materials and energy. Environmental viewpoints are not created in a vacuum, but are embedded in social, political and economic outlooks, which necessitate the consideration of the complex ideas and beliefs of which environmental attitudes are a part. Jonathon Porritt, an environmentalist from the United Kingdom, bemoans the tendency of green feminists and peace activists condoning the perpetuation of life destroying industrialism (Porritt, 1984). Others welcome the connections among social and environmental groups.

As competent and objective as teachers of environmental topics may be, they typically lack the depth and breadth of background. Most environmental educators were prepared to be science teachers or social studies teachers, or in the case of elementary teachers, reading-writing-arithmetic teachers (Disinger, 2001). Their lack of preparation in environmental education results in a heavy dependence on instructional materials designed by someone else, and those materials typically exhibit biases (ICEE, 1997). Instructional materials reflect the shift in societal values, including those related to the environment. Educators may then transmit information that is lacking in balance, objectivity and scientific accuracy (Disinger, 2001).

Educational experiences have the potential to help form the values, beliefs and perspectives toward each other and the world (Nelson, 1993). Cultural beliefs and practices learned through the educational system may undermine the sustaining capacities of natural systems upon which all life depends. Behaviors learned in the educational system often mirror that system's culture, values, and supporting philosophies. The impact that schooling has on learner behavior and the role that education plays in establishing or modifying cultural beliefs must be acknowledged by educators (Bowers, 1993). According to Vasquez-Levy (1993), the demands of work and the assumptions and beliefs generated within cultures are partially responsible for people's constructed beliefs. Environmental issues have been related to economic, aesthetic, political and spiritual dimensions, as well as to scientific and technological ones (Smyth, 1995). Criticism has been directed at educators whose focus has been on the scientific and technological aspects of the environment to the exclusion of the sociological elements (Redclift, 1987).

Environmental belief studies have been conducted which have focused on changes in beliefs related to the new environmental paradigm, or more holistic view of nature and society, from the dominant environmental paradigm or mechanistic worldview (Daly & Cobb, 1989; Merchant, 1980). These studies interpreted the global environmental problem as a manifestation of a deeper social crisis characterized by a reductionist and mechanistic worldview (Houston, 1982; Bohm, 1983; Capra, 1983; Clarke, 1990; De la Court, 1990; Shiva, 1992; as cited in Tilbury, 1997). This view of reality, known as the Western worldview, has resulted in the treatment of nature as a human resource (Sterling, 1993). There has been a growing realization that environmental problems cannot be understood with reference to social, economic and political values, and therefore the

dominant Western environmental paradigm is no longer seen as a valid worldview. According to Fien & Tilbury (1996), managing the environmental crisis will depend on changes in environmental values and lifestyle choices and not upon scientific solutions.

Over the last 20 years, views of environmentalists about the most important areas of concern have changed. The exploitation of non-renewable resources was a major concern, but there also existed an optimistic attitude that resource depletion would be solved by innovative technologies (Redclift, 1994). More recently, concerns about global climate change, ozone depletion and the severe reduction in biodiversity and widespread deforestation (United Nations, 1992) have been at the forefront of environmental problems. Emphasis has recently been on "education for sustainability," which includes important elements of economic and cultural understanding (Tilbury, 1995). In the industrialized nations, scientific technological knowledge predominates and is held in high esteem, and other cultures are expected to share this viewpoint (Castillo, 1997).

Using the New Environmental Paradigm (NEP) and the Dominant Social Paradigm (DSP) as a basis for their study, La Trobe and Acott (2000) provided a measure for environmental attitudes that included references to the value of nature as well as the duties and obligations that humans have to other parts of nature and to future generations of humans. The NEP assumes that environmentalism challenges the most basic views about nature and the relationship between humans and nature, and describes the rising ecologically benign culture (Dunlap & Van Leire, 1978). The NEP represents a worldview consisting of beliefs that a healthy global environment and human well-being and are inseparably linked and a balance between economic growth and environmental

protection is essential for humans to live in harmony with nature (Stern, Dietz, & Guagnano, 1995).

Described as the dominant western mode of thought, the DSP has little concern for nature and is resource exploitative, consumptive, growth oriented, and materialistic (Milbrath, 1985). The British study measured belief and value systems concerning nature in order to gauge whether attitudes toward nature are changing. The study introduced issues not addressed by the NEP scale, such as the intrinsic value of nature and the moral duties of humans to the rest of nature. The results of the study indicated that most of the individuals hold values similar to those described by the NEP, similar to the findings in Kempton, Boster, and Hartley's study of environmental values.

Brackney and McAndrew (2001) assessed undergraduates' environmental attitudes in a study of ecological worldviews. It was hypothesized that individuals with worldviews in which humans are considered citizens of the ecosystem with a moral responsibility toward the rest of nature would find arguments based on moral or ethical principles, the beauty of nature, or the importance of economic arguments more compelling when considering the preservation of endangered species. It was found that participants with positive ecological worldviews were more receptive to arguments for preserving endangered species based on ethics and morality, the importance of the species to the ecosystem, and one's ability to make a difference. Arguments based on aesthetics or economics was found to be the least persuasive.

Influence of Religion on Beliefs

Based on the literature on religion and the environment, Christians are generally not regarded as environmentalists. In Lynn White's 1967 classic essay, he proposed that Genesis 1 predisposes Christians to regard the environment as having value primarily through its use by humans, and as falling under human dominion. He also argued that humanities' intrinsic perspective on nature is anthropocentric due to the Judeo/Christian view. This view is expressed in Genesis:

> And God said unto them, be fruitful and multiply, and replenish the earth, and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth. (Gen. 1:28)

According to research, religion plays a major role in shaping environmental beliefs and attitudes. Eckberg & Blocker (1996) studied the relationship between religion and environmentalism and found evidence of a "pro-environmental" effect. Environmental values were found to derive from three sources:

1. Religion, whether traditional Judeo-Christian religious teaching or a more abstract feeling of spirituality;
2. Anthropocentric (human-centered) values, which are predominantly utilitarian and are concerned with only those environmental changes that affect human welfare; and
3. Biocentric (living-thing-centered) values, which grant nature itself intrinsic rights, particularly the rights of species to continue to exist (Kempton, Boster, & Hartley, 1996, p. 87).

Educators are human, and they are products of and are in constant interaction with the cultures in which they live. In the first chapter of the Book of Genesis of the Judeo-Christian Bible, which has been culturally entrenched in Western Judeo/Christian societies, humans have been divinely assigned the role of "God's Gardeners" by caring responsibly for all of creation. This influence, resulting in an anthropocentric view of humankind's relationship with the environment, has influenced societies' beliefs. Consequently, the educators who live in these societies have, to some degree, formed their belief systems based on the underlying structures of the Judeo-Christian influence.

Content of Environmental Education

The content of environmental education varies widely because of the lack of common agreement about what constitutes quality environmental education. Research efforts attempting to ascertain the focus of environmental education programs and curriculum is crucial if we are to help children build the knowledge and attitudes necessary to solve our global environmental problems. The identification of environmental education concepts has been a focus of different countries in their development of environmental education. The identification of these concepts is necessary for organization and classification of information for use in preservice and inservice teacher training, student instruction, and curriculum development. In the domain of cognitive learning, related to the field of environmental education, concept formation is considered to be a very important element in the learning process (Engleson, 1987). Concepts must be brought from a variety of professional fields and philosophies because of the interdisciplinary nature of environmental education. According to UNESCO, the

basic concepts of environmental education are considered to be applicable everywhere (1990).

In the first annual report on the Council on Environmental Quality, President Nixon stated in a message to Congress that

> We must seek nothing less than basic reform in the way our society looks at problems and makes decisions. Our educational system has a key role in bringing about this new reform. It is vital that our entire society develop a new understanding and a new awareness of man's relation to his environment that might be called "environmental literacy." This will require the development and teaching of environmental concepts at every point in the educational process. (1970, p. vii)

In 1971, the U.S. Commissioner on Education stated that to meet the long-range objectives of education, concepts of environmental education should be brought into virtually every aspect of learning (Marland).

Built on the earlier work related to conservation education and outdoor education, studies began to surface on the identification and selection of appropriate environmental education concepts. Most environmental education studies, focusing on identifying the basic lists of environmental concepts or fundamental ideas necessary for curriculum development, were conducted from the 1960s to the 1980s. From the 1960s to the 1970s these lists were compiled in studies by researchers such as Visher (1960), Yambert (1960), Hanselman (1963) and White (1967).

In researching fundamental concepts for use in the development of educational programs, an extensive study was done by Roth who identified, compiled, and produced taxonomy of 111 environmental management concepts in 14 categories (1969). Using a Q sort technique, Bowman (1972) identified four major areas of concern in Roth's concept list: biophysical (living things are interdependent with one another and the environment);

sociocultural (the relationships between man and the environment are mediated by culture); environmental management (the management of resources to meet the needs of successive generations demands long range planning); and change (organisms and environment are in constant change). Bowman's model reinforced the overall "quality of life" objective stressed by Roth, as well as identified relationships between and among these different areas.

Schlageter (1980), with 44 concepts adopted from Roth's environmental concept list, studied student cognition, attitudes, action-orientation, and teacher attitudes toward seventh grade level environmental education concepts. The teachers in his study concurred with the results of the university faculty surveyed in Roth's 1969 study, which stated that: (1) environmental management concepts are important; (2) teachers possessing a positive attitude toward the environmental management concepts favored an interdisciplinary approach to environmental education; and (3) an association appeared between concept rank established by the teachers and student concept comprehension.

After Roth's 1969 study, other researchers followed: Ronfelt (1969), Roth (1969), Cauley (1971), Allman (1972), Isabell (1973), Rentsch (1973), Magnoli, (1976), and Brennan (1986). Although all of these efforts contributed to the develoment of environmental education in the United States, validation methods differed in their polling of environmental professionals' opinions relative to the importance of environmentally related concepts. Allman built on Roth's results to identify concepts appropriate for elementary education curricula by surveying a national sample of 87 education and curriculum experts. Five categories were generated from the classification of 113 concepts, which emphasized the multidisciplinary nature of environmental education:

(1) general; (2) air, water, and noise pollution; (3) conservation and preservation of land, forests, timber, wildlife, human resources, and minerals; (4) urban renewal; and (5) balance in nature.

A framework entitled "Fundamentals of Environmental Education" was developed in 1976 by the Subcomittee on Environmental Education, Federal Interagency on Education, to help achieve the understanding, coordination, and action necessary for a balanced approach to improving environmental quality. Under the heading of "Fundamentals about the Earth's Environment" suggested by the framework, there were four major concepts. They were:

1. The environment of Earth as a whole.
2. The ecosphere is a dynamic, constantly changing macrosystem – a mosaic of ecosystems.
3. The energy and materials necessary for all life are components of each ecosystem.
4. Each ecosystem includes a number of species populations, the size and stability of which vary, depending on biotic and abiotic changes in the system.

In the "Fundamentals Concerning Humans as Ecosystems Components" five categories occur:

1. Humans use ecosystems to satisfy basic needs and desires.
2. Humans affect ecosystems.
3. Ecosystem affect humans.

4. Complex interactions among humans and other ecosystem components occur continuously.

5. Humans are responsible for their influences on ecosystems.

In 1976, the Subcommittee on Environmental Education of the Federal Interagency Committee on Education (FICE) presented a framework of fundamental environmental concepts. The collected concepts, or statements, represented the structure of environmental education by those researchers who developed them. No single list, however, encompasses all knowledge about the environment. The largest concept list for environmental education was compiled by adapting work done by Ballard in 1989. The Children's Environmental Education Television Project (CEETV) generated a computerized database of 600 individual concepts for use in building activities and programs in environmental education (Hanselman, Raghunathan, Sarabhai, 1990).

Few environmental education research studies have applied the Q sort technique, although this methodology has been extensively used in other areas of research. Research studies that utilized the Q sort technique include Bowman, (1972), Chitwood (1977), Johnson (1977), Townsend (1982), and Chou (1991). Using Roth's (1969) findings related to concepts in environmental management education, Bowman (1972) studied the relative importance and placement of those concepts. Chitwood (1977) studied the attitudes toward the natural environment in four non-residential Youth Conservation Camp enrollees. To define the inter-relationship among environmental education, conservation education, outdoor education ecological education, environmental education and general education, Johnson (1977) used Q methodology to rank order goal statements. Townsend (1982) and Chou (1991) applied Q sorts in their studies that

identified the underlying structure of the domain of environmental education concepts. Townsend's (1982) study gathered responses from university faculties and nongovernmental organizations. Chou (1991) compared faculty responses from Ohio State University and the National Taiwan University to determine the underlying constructs, or factors, appropriate for K-16 environmental education.

Environmental Education Foundation in the United States

Although the term environmental education has been consistently used since the 1960s, the field has developed over many years and was influenced by three education movements, all having been popular at various times during the past century and having reflected the socio-political climate of their time. The three education movements are nature study, conservation education, and outdoor education. The nature study movement began in the late 1800s and dominated early childhood education until the 1920s (Brice, 1972). The document that gave the first definition to the movement was Wilbur Jackman's 1891 *Nature Study for the Common Schools*, which integrated the outdoor environment with academics. Nature study emphasized the use of discovery learning and focused on direct observation and experiences in and outside the formal classroom. Increasing students' awareness and appreciation for nature was also a focus of nature study (McGlauflin, 1991; Swan, 1975, in Braus & Disinger, 1998).

Preceding Jackman in the mid-1800s, Louis Agassiz exhorted his students to "study nature, not books," a concept which had been similarly championed by Rousseau. The popularity of the nature movement, however, did not increase until teaching materials, provided by Cornell University in the early 1900s, became available. The

"Rural School Leaflets" series was made available to schools until the 1960s and was responsible for much of teacher education in nature study. The American Nature Study Society was established in 1905 and still exists, though the nature study movement declined in influence; many members are still active in the conservation and environmental education movements (NAAEE, 1999). Junior Audubon Clubs, another source of nature education materials, focused on teaching children to appreciate nature (Schmidt, 1996). Nature study was the forerunner of elementary education science, using inquiry methods and/or direct observation inside and outside the classroom, methods that are highly touted today by educational theorists (Swan, 1975).

The movement to outdoor education took students out of the classroom and into a natural learning environment. The conservation of natural resources was emphasized during the 1930s, '40s, and '50s as a result of poor land management practices during the 1930's "Dust Bowl" era, giving rise to the conservation movement in education. Poor farming practices resulted in flooding and soil erosion. High winds filled the skies with soil particles from the Midwest to Washington, D.C. (Sampson, 1985). National resource management agencies such as the U.S. Forest Service, U.S. Geological Survey, National Park Service, U.S. Soil Conservation Service (now the Natural Resources Conservation Service), and the U.S. Fish and Wildlife Service were initiated to awaken Americans to environmental problems and the importance of conserving natural resources. Education continues to be a tool used by these agencies to accomplish their missions.

President Franklin D. Roosevelt's support for conservation education was evident in his report of the Great Plains Committee in the 1930s, in which he made the following recommendations:

> To insure optimum utilization of educational institutions in a conservation program, curricula, public-work materials, and textbooks should be revised;
>
> Teacher training institutions in the Plains States should develop a teacher preparation program which provides a broad base in fundamental sciences related to conservation; and
>
> In developing new educational materials and processes, governmental and non-governmental agencies should seek the assistance of professional educators. (Bruker, 1973, p. 136)

The National Education Association (NEA) assumed a leading role for conservation education in schools by aiding in the formulation of national and state laws requiring schools to develop conservation education programs. In 1935, the Education Policies Commission of the National Education Association stated:

> Realization of the basic importance of these (natural) resources, determination to utilize them for the common good through long-range planning, and general knowledge of appropriate remedial and preventive conservation measures are among the marks of a good citizen. (Braus & Disinger, 1998, p. 11)

In 1953, The Conservation Education Association, formed to support the educational missions of the NEA, merged with the North American Association for Environmental Education (NAAEE, 1998), an organization which is still active in pursuing goals in environmental education.

The third primary antecedent of environmental education today is the outdoor education movement, which experienced growth in the United States during the 1950s. It was based on the premise that, by teaching outdoors, urban youth would have the opportunity to experience direct contact with the natural environment (Braus & Disinger, 1998). Outdoor education did not identify itself with a unique body of knowledge, but rather focused on process rather than on educational goals or content. Its distinguishing venue has been the "outdoors," or outside the school building. L. B. Sharp, influential in

the outdoor education movement in the mid-1900s, put it this way, "Teach outdoors what is best taught outdoors, and indoors what is most appropriate there" (quoted by Roth, 1978). This movement has historically been described as a vehicle for teaching all subject areas in the curriculum, such as art, mathematics, music, and science, and has been particularly emphasized in residential camp programs. Practitioners of nature study and conservation education have often found the techniques and venues of outdoor education to be useful and even essential. Important groundwork was laid for the development of environmental education by this movement and by its primary supporting organization, the Outdoor Education Association, by "emphasizing the thoughtful use of the outdoor world in education" (Braus & Disinger, 1998, pg. 11).

Other environmental education antecedent and concurrent movements have been identified. These include resource-use education, progressive education, resource management education, population education, and general education. They will be briefly described in sequence. Resource-use education, which has been described as a social studies "twin" of conservation education, focused more on economics and geography than on the natural sciences. The content was considered to be weaker than the conservation education materials and relied on the classroom teacher in developing instructional materials (Roth, 1978).

Progressive education--with roots back to Comenius, Rousseau, Pestalozzi, and Froebel–as considered to be "the most education-focused of the forerunners of environmental education" (Roth, 1978, p. 16). A holistic approach to learning was emphasized and was influenced by the philosophy of John Dewey. The focus of the progressive education movement of the 1930s was "learning by doing," which

incorporated learning about the environment in the environment. It introduced curriculum reforms toward a more holistic approach to learning and resulted in making education more responsive to the needs of children (Roth, 1978).

Resource management education "has represented the professionalization of certain distinct man-land relationships: soil conservation, water management, game management, urban and regional planning . . . and so on" (Schoenfeld, 1971, p. 4). Population education became a concern as the relationship between population and environmental impact was realized (Swan, 1975). General education has been characterized as "a deliberate retreat from the tendency of the Germanic university ideal to compartmentalize knowledge, and as such shares with environmental education the basic philosophy of the integration of knowledge" (Nash, 1976, p. 13).

Demographic changes during the 1950s resulted in a waning of interest in conservation education. The emphasis on renewable resources at the agricultural level had little appeal to a population that consisted primarily of city dwellers (Bowman, 1972). The increased public awareness of the problems of water pollution, air pollution, noise pollution, overpopulation, and excess energy demands in the 1960s made it apparent that it was not possible for educators to focus solely on natural resource management. The external pressures in society forced a mixing and blending of outdoor education and conservation education, which resulted in a new philosophy and approach: environmental education (Kirk, 1977). The environmental movement of the 1960s and 1970s was far more widespread and popular than previous movements, involving public values that stressed the quality of the human experience and, therefore, the human environment (Hayes, 1985). This movement, which fostered responsible environmental citizenship,

was fueled by powerful images such as the first photographs of Earth taken from space (Disinger & Monroe, 1994). According to Braus and Disinger (1998), environmental education:

> places special emphasis on the social dimensions of environmental problems. It is characterized by the development of explicit and implicit interconnections among human health; science and technology; the environmental, economic, and social issues and problems of society; and other quality of life concerns. And it emphasizes the critical thinking and problem-solving skills needed for informed personal decisions and public action. (p. 13)

The decade of the 70s saw a wave of environmental legislation passed to protect human health and the quality of natural ecosystems. Congress enacted a dozen major laws affecting human health and the environment. These included the Clean Air Act, the Endangered American Wilderness Act, and the Endangered Species Act. President Nixon, ensuring that teachers received training in environmental issues, signed the National Environmental Education Act of 1970 into law. The Act was funded only through 1975 and then it was repealed in 1981. Congress brought up the issue again in 1990, which ultimately became the National Environmental Education Act. This national commitment to support environmental education set up programs for curriculum development and teacher training in the area of environmental education (Schmidt, 1996).

The National Environmental Education Act of 1990, signed by President Bush on the 20th anniversary of the first Earth Day, created an Office of Environmental Education at the Environmental Protection Agency. Administered by the Environmental Education Division, the act mandated that the Environmental Protection Agency (EPA) make environmental education a priority. The EPA's goals were to provide national leadership

for the public and private sectors and to arrange environmental education initiatives at the federal level. The act included the following:

- A mandate that the EPA establishes and operates an Environmental Education and Training Program
- Authorization for the EPA to award grants that support environmental education projects
- Requirement for the EPA to establish the National Environmental Education Advisory Council

Earth Day 1990 brought together the citizens of the world for the twenty-year anniversary of the first Earth Day. It reaffirmed the level of concern held by people in relation to the environmental problems of the planet. The world looked to education as the vehicle through which society prepares its citizens for the defense and improvement of the environment for present and future generations. To accomplish this goal education must be environmental, but because of its multifaceted nature, environmental education means different things to different educators. Conceptual ambiguities and communication risks exist with "environmental education" because the phrase might trigger concepts of ecology, environmental science, or outdoor education, each of which fit under the category of environmental education but offer only a partial contribution to the total (Ramsey, Hungerford, & Volk, 1992).

Environmental Education Foundation in the UK

Historically, concern about the environment in the United Kingdom was made evident in terms of nature as content, as teacher, and as victim. These were exemplified in

different ways, such as in biblical teaching, in the environmental insights and philosophies of educational progressives and romantic poets, and then later in nature study as it related to science. In the first half of the 19th century, biblical and religious instruction pervaded the curriculum. The Psalms of the Old Testament testified to the glories of God's creation and his ownership of it. Nature was used metaphorically to teach moral lessons in *The Book of Nature* (1803), that which used the physical hazards of the wind and waves to teach about moral dangers. People were reminded that they were God's stewards and should take care of his creation, and furthermore were enjoined to respect animals as God's creatures. The beauties and wonders of nature were used to teach the spirit of compassion toward humans and animals. The romantic poets, such as William Wordsworth, suffused their poetry with the content and lessons of nature. Wordsworth espoused, "Let nature be your teacher" as he cited the country children's advantages of informal natural education over the dull, bookish and artificial schooling of the children living in town.

By the middle of the 19th century, religious instruction remained at the core of the educational curriculum, but was no longer all-pervasive. A more secular and cognitive attitude to the development of teaching about nature and the outdoors began to surface. In Britain, Sir Archibald Geikie, a Scottish geologist and geographical educationist, applied the philosophies of progressive education and literary romanticism in his approach to education. Geikie promoted local study for instilling habits of observation and reflection, and also in stimulating a love of nature. This approach to science involved the linking of geography, science, and outdoor work.

In elementary school in the 1890s, nature study and gardening evolved from object lessons and elementary science. Cross-curricular schemes were devised to connect working both inside and outside the school. Moral and spiritual insights were taught through environmental and nature study, using casual acquaintance, observation and curiosity. Animal welfare concerns were reintroduced. Nature study work in the 19th and 20th centuries was an attempt to protect urban-based children from the corrupting power of the town. Extracurricular outdoor education movements were formed, also stressing the perils of industrialization and of urban life. Organizations adopted the responsibilities schools would not: conservation education. The motto of the School Nature Study Union was "To see and admire; not harm and destroy." (Jenkins & Swinnerton, 1996). In 1928, active conservation training in school was implemented through programs such as the Save Our Countryside campaign. Professional journals educated the teachers in environmental issues, such as pollution (Marsden, 1997).

The United Kingdom understood the importance of dealing with environmental problems when the killer fog of 1952 led to the passing of the first Clean Air Act in 1956. More recently, air pollution was "solved" in Britain by building higher chimneys on power stations so the pollutants blew farther away. Factories were encouraged to set up on the coast so that their waste would float out to sea. Pressure from countries impacted by such actions has forced Britain to agree to more globally minded solutions (Economist, 1990).

Environmental education has been a part of the United Kingdom (UK) school curriculum since the 1970s (Sterling, 1991). Since that time, approaches to developments in environmental education have varied and dramatic alterations to its status have

occurred. Emphasis on environmental education wavered from times of intense focus to a complete lack of attention. Attempts were made in the 1970s to establish environmental subject areas in the formal school curriculum and in teacher education programs (Scott & Oulton, 1998).

In the late 1980s, Mrs. Thatcher's Conservative government shifted the focus from attempts to modernize Britain, dubbed by environmentalists as the "dirty man of Europe," to the reform of education and environmental policy. In the late 1960s and early 1970s, Environmental Studies were introduced into many primary schools as a form of topic work or local studies, and "school leaving" examinations encouraged curriculum innovation and some courses in environmental education for older pupils. Progressive teachers developed a practical understanding of sustainable development based on the curriculum materials published in response to non-governmental organizations, which recognized the links between environmental, development, Peace and Human Rights Education (Hill, 1991). The majority of schools and teachers were not impacted because of moving back toward a more conservative curriculum resulting from a conservative political and education climate (Huckle, 1993).

The late 1980s saw an upturn in the economy, which resulted in more congestion and pollution. Britain was already attracting criticism from the European Community for its record of inaction on such environmental issues as acid rain, drinking water quality, and global warming, while at the same time education and the economy were being restructured (Friends of the Earth, 1990). Public concern about the environment grew as the government failed to develop integrated and comprehensive environmental policies. The Prime Minister of Britain, Margaret Thatcher, the only science graduate at the head

of a large industrial country, brought environmental issues to the forefront of British politics in 1988 when she read a paper on climate change. She chose the topic to present to the Royal Society, Britain's most distinguished scientific club. Mrs. Thatcher realized that public interest in environmental issues was rapidly increasing, which was confirmed at the polls in 1989 when the Green party won 15% of the national vote in the elections for the European parliament.

In 1988/1989, Mrs. Thatcher, made several speeches on the environment and promised a White Paper, which was published in 1990 as *This Common Inheritance: Britain's Environmental Strategy* (HM Government, 1990), which formed the basis for the UK national report to the United Nations Conference on Environment and Development (UNCED). Environmental groups criticized this government statement for its lack of commitment and imagination and for containing few new initiatives. Mrs. Thatcher then demanded that the Department of Education and Science publish something on environmental education, and the manuscript of *Environmental Education*, 5-16 (Department of Education & Science, 1989) was quickly printed.

By 1990 environmental education was firmly established in the national curriculum, providing a framework of aims and objectives designed to engage students in education about, from, in, and through the environment via a cross-curricular theme. Although environmental education is perhaps more firmly established in the curriculum than at any time in the past, education for the environment is constructed in terms of personal attitudes and values rather than active and informed citizenship (Huckle, 1996).

The end of the 1980s within England and Wales viewed all subjects as making a contribution to pupils' environmental education. Although environmental education was

and is inherent within the national curriculum, the force has diminished. According to Gayford and Dillon (1995), the content of environmental education has systematically been pared down by the Office for Standards in Education in an effort to focus on the statutory, assessed, part of the curriculum (OFSTED, 1992, 1993).

The European Union (EU), which comprises 15 countries including the nations of the United Kingdom, mandates legal provisions endorsed by the European Parliament that obliged member countries to follow fairly strict environmental criteria. In 1992, the Commission of the European Communities (the Secretariat of the EU) published the European Community Program of Policy and Action in Relation to the Environment and Sustainable Development. This document, commonly known as *Towards Sustainability*, "acknowledged the need for promotion of environmental information as a means of building public environmental awareness and toward a goal of sustainable development" (Filho, 1996, p. 5). Simply put, it linked environmental conservation and economic activities, providing sound environmental conservation policies and strategies to areas containing a large population. Due to the level of attention to environmental issues in Europe, environmental education progressed to the level of a well-established methodology (Filho, 1996).

Resolutions were passed in the 1980s, which focused on using environmental education to raise the environmental awareness of both students and the public (Council of Europe, 1988). These resolutions and recommendations stated that governments and the members of the Council of Europe should:

- note the "basic principles for the promotion of environmental education," from the various conferences (Tbilisi, Moscow) that shaped this

methodology, when creating or reviewing their environmental education policies;

- ensure that teachers have an opportunity to revitalize and diversify classroom activities and basic learning processes by providing them with resources;
- promote working relations with research institutions in the field of natural science, social studies, and education;
- develop an active and stimulating policy for the initial and in-service training of teachers by introducing appropriate elements into their training program and by creating, within and around schools, educational areas conducive to the sensory awakening of pupils and to practical activities;
- create an infrastructure to help teachers and others involved in environmental education, through the provision of consultants, a diversified range of curricula, training facilities, and documentation; and
- ensure wide distribution of the recommendation among all interested parties, especially curriculum developers, educational advisors, teacher trainers, and teachers (Filho, 1996, p.7).

In Rio de Janeiro, Brazil at the International Workshop on Environmental Education held during the United Nations Conference on Environment and Development, it was stated

> the development of environmental education has taken different forms and is found in different phases in individual countries. Cultural influences as well as political systems have been acting to influence the implementation and progress of environmental education. (Leal, Filho & Hale, 1992; in Filho, 1996, p. 7)

Environmental Education in the UK Classroom

Education in the United Kingdom consists of central government control of the curriculum. Some capacity for individual bias exists in the direction of studies, but all students follow the same core curriculum (Dussart, 1990). School attendance in the UK is as follows:

- Infant School: Ages 5-7 (Years 1-3)
- Junior School: Ages 7-11 (Years 4-6)
- Secondary School: Ages 11-16 or 11-18 (Years 7-11)

Compulsory education begins at the age of five and is completed at the age of sixteen. Sixth Form College is for students from 16-18 and Further Education College is for students from the age of 16 and older. A Post Graduate Certificate (PGCE) is awarded to a graduate student studying for one year after completing a degree. A Certificate of Education is awarded after one year of study.

In the UK, environmental education gained respectability as a result of increased public concern for the quality of the environment. It has been a part of the UK school curriculum for many years, although approaches have changed and developments have been characterized by shifts in emphasis and alterations to the status afforded to it. Many primary schools in the late 1960s and 1970s had environmental education introduced into the curriculum as a form of topic work or local studies. Considerable curricular innovation occurs in environmental education in the 1970s for older students because the establishment of school leaving examinations and the establishment of all ability

comprehensive secondary schools. Environmental education about and from the environment was the focus of the curriculum (Huckle, 1990).

During the 1970s attempts were made to establish environmental subject areas within the formal school curriculum. At the end of the 1980s, within England and Wales, it was seen as a non-statutory, cross-curricular theme within the national curriculum that suggested that schools should reinforce the environmental education that students gain from their formal lessons. To reduce the complexity of the curriculum and to focus on the statutory, or assessed, part of the curriculum, however, the environmental education content has been pared down (Scott & Oulton, 1998).

The focus known as "Environmental Education For Sustainability" (EEFS) resulted from the public's growing concern over the stability of ecosystems and sustainability of social practices during the 1990s. This holistic worldview approach focused on both immediate and long-term environmental improvement. Research suggests that, although growing social environmental concern has increased the profile of environmental education within the school curriculum, the approach to environmental work in schools has been one of fragmented investigation of the environment and its related issues. Environmental education in schools has been generally patchy and lacking in coordination (Tilbury, 1997). Within the National Curriculum in England, environmental education is a cross-curricular theme, and practices have been primarily descipline-based (Dorion, 1990; Huckle, 1993).

Environmental education in the United Kingdom is seen by many as having a direct relationship in influencing and perhaps changing the learners' attitudes and behaviors. This values-laden perception involves a new ethic that environmental

education is the process of fostering or reinforcing attitudes and behaviors, which embraces plants and animals as well as people (IUCN/UNEP/WWF, 1991). The School Curriculum And Assessment Authority, however, has avoided values in its language and emphasis in the development of its definition of environmental education (SCAA, 1996). No explanation is given to this lack of reference to values when compared to the environmental education definition given by the National Curriculum Council (Scott & Oulton, 1998).

Environmental education commands educational and political support in the UK. The Government's Environment White Paper made the claim that the environment has been put at the center of the government's new initiatives in education, training, and research (McLeish, 1992). Contributers to the United Kingdom's National Curriculum Council's final report on environmental education stated that the report was "out-of-date" and "unhelpful to teachers" (Blackburne, 1990, p. 6). Environmentalists were angry that the final version was considered to be a toned down version of the original draft. They pointed out that the report was a step in the right direction, but a long way remains before a truly "green" curriculum is taught. The document provides aims and objectives of each educational level and suggests activities to support them. The education officer for Friends of the Earth, John Howson, suggested that the final document was strong on awareness but weak on action (Blackburne, 1990).

Within environmental education, the consideration of values in relation to the purposes of teaching is on highly contested ground (Scott & Oulton, 1998). The United Kingdom has struggled to come to a conclusion regarding the purpose of environmental education. Lucas (1982) challenges the notion that, given sufficient knowledge and the

opportunity to develop their values, learners will make appropriate choices related to the environment. He suggested that increased interventions that affect behavior patterns are necessary in environmental education. Walker (1997), however, has questioned whether changes in behavior are necessary outcomes of environmental education programs.

Education in the UK is seen as having an important and influential role in raising environmental awareness. Environmental education is viewed as the key to global environmental sensitivity and consciousness. The UK produced a report from the Department for Education's Committee entitled "Environmental Responsibility" which recognized the global need to develop greater environmental knowledge, skills and understandings in the population at large. This report identified the neglect related to "greening the curriculum" in post-16 year old education in the UK, and stated that it should be regarded as a high priority. Potter (1993) stated that, "whatever the area of study, if a supportive environmental education is to be provided for all students, an environmental curriculum entitlement must be established in all education institutions."

In England and Wales, a major boost in education about the environment in primary and secondary schools was implemented in September, 2000. Revisions in the National Curriculum substantially increased the emphasis on environment and sustainable development not only in subjects such as science and geography, but was also prominently featured in a revised introduction to the entire curriculum (Summers, 2000).

Environmental Education in the U.S. Classroom

In the United States, 95 percent of adults and 96 percent of parents support the teaching of environmental education in the schools (NEETF, 1997). A recent public

opinion poll reported that young people appeared to be more motivated and environmentally aware than their parents, and that they had ranked the environment as the most important issue for the future. They also believed that adults had failed to do enough to protect the environment. Their beliefs resulted in an attempt to influence their parents' behavior, and that they may believe they were successfully accomplishing that goal (Fuller, 1992).

School systems usually break the curriculum into specific disciplines such as science, math, geography and history. Environmental education is usually not taught as a separate, distinct entity in K-12 classrooms. It has traditionally found a home within the discipline of science, but environmental education is not just science education because it is considered to be interdisciplinary, participatory, critical, community-based, values-based, and inquiry-based. Orr (1992) stated that, because of the complexity of environmental issues, a single discipline or department is not sufficient to elicit understanding. Furthermore, the infusion of environmental education into various subjects results in a piecemeal and ineffective strategy. This has also made it difficult to assess students' level of environmental knowledge, and, therefore, the environmental education curriculum, when report cards and exams have stressed evaluation of the traditional subjects.

Because environmental education is still equated with science education, school systems may believe that, by including a unit on an environmental topic such as ecosystems, they have satisfied their environmental education requirement. Although ecological issues are a component in environmental education, environmental issues also involve people, attitudes, economics and geography. It includes much more than what is

traditionally thought of as science. According to Braus (1995), students must be given a solid science education, but they also must be given the life skills they will need to become responsible citizens.

In the typical public school, environmental education has traditionally been taught within the discipline of science. Concept/magnet schools, such as environmental schools, and Science-Technology-Society schools have used traditional skills to define the technological, scientific, and societal aspects of real world problems, and then applied decision-making processes and problem solving to address those problems (National Science Teachers Association, 1982). Other approaches have involved the use of environmental supplementary curricular guides, such as Project WILD, Project Learning Tree, and non-formal educational materials provided by 4-H, scouting, and others (Heimlich, 1992).

The Environmental Education Materials: Guidelines for Excellence have been developed to aid educators and curriculum developers in meeting the standards set by traditional disciplines, as well as to help educators develop integrated, cross-disciplinary environmental education programs. These guidelines further provide direction to the educator wishing to evaluate or construct the quality of environmental education materials. They serve the field of environmental education by demonstrating the essential link between environmental education and the traditional disciplines (NAAEE, 1999). The Guidelines for Excellence promotes learner-centered, hands-on opportunities for students to construct understanding. This is achieved through direct experience and incorporates real-world contexts and issues that will foster skills and habits that students can use throughout their lives to understand and act on environmental concerns. They

seek to help educators develop effective and meaningful environmental education programs that translate into a citizenry better prepared to address problems whether they are related to the environment or not.

The Guidelines point out six key characteristics of high quality environmental education materials. They are:

1. Fairness and Accuracy
2. Depth
3. Emphasis on Skills Building
4. Action Orientation
5. Instructional Soundness
6. Usability

Guidelines follow each key characteristic and under each guideline are given several indicators listed under the heading, "What to Look For," which aids in gauging whether the materials being evaluated or developed follow the guidelines.

With the exception of secondary science teachers, teachers lack confidence in teaching science and environmental issues and are reluctant to teach in these areas. Barriers to effectively implementing environmental education have included the lack of effective and adequate preservice and in-service training. Training in environmental education has been proven to help teachers. According to Braus (1995), teachers need to be trained in (1) what environmental education is all about, (2) how to facilitate open-ended discussions, (3) how to teach thinking across the curriculum, (4) how to teach environmental education action skills and problem solving, (5) how to deal with

information and technology, and (6) how to teach in an interdisciplinary way and integrate environmental education across the curriculum- how to teach holistically (p. 6).

The practice of environmental education in the United States has been characterized by essential elements, including the elements based on Disinger and Monroe (1996). They are:

1. Environmental education is based in knowledge about ecological and social systems. It draws on and integrates knowledge from disciplines that span the natural science, social sciences, and humanities.
2. Environmental education considers humans and their creations to be a part of the environment. Along with biological and physical phenomena, environmental education considers social, economic, political, technological, cultural, historical, moral, and aesthetic aspects of environmental issues.
3. Environmental education emphasizes the role of attitudes, values, and commitments in shaping environmental issues. It acknowledges that environmental issues are not strictly scientific in nature, and that recognizing the feelings, values, attitudes, and perceptions at the heart of environmental issues is an essential step in understanding them and a precursor to accepting responsibility for exploring, analyzing, and resolving them.
4. Environmental education emphasizes the critical thinking and problem-solving skills needed for informed personal decisions (NAAEE, 1998, pg.116).

Efforts to reform U.S. schools and curricula have a long history. When the Soviet Union sent Sputnik circling the globe in 1957, the U.S. Congress looked to the schools to regain our technological superiority through curriculum reform in the 1960s. In the 1970s accountability became the central focus of education reform as expected outcomes of instruction were determined to hold teachers and administrators accountable for the quality of their work. In 1983, A Nation at Risk was published. It was a prominent reform publication of the century, which resulted from concerns about the quality of the U.S. educational system. Low academic achievement in comparison to many European and Japanese students, declining test scores, declining enrollment in science and mathematics, and low levels of literacy necessitated strategies for improvement in the U.S. educational system (NAAEE, 1995).

A Nation at Risk has faded in the light of America 2000, the reform agenda of the first Bush Administration, and subsequently signed onto by the Clinton Administration. America 2000 was intended to do what the curriculum reform movement of the 1960s, the accountability movement of the 1970s, and A Nation at Risk of the 1980s have been unable to accomplish. Goals 2000, the Clinton education reform version of America 2000, has been an approach to education reform that uses standards as the foundation of its efforts for educational reform. Virtually every subject-matter field in education, including environmental education, has formulated or is in the process of formulating or revising national education standards that describe what students should know and be able to do.

In response to the national "Goals 2000" process, a model set of guidelines for environmental education was developed in 1999. The North American Association for

Environmental Education (NAAEE) published the document entitled Excellence in Environmental Education – Guidelines for Learning (K-12) as part of the National Project for Excellence in Environmental Education. The document provides students, parents, educators, policy makers and the public with a set of high-quality environmental education guidelines, based on what an environmentally literate person should know and be able to do upon graduation from high school. Of the eight broad educational goals dictated by the passage of the "Goals 2000: Educate America Act" of 1994, of particular importance for the development of environmental education guidelines, as they relate to the core disciplines, are:

> Goal 3 – Student Achievement and Citizenship, which states that
>
> by the year 2000 American students will leave grades four, eight, and twelve having demonstrated competency in challenging subject matter, including English, mathematics, science, history, and geography; and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy.

Goal 4 – Science and Mathematics, which states that "by the Year 2000, U.S. students will be first in the world in science and mathematics achievement."

The need for greater strides to be made in educational systems that provide students with skills and knowledge necessary to formulating responsible choices concerning the world around them is recognized by education reformers. Environmental education has a lot to offer the education reform movement, including pedagogical methods such as hands-on activities, relevant subject matter, and topics that engage students. Education reformers view environmental education as an effective tool in

capturing students' enthusiasm for learning in subject areas ranging from science and math to literature (Lieberman, 1994).

International/Global Perspective

Globally, many countries have realized the need for formal and informal environmental education programs. The 1972 Stockholm Conference on the Human Environment cited the development of environmental education as one of the most critical elements involved to respond to the global environmental crisis. An identified need of the conference stated :

> Creating citizens not merely aware of the crisis of overpopulation, mismanagement of natural resources, pollution, and degradation of the quality of human life, but also able to focus intelligently on the means of coping with them. (UNCHE, 1972, p. 7)

In 1972, an international program of environmental education was implemented through a series of workshops and conferences by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the United Nations Environment Programme (UNEP). The Belgrade Charter was adopted in 1975 as representatives from 60 nations met in Belgrade Yugoslavia and developed a basic structure and goals for worldwide environmental education. A goal statement concerning environmental education was developed and was adopted by the United Nations. It reads:

> The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones. (Belgrade Charter)

Interdisciplinary panels at the international (UNESCO) and national (USA) level recommended the following basic concepts to serve as the foundation on which to build individual national environmental education programs by the member states of the United Nations. This list was

1. The environment of Earth is made up of physical components - air, water, and solid material - which constitute a complex and totally interrelated life support system called the "ecosphere." The ecosphere is composed of interacting systems called "ecosystems" in which organisms, living things, interact with physical components. All living things are interdependent with one another, and with their physical environment.
2. Materials are continually cycling and recycling in and among ecosystems. Energy, on the other hand, moves through ecosystems - some available energy is dissipated with each conversion, until all available energy is gone. These two factors illustrate why pollution control (preventing pollutants from entering natural cycles) and energy conservation are of fundamental importance in environmental education.
3. Each ecosystem has an ability, called "carrying capacity," to support given numbers of each species within it. Population figures fluctuate from time to time, depending on variations in the components of the system, but remain relatively stable unless the system is altered in some significant way.
4. Humans are an integral part of the ecosystems of Earth, and are dependent on these systems for their life support. Humans are more capable of

altering ecosystems - changing the way they operate - than any other species. The pollution that humans can produce may harm human health and reduce the ability of ecosystems to support life. Human settlements and their development of resources can destroy habitats of other species. Humans are unique in the rapidity and magnitude of the changes they can make in their environment. These changes can be global, are often immediate, and may be irreversible, Human technology can be sued either to the detriment or the enhancement of earth's ecosystems.

5. The unique human intellectual capacity to reason, experiment, understand, remember, and communicate, produces a moral and ethical responsibility to bring human activities into balance with ecosystem processes. Human survival requires harmonizing man's activities with global ecosystems. Unless man can mold his policies and actions to conform with ecosystem processes, he may sacrifice his existence as a species.

In Tbilisi, USSR in 1977, UNESCO sponsored the Intergovernmental Conference on Environmental Education, which built on the Belgrade Charter. Environmental education objectives were generated and developed by the participants of the Tbilisi Conference (Volk & McBeth, 2001). Recommendations were made which advocated relying on individual and community involvement and using interdisciplinary approaches to solving environmental problems (Braus & Disinger, 1998). Three broad objectives for environmental education were determined:

1. To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas

2. To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment
3. To create new patterns of behavior of individuals, groups and society as a whole towards the environment. (North American Association for Environmental Education, 1999)

The conference also outlined the five components of environmental education. They were:

Awareness: To help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied programs;

Knowledge: To help social groups and individuals gain a variety of experiences in, and acquire a basic understanding of, the environment and its associated problems;

Attitudes: To help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection;

Skills: To help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection;

Participation: To provide social groups and individuals with an opportunity to be actively involved at all levels in working toward the resolution of environmental problems.

According to the Tbilisi Conference, the aim of environmental education is:

> . . . to create individuals who acknowledge that the natural environmental and human environment are profoundly interdependent (and to) . . . prepare the individual for a life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment with due regard given to ethical values. (UNESCO/UNEP 1978, p. 2)

Some form of environmental education must be adopted by every nation as a way to foster conservation values in young people. International treaties have been signed by many countries in their attempt to emphasize the importance of teaching environmental values. Three multilateral treaties have committed their parties to providing environmental education to their citizens. In September of 1990, the Convention on the Rights of the Child, which involves approximately 131 countries, dictated that the education of the child shall be directed to the development of respect for the natural environment (United Nations Treaty Series).

Approximately 129 countries, including the United States, are involved with the Convention Concerning the Protection of the World Cultural and Natural Heritage (2002), which was organized in 1975. These countries have agreed to strengthen appreciation and respect by their peoples through educational and information programs. These programs have focused on natural features, geological and physiographical formations and areas which constitute the habitat of threatened species of plants and animals, and natural sites or areas of value from the point of view of science, conservation or natural beauty.

The Protection of Victims of International Armed Conflicts, which began in 1977, includes approximately 112 countries, not including the United States. Protocol I states that warfare is prohibited, which is intended or expected to cause widespread, long-term

damage to the natural environment. Environmental education is necessary to develop the social conscience needed to support the dictates outlined in these treaties (Westing, 1993).

The 1990 United Nations Conference on Environment and Development, held in Rio de Janeiro, adopted an ambitious program for achieving sustainable development in the 21st century. The Agenda 21 program contains 40 chapters, with Chapter 36 focused on the promotion of education, public awareness and training. Its content included encouraging governments to establish national and regional centers of excellence in research and management of specific environmental problems, as well as to set up national advisory environmental education coordinating bodies representative of various environmental and educational interests. It further recommended that governments should encourage all sectors of society to include an environmental management component in all training activities. National and professional associations were encouraged to strengthen environmental connections and commitment (ECO-ED).

At the United Nations Conference on Environment and Development (UNCED) in 1992, which was billed as "the last chance to save Earth," education was recognized as potentially playing a crucial role in cultivating the change required to achieve a sustainable earth. UNCED recognized the critical role of education in achieving the attitudinal and practical change needed to achieve any level of sustainability (Sterling, 1992).

Environmental Education and Q Methodology

A cross-cultural study was done by Chou in 1991 as a doctoral thesis, and subsequently summarized and published in an article by Chou and Roth in 1995. In the study 120 faculty members from The Ohio State University (OSU) and the National Taiwan University (NTU) were sampled in order to determine their perceptions of the underlying constructs appropriate for environmental education (K-16). The objectives were to establish and compare the constructs underlying the identified concepts, and to identify any significant relationships between the constructs and the demographic variables (Chou & Roth, 1995).

The instrument developed for the study was constructed from 72 concepts derived from literature, from research conducted by other professors and graduate students, and from environmental education programs such as Project Wild. The original list of 72 concepts was presented to the panel of experienced officials from environmental protection agencies, environmental management professors and environmental education professors from both countries. The panel made judgments based on the relative importance of each concept and through computing the mean scores, a final list of 42 concept statements was determined for use in the study (Chou, 1991).

Reliability was determined through the test-retest method. Two pilot tests were conducted, one with six participants from OSU using the English version, and one with a group of six Chinese doctoral students from OSU. A break of two weeks occurred between each sort. The reliability of the entire Q set and each individual statement was determined, the first with the mean of all 42 statements, and the second with the Pearson

Product-moment correlation coefficient calculated for the two sorted data sets on each individual statement (Chou, 1991).

Research subjects from OSU and NTU were instructed to ask themselves "What should students know about the environment" as they sorted the 42 concept statements into piles based on their perception of the relative level of importance of the statements for use in environmental education. Unrelated to Q methodology procedure, a correlational factor analysis was used to calculate the results of the scores of each statement of the Q sort done by the participants. The identified constructs were then recommended as basic elements for program planning and curriculum development in environmental education in the United States and the Republic of China. Suggested recommendations for further study included replication of the instrument in different regions of the world, and targeting other populations, such as elementary and secondary school teachers (Chou & Roth, 1995).

Q was determined to be the most appropriate statistical methodology for this study because Q is a systematic study of subjectivity, which in this study relates to educators' beliefs concerning environmental education. Q is a method of data collection and analysis in which the resulting data are amenable to qualitative interpretation and numerical treatment through the statistical applications of correlational and factor analytical techniques (McKeown & Thomas, 1988). The Q sorts completed by the participants in this study are the individual rankings, which are objective records of the participants' subjective beliefs. Persons are correlated, as opposed to the statements correlated in the Chou (1991) study, which was not an accurate use of the Q methodology. The resulting

factors in a Q methodology represent points of view, which can be associated with a common perspective (Brown, 1980).

CHAPTER III

METHODOLOGY

This study was designed to determine the beliefs that educators have about environmental education concepts in the United States and the United Kingdom. A particular focus was given to educators' beliefs concerning concepts taught in their classrooms and those concepts that are perceived as ideal. This chapter describes the method used to conduct the study. Sequentially, this chapter includes the instruments used in this study, which included a Q sort, demographic information, and exit interview questions. The remaining portion of this chapter includes the selection of the participants, research design, data analysis and summary. Approval for the use of human subjects for the study was granted through the Institutional Review Board (Appendix B) at Oklahoma State University.

Q was determined to be the most appropriate research methodology for this study because Q is a systematic study of subjectivity, which in this study relates to educators' beliefs concerning environmental education. The data are collected and analyzed through the statistical applications of correlational and factor analytical techniques, and subsequent qualitative interpretation (McKeown & Thomas, 1988). The Q sorts completed by the participants in this study are objective records of the participants' subjective beliefs. Persons are correlated and the resulting factors represent points of

view, which can be associated with a common perspective (Brown, 1980). Q was, therefore, determined to be the most appropriate research method for responding to the following research questions:

1. According to educators, what beliefs emerge related to primary-12 classes in environmental education in the United Kingdom and United States?
2. In what ways do educators' perceptions of the actual and ideal primary-12 classes in environmental education in the United States and the United Kingdom differ?
3. In what ways can educators who hold such beliefs about environmental education in the United States and the United Kingdom be described using demographic attributes such as nation of training and experience (the United Kingdom and the United States), age, years of teaching experience, environmental education training, education level and major, number of hours spent watching educational television, gender, level of environmental activism, major sources of environmental education information, and religion?

Instrumentation

Three instruments were used in this study to increase understanding and depth of meaning of the educators' beliefs concerning environmental education concepts. The instruments included a Q sort, demographic information and exit interview questions. Q sort is an instrument used to create a taxonomy of belief types, which in this study

involves environmental educators' beliefs concerning environmental education concepts in the United States and the United Kingdom.

For experimental purposes, a subset of statements related to the focus of research is drawn from a larger concourse. The subset of statements is known as a Q sample, which is eventually presented to the participants in the study in the form of a Q sort. Factor scores are obtained through factor analysis, which examines a correlation matrix and determines how many basically different Q sorts are in evidence. A factor score is the score for a statement resulting from the factor analysis of the Q sorts. It is basically an average of the scores given by all of the Q sorts associated with the factor. The separate Q sorts are weighted for the sake of precision because some are closer approximations of the factor than others. In this study, the two statements with the highest weighted composites were assigned +5, the next three highest scored the +4 and so forth. Separate perspectives emerged, which then condensed around three operant types. The distinctiveness of the perspectives was determined by the statements that distinguished them (Brown, 1993).

Q Methodology

Q methodology was introduced in 1935 by psychologist/physicist William Stephenson in a letter to *Nature.* As a method of providing a foundation for the systematic study of subjectivity, with subjectivity defined as a person's communication of his or her point of view. Q method is typically based on ordinary conversation, commentary, and discourse of everyday life. From this discourse, or concourse, a sample of statements is drawn for administration of the Q sort, in which participants rank order

the statements along a continuum according to their beliefs concerning the importance of each statement, using a specific condition of instruction as a guide (Brown, 1993). The Q sort is a modified rank ordering of statements that focuses on the relative positioning of statements to each other (Brown, 1980).

Unlike a Likert scale, which is not an even distribution and demonstrates a tendency toward clustering to the positive extreme, the structure of the Q methodology response form results in a forced normal distribution. Respondents rank the Q statements into the forced normal distribution. The resulting Q sorts, or individual rankings, are objective records of the participants' subjective beliefs. Each Q sort is an independent experiment, unique to each respondent. Once the Q sorts are completed, data analysis is accomplished with the intercorrelations of the sorts as variables and factor analysis of the correlation matrix. Persons are correlated, and the resulting factors represent points of view in which the magnitude of that point of view is indicated by his or her loadings on that factor (Brown, 1980). Case-wise sorting (patterning within individuals) rather than factor-wise sorting (patterning across individuals) is the intended goal of Q methodology (Brown, 1993).

Factors are interpreted using as much information as possible to increase understanding and depth of meaning of the belief captured by the factor structure. Information includes the respondents' demographic correlates to the factor score for each factor, the weighted z scores for each statement in the Q-sample, reconverted into an array of scores corresponding to the +5 to –5 values used in the Q-sort, and interview data. Data analysis determines how many different factors, or beliefs, exist. Resulting factors are completely dependent on how the participants in the study performed.

Points of view are represented and are loaded on a factor depending on the magnitude of association with that factor. Each statement is then scored through the construction of a factor array and a determination is made as to which statements in the arrays are statistically different for any pair of given factors. Persons are assumed to share a common perspective when they are significantly associated with a given factor. Shared perspectives can be assumed when individuals load positively on the same factor, while negative loadings are a sign of rejecting that factor's perspective. Focus is given on assessing the emerging theories or patterns associated with the factor loadings (McKeown & Thomas, 1988). In Q methodology large numbers of respondents are not needed because, in theory, only one respondent is needed to identify each belief type, and large numbers produce redundant results (Brown, 1980).

Brown (1980) described Q as a technique for identifying similarities among subjects, in this case beliefs, which may not have been known a priori. It was called Q methodology to distinguish it from the more familiar technique of R methodology. A primary difference between Q and R methodologies is that R methodology provides a perspective on behavior that is from the observer's standpoint, or external. Q provides a perspective that is internal, or from the subject's standpoint. Until the subjects assign a score to the statements being ranked, the investigator does not know which statements are valued.

In Q methodology, generalizations are not thought of in terms of induction, meaning from the few (sample) to the many (population), as is the case in surveys. Rather, persons of the same type will be expected to load highly on the same factor. The Q methodology postulates that observation and measurement can take place only from the

external frame of reference. Internal processes are inferential and therefore hypothetical, with the intervening variables defining their status (Brown, 1980). Q methodology was chosen for this study based on its ability to provide a systematic measure for the opinions upon which this study is based by providing numerical treatment from which functional categories, or factors, emerge.

This study uses the Q statements developed by Chou (1991) in which 120 faculty members each from The Ohio State University and the National Taiwan University were sampled. Chou's descriptive correlational study compared the perception of the structure of concepts held by university faculty in the United States and the Republic of China by determining the underlying constructs appropriate for environmental education (K-16). Chou assessed the perceptions of faculty members toward the basic concepts appropriate for environmental education in order to establish and compare the constructs underlying the identified basic concepts. Further research was conducted to identify any statistically significant relationships existing between the underlying constructs and attribute variables such as age, sex and education.

The Q sort technique involves collecting a set of statements related to the topic of research. The statements are derived from what is referred to as a concourse, which is the flow of communicability surrounding any topic. A concourse can be obtained through a variety of methods, such as commentaries from newspapers, talk shows, and essays. The most common method has typically been interviewing people and recording their responses (Brown, 1993). A pool of basic environmental concepts was derived from many sources in Chou's study, such as Roth's (1969) and Townsend's (1982) studies, World Resources 1988-1989, and <u>One Earth, One Future: Our Changing Global</u>

Environment (1990). The collected statements, known as a Q set, may be structured or unstructured. An unstructured Q set contains statements that are randomly drawn from a carefully defined population of statements. Statements in a structured Q set are created to correspond to a specific theory or set of hypotheses (Brooks, 1970). Chou's study, and subsequently this study, used the unstructured Q set.

Reliability of the Q sort was determined using the test-retest method, which has been commonly used in reliability determination (Brooks, 1970). A pilot test was conducted with six people with different background disciplines and six Chinese doctoral students, all from Ohio State University. They were instructed to sort the Q set twice with a break of two weeks between each sorting. The data sets from the separate sorts were then calculated using the Pearson product-moment correlation coefficient on each individual statement. The mean of all 42 correlation coefficients was calculated for the English and the Chinese version, which determined the reliability of the entire Q set.

A total of 72 related environmental concept statements were reviewed by a panel to determine their suitability, importance and accuracy. The panel consisted of university professors in the areas of environmental management and environmental education from both countries, and an experienced officer in an environmental protection agency. Six experts were from the Republic of China and six were from the United States. The panel was instructed to make judgments, using the Q sort technique, about the relative importance of each of the original 72 concepts. A final list of 42 concepts resulted from determining the mean scores of the reviewed concepts and was retained for use in the data collection stage.

The research subjects were requested to sort the 42 concept statements into seven different piles labeled from zero to six in terms of their relative importance, with 6 being the most important pile and 0 the least important. There are two types of sorting methods in Q methodology, a forced and an unforced sort. The forced sort, used in this study, specifies the shape and scatter of the distribution curve by requiring the participants in the study to place a predetermined number of statements into each category. Chou used a Q sort with a forced sorting, consisting of a rectangular distribution. Using the unforced sort involves participants placing the statements in categories regardless of the number of statements placed in them (Brooks, 1970). In Chou's study the key question, or Condition of Instruction, that the participants were to ask themselves was "What should our students know about the environment?" A mean score for each statement was obtained for both universities through the calculation of the sum of all responses on each statement (Chou, 1991).

Although not practiced in Q methodology, hypothesis testing was completed for each concept statement using a t-test to determine if any statistically significant differences existed between the professors at Ohio State University and the National Taiwan University in relation to each particular statement. It was found that there was no statistically significant difference on 31 out of 42 statements. Five constructs from each site were identified using factor analysis with an orthogonal rotation on the data obtained from Ohio State University and the National Taiwan University. Four out of the five identified constructs were the same from each site. They were (1) Environmental Ethics, (2) Population and Quality of Life, (3) Interdependence, and (4) Environmental

Management. The remaining two constructs from Ohio State University and the National Taiwan University were Socio-Culture and Resource Conservation, respectively.

In contrast, this study extends and expands on the Chou study, in which the statements in the Q sort were classified and analyzed rather than the beliefs of the participants who were involved in the study, as is traditionally done when using the Q methodology. Public school teachers were involved in this study, rather than university faculty, as were used in the Chou study. A sample of 40 educators, 20 each from the United States and the United Kingdom, were invited to participate. Q methodology is not concerned with how many people believe as they do, but with how and why people believe as they do. Therefore, large numbers are not necessary, and validity tests are not required in the psychometric framework of Q because external criterion are not needed to appraise a person's own perspective (McKeown & Thomas, 1988). Q methodology focuses on analyzing the correlations between persons and person clusters or factors. When the focus of analysis is on the correlations between tests, as was done in the Chou study, it is known as "R" methodology.

Demographic Information

Emerging demographic patterns, collected in the Information Sheet (Appendix B), were a focus of this study to gain an understanding of who the respondents were. These demographic attributes were age, education, gender, nation of training and experience (the United Kingdom and the United States), years of teaching experience, environmental education training, number of hours spent watching educational television, level of environmental activism, major sources of environmental education information,

and religion. The demographic variables in this study were chosen on the basis of their prevalence in other environmental education studies and on the research studies that have determined their influence on environmental attitudes and beliefs. Demographic patterns are described as they relate to the participants whose Q sort loads on a particular factor. This data provided an understanding of who the respondents were, while also providing information related to whether the results were coming in only from specific populations, such as older males. Profiles of each belief type were created based on information related to demographic questions, as well as the exit interview questions.

Educators' commitment to teaching environmental education have been linked to significant life experiences as well as to beliefs and attitudes about environmental education. Palmer (1993) asked environmental educators to provide statements identifying significant life experiences that led to a "practical concern for the environment" (p. 27), which included actions such as tree planting, recycling, membership in environmental organizations, wildlife gardening, making a conscious effort to buy "environmentally friendly" goods, and reading articles and books on environmental issues. Thirteen categories of life experiences emerged from analysis of the autobiographical statements. Of those 13, the following four were used in this study to help determine the profiles of the belief types:

1. Religion/God
2. Education/courses (in this study, courses relate to environmental education training)
3. TV/Media
4. Books

The following research indicates the beliefs and attitudes associated with the demographic variables used as an instrument in this study.

Research suggests that the most environmentally concerned individuals tend to be well educated and young (Buttel & Flinn, 1974, 1978b; Dillman & Christensen, 1972; McEvoy, 1972; Tognacci et al., 1972). In 1993, Arcury and Christianson found that the sociodemographic factors of education, income, age, and gender account for much of the variation in the environmental worldviews of Kentucky adults rather than their place of residence, such as rural, urban, metropolitan, and non- metropolitan (Volk & McBeth, 1998).

In her study contrasting the environmental worldviews of African American adults with Caucasian adults in Virginia, Sheppard (1995) found that African Americans had lower concern for pollution, lower value for nature, and greater endorsement to the ideas of no limits of growth than did Caucasians. Using similar instrumentation, Noe and Snow (1989/90) surveyed Hispanics and non-Hispanics from the general population in South Florida. Their research indicated that non-Hispanics moderately favored an ecological view, while Hispanics were very sensitive to an ecological view.

Kellert (1985) found that, in students ranging in age from 2nd to 11th grade, African American children displayed more willingness to subordinate animals and displayed less affection for, and interest in, wildlife than white children. White children were found to have a greater knowledge of the natural environment and animals than did African American children. Iozzi (1989) stressed the importance of educating the connection between environmental problems and social problems after studies suggested

that a minority subculture exists which is concerned more with social problems than environmental problems.

A study of undergraduates by Gifford, Hay, and Boros (1982-1983) found that men had more environmental knowledge about pollution and ecological issues than women did, although more women than men reported they would actively do something about environmental problems. It was also found, however, that women reported no more actual commitment to environmental causes than did men. Environmental education research consistently reported the same pattern of gender differences in which males had more environmental knowledge than females, and females reported stronger feelings and verbal commitment to the environment (Chawla, 1988). In a study assessing the ecological worldviews of undergraduates, it was found that women had more positive ecological worldviews and found moral arguments to be more persuasive than did men (Brackney & McAndrew, 2001).

Iozzi (1989a) believed that the media strongly influence environmental attitudes and values, and because students learn better when information is acquired through several senses, television and films provide a promising medium for environmental education (Iozzi, 1989b). Environmentally based media exposure has been examined in studies to determine its influence on environmental knowledge, awareness, concern and attitudes. More positive attitudes towards animals were found in Canadian children in grades six through eight who watched films and television about wildlife compared to non-viewers (Eagles & Muffitt, 1990). Television was rated as a more prevalent source of environmental information than newspapers or magazines by junior and senior high students (Alaimo & Doran, 1980; Hausbeck et al., 1992). Oceanic knowledge was found

to be directly affected by the number of Cousteau programs viewed in a year (Fortner & Teates, 1980), and studies by Fortner and Mayer (1983) indicated that the largest percentage of their subjects received most of their aquatic information from television.

Fortner and Lyon (1985) studied the knowledge and attitudes of middle-class adults who had viewed a Cousteau television special. The study found that viewer knowledge increased and remained high, and viewers' attitudes shifted toward the goals of the producers, for a period of two weeks after viewing the special. Attitudes then returned to pretreatment levels. A study from Ohio State University found that adults' retention of information about the Great Lakes obtained during one week on the evening news scored significantly higher on broadcast than on non-broadcast questions (Brothers, 1990; Brothers, Fortner, & Mayer, 1991).

Gender and education backgrounds were found to affect attitudes toward nature and the environment as well as nature-and environment-related activities and knowledge. More positive attitudes towards nature and responsibility towards the environment were shown by female students than male students in a study of university students in Finland. Biology students exhibited the most positive attitudes and the greatest levels of knowledge compared to other educational groups studied, such as technology and economics (Tikka, Kuitunen, & Tynys, 2000).

According to research, religion plays a major role in shaping environmental beliefs and attitudes. In 1996, Eckberg & Blocker studied the relationship between religion and environmentalism and found evidence of a "pro-environmental" effect. Americans' environmental values were found to derive from three sources:

1. Religion, whether traditional Judeo-Christian religious teaching or a more abstract feeling of spirituality;
2. Anthropocentric (human-centered) values, which are predominantly utilitarian and are concerned with only those environmental changes that affect human welfare; and
3. Biocentric (living-thing-centered) values, which grant nature itself intrinsic rights, particularly the rights of species to continue to exist (Kempton, Boster, & Hartley, 1996, p. 87).

The strongest anthropocentric value has been found to be concern for one's descendants (Kempton, Boster, & Hartley, 1996).

In the first chapter of the Book of Genesis, which has been culturally entrenched in Western societies, humans have been divinely assigned the role of caring responsibly for all of creation. In Lynn White's 1967 classic essay, he proposed that Genesis 1 predisposes Christians to regard the environment as having value primarily through its use by humans, and as falling under human dominion. He also argued that humanities' intrinsic perspective on nature is anthropocentric due to the Judeo/Christian view.

Exit Interview Questions

After completing the two sorts, participants were asked to answer the following Exit Interview Questions:

1. What do you believe students should know about the environment?
2. In what ways and to what degree do you believe you influence your students through your environmental education program?

3. What are the barriers that are preventing you from implementing your perception of the ideal environmental education program?

According to Kagan (1992), teacher beliefs may be elicited through a variety of methods. These questions gave participants the opportunity to elaborate on his or her point of view and to make crucial comments related to their personal opinions concerning environmental education. The first question allowed teachers the opportunity to express their personal beliefs, using their own words, about environmental education in the classroom. The second question related to their beliefs about their perceived effectiveness in teaching environmental education to their students, and the third question allowed teachers the opportunity to express why they believed they were not teaching their perception of the ideal environmental education program. Rich, (1990) stated that often beliefs reflect an incongruence with behavior, and that an incongruence occurs because practical and ideological beliefs conflict. This data were essential to describing the beliefs inherent in the resulting factor structures.

Selection of the Participants

In this study, 40 educators teaching in the United Kingdom and the United States were requested to complete the Q sorts. These educators have been teaching environmental education concepts in their classrooms, primarily through the subject of science. Simmons (1989) and Ham et al. (1988) have reported that most teachers view environmental education as science.

Out of the 20 participants from the United States, seven educators were from North Dakota, seven were from South Dakota, three were from Texas, and three were

from Nebraska. Educators from the United Kingdom included 13 from England, five from Northern Ireland, and two from Wales. Data were collected in February of 2000. The participants, or P set (person samples), were certified educators who were contacted using the following methods and invited to participate in the study using three methods. In Q, the term sample refers to the set of items, with the subjects as variables rather than the sample elements as would be found in R-methodological studies. A P set is the language used to denote the persons who are theoretically relevant to the problem being considered and is not randomly chosen (Brown, 1980).

The first method involved contacting the educators through the school addresses and educator names listed on the GLOBE web site. GLOBE - Global Learning and Observation to Benefit the Environment - is an international environmental science and education program involving students from kindergarten through grade twelve. Educators in more than 80 countries implement the GLOBE program in schools. Using the GLOBE site provided a parameter for the choice of educators and afforded a means of contacting schools required to request educator participation, particularly in the UK. This method provided the researcher with a means of contacting primary level through high school level educators who teach environmental education topics in their classrooms. They were chosen from a list of GLOBE schools in the United Kingdom and the United States.

Letters were distributed to the schools, through email and through the post office, requesting participation and explaining the educators' role in the study (Appendix B). Participant Agreement letters (Appendix B) and return envelopes were included in the packet sent to the schools. The follow up letter (Appendix B) was determined to be

unnecessary due to the number of responses from the UK schools and due to the response rates of the second and third methods of contact used in the study.

The researcher facilitated the Q sort personally by traveling to the schools and working directly with the educators. Participation in the study was voluntary. The researcher used interview techniques based upon available methodologies and current research. Eighteen schools agreed to participate in the study. It was not possible, because of time constraints and distances between schools, to visit all the schools that responded to the request to participate in this study. It was, therefore, necessary to enlist the second method of contact.

The second method of contact involved calling schools throughout the United States and the United Kingdom and requesting participation from educators teaching environmental education to their students. These schools were situated near schools with educators who had agreed to participate, resulting in a decrease in travel time. Schools in which educators verbally agreed to participate were visited and research was conducted on site. Six schools agreed to participate in the study. The third method of contact involved face-to-face interaction at the National Aeronautics and Space Administration's Aerospace Education Services Program (NASA/AESP) educator workshops. The main focus of this workshop was hands-on inquiry-based science instruction. Therefore, the majority of participants were middle school and high school science teachers. Those educators who agreed to participate in the study conducted the research at the conclusion of the NASA/AESP workshop given by the researcher. Random selection of participants is not an issue in using the Q methodology (Brown, 1980); therefore, participants were chosen to represent those educators who would hold relevant opinions about

environmental education. Out of three workshops, for a total of 53 educators, seven participants agreed to participate.

Research Design

Q methodology was chosen for this study to examine a person's point of view, in this case beliefs, quantitatively. Using a somewhat quantitative analysis methods such as correlational and factor analytical techniques results in greater objective records of the participants' subjective beliefs (McKeown & Thomas, 1988). Unlike a Likert scale, which is not an even distribution and demonstrates a tendency toward clustering to the positive extreme, the structure of the Q methodology response form results in a forced normal distribution. Respondents rank the Q statements into the forced normal distribution.

According to Schlinger (1969), Q methodology:

> . . . gives insight into overall respondent attitudes toward a subject, and it takes account of a whole set of associations, feelings, opinions, notions, and cognition which an individual may hold . . . (p. 53)

The Interview Script (Appendix B) was designed for efficiency of use and to meet the purposes of this study and was based on similar studies, such as Chou's (1991) study and Spradling's (1999) study. This study involved the use of two Conditions of Instruction; therefore the participants repeated the Q sort process twice.

Prior to taking part in the research, participants in this study completed a consent form (Appendix B). The Interview Script (Appendix B) was read to the participants before they sorted the statements. They were asked to read through the 42 statements and to sort them into three equal piles before beginning the specific Q sort because making

accurate distinctions between more than 10 to 20 items is generally difficult for respondents (Brown, 1980).

Participants were instructed to sort the three piles according to the following criteria: (1) those statements which were most likely to be found in their environmental education classroom; (2) those statements which were least likely to be found in their environmental education classroom, and (3) those statements which would be neither strongly or weakly represented in their environmental education classroom. They were then instructed to sort the statements from the three piles onto the Q sort form board matrix according to the following Condition of Instruction: Which statements are currently represented in your environmental education program?

After the statements were sorted and recorded on each individual form board matrix, the participants were requested to shuffle the statements and begin the Q sort process over, beginning with sorting the statements into three piles according to the following criteria: (1) those statements which were most likely to be found in their perception of the ideal environmental education classroom; (2) those statements which were least likely to be found in their perception of the ideal environmental education classroom, and (3) those statements which would be neither strongly or weakly represented in their perception of the ideal environmental education classroom. The respondents were then instructed to sort the statements according to the second Condition of Instruction: Given all possible resources and support, which statements would be represented in your perception of an ideal environmental education program? The statements were sorted and recorded on each individual form board matrix. The statements were sorted based on the Q Sort Form Board Matrix shown in Figure 1.

In both Q sorts, participants sorted the 42 statements into a forced-normal distribution. The middle score (0) is a neutral point, whereas the items under +5 and –5 are assumed to hold a greater importance to the participant than items elsewhere in the

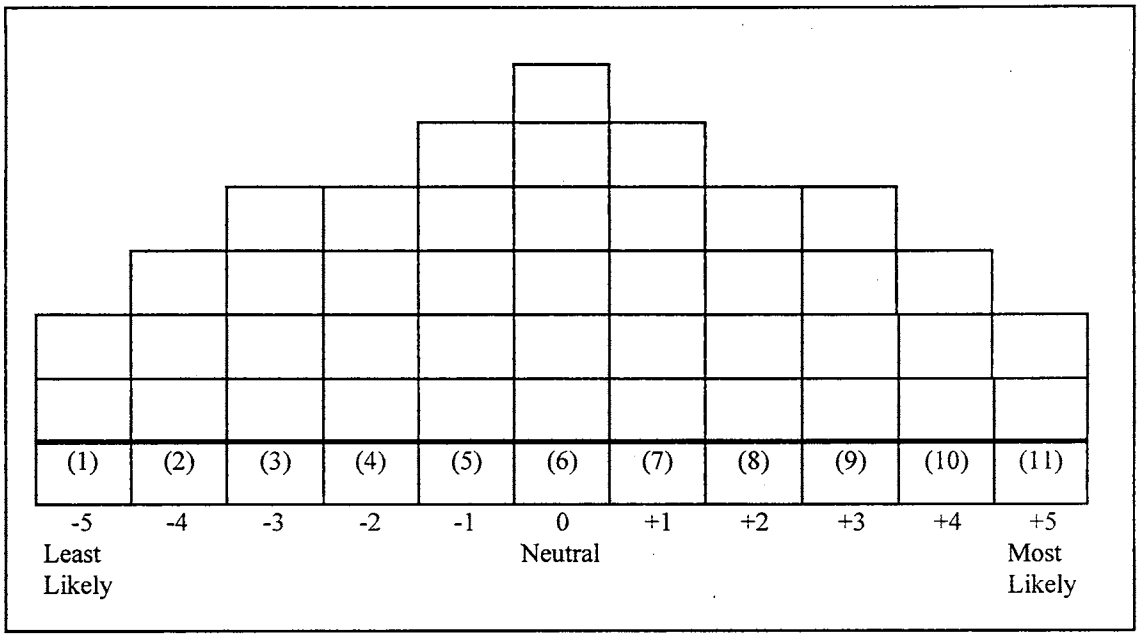

Figure 1. Q Sort Form Board Matrix.

sort (Brown, 1980). Like a normal distribution, it is distributed symmetrically about the middle, but is usually flatter than a normal distribution. The range and the shape of the distribution have no effect on the subsequent statistical analysis. Q characterizes individuals by determining a set of traits, and then compares those individuals for the distribution of these sets. Results of the statement loadings on the Q Sort Form Board Matrix for the three resulting factors are given in Appendix D, Table D-II.

Data Analysis

The resulting Q sort rankings from the 40 participants (80 sorts) in this study were entered into a computer program entitled, PQMethod 2.06. Q sorting is subjective and issues of validity are not an issue because no external criterion exists by which to appraise a person's own perspective. In Q the mathematics is subdued and serves to reveal the structure of the data through the detection of connections (Brown, 1993).

Three sets of sequential applications were involved in data analysis. They included correlation, factor analysis, and the computation of factor scores. Factor analysis reveals the number of factors, or beliefs, there are through the examination of a correlation matrix. The correlation matrix determines how many different Q sorts are in evidence, and determines those sorts, which are highly correlated with one another but uncorrelated with members of other beliefs. The number of factors is dependent on how the Q sorters performed (McKeown & Thomas, 1988).

Factor analysis provides the statistical means by which the subjects are grouped through the process of Q sorting. The mathematics of the factoring process in Q method and R method are virtually identical. It is unimportant whether the coefficients in the correlation matrix are Pearson's *r*, Spearman's *rho,* or any other commonly used nonparametric measure of association (Brown, 1971). Factor loadings are correlation coefficients. They indicate the extent to which each individual Q sort is similar or dissimilar to the composite factor array for that type.

Principal components were used to extract the summary variables known as factors, or components. All of the factors have the same mean, standard deviation and

variance due to the transformation of each of the rankings from –5 to +5 for the statements in each Q sort into positive values from 1 to 11. This would be the case whether using principal components analysis or other forms of cluster and factor analysis (Brown, 1980).

Q methodology proceeds primarily in terms of factor scores for the interpretation of data, as opposed to R methodology, which focuses on factor loadings as were evidenced in Chou's 1991 study. A factor score is the score for a statement taken from all the Q sorts associated with that factor. It is a kind of average of the scores given that statement (Brown, 1980). Determining whether a factor is significant involves theoretical and statistical significance. VARIMAX rotation (orthogonal rotation) was used and standardized scores were computed for the factor solutions. To identify the number of common responses that characterize a particular collection of individuals (Anderson et al., 1977), Q factor analysis was used in this study as it relates to teachers of environmental education. Factor analysis was used to reveal educators' beliefs shared by factors, meaning that the educators' Q sorts load on the factors rather than the statements.

Summary

This chapter described the method used to conduct this study, which was designed to determine the beliefs that educators have about environmental education concepts in the United States and the United Kingdom. A particular focus was given to educators' beliefs concerning concepts taught in their classrooms and those concepts that are perceived as ideal. Sequentially, this chapter includes the instruments used in this study, which involved Q methodology, demographic information, and exit interview questions.

The remaining chapter includes the selection of the participants, research design, data analysis and summary.

Q methodology was determined to be the most appropriate statistical methodology for this study because subjective beliefs concerning environmental education can be collected and analyzed, resulting in objective records of the educators' subjective beliefs. Qualitative and quantitative interpretation may then be employed to determine the resulting factors representing points of view, which can be associated with a common perspective (Brown, 1980). Demographic attributes and their relationship to the participants' factor loadings will be described in chapter four.

This study used the 42 environmental education statements in the Q set developed and tested in the 1991 Chou study, which involved participation from faculty members of Ohio State University and the National Taiwan University. Forty educators, 20 each from the United States and the United Kingdom, were invited to participate in this study, which was conducted in February of 2000. The participants were certified educators who were contacted and invited to participate in the study by email, postal mail, and phone.

The researcher facilitated data collection by personally directing the participants through the Q sort process. The participants were requested to sort the 42 environmental statements onto the Q sort form board matrix according to two Conditions of Instruction. After the statements were sorted and recorded on each individual form board matrix, participants answered the three exit interview questions. The resulting 80 Q sorts were factor analyzed to reveal educators' beliefs.

CHAPTER IV

ANALYSIS OF DATA

This chapter focuses on the description and interpretation of the data collected in this study and the results of the statistical analysis. The purpose of this study was to investigate the following research questions:

1. According to educators, what beliefs emerge related to primary-12 classes in environmental education in the United Kingdom and United States?
2. In what ways do educators' perceptions of the actual and ideal primary-12 classes in environmental education in the United States and the United Kingdom differ?
3. In what ways can educators who hold such beliefs about environmental education in the United States and the United Kingdom be described using demographic attributes such as nation of training and experience (the United Kingdom and the United States), age, years of teaching experience, environmental education training, education level and major, number of hours spent watching educational television, gender, level of environmental activism, major sources of environmental education information, and religion?

The identification and description of the three factors that emerged from data analysis will be given first, followed by the description of the participants. The descriptions are based on the factor matrix with loadings that indicate a defining factor, the rank statement totals as well as the five highest (most likely found) ranked statements, the five lowest (least likely found) statements, and the distinguishing statements for each of the three revealed factors. Exit interview answers from the participants will assist in the factor interpretation.

Factor Solutions

Factor analysis revealed a three-factor solution was the optimum choice because more sorts were accounted for, leading to a statistically more favorable solution. A three-factor solution loaded 74 sorts out of 80, leaving 6 sorts out of the possible 80, which did not load into any of the three factors (Table I). Fifty-three percent of the variance was accounted for in the three-factor solution. A four-factor solution loaded 62 sorts out of 80, leaving 18 sorts, which did not load. Although 56 percent of the total variance was accounted for, the high number of unloaded sorts resulted in an unfavorable solution. A five-factor solution loaded 52 sorts out of 80, leaving 28 sorts, which did not load. Forty-five percent of the total variance was accounted for in the five-factor solution. Using a four- or five-factor solution is also theoretically less favorable because spreading the results over more factors was determined to dilute the meaning of each, and made the resulting data look increasing more similar with the addition of more factors. Table I represents the number of defining variables, or factors, the number of loadings and the percentage of total variance accounted for.

TABLE I

THREE-FACTOR SOLUTION

Category	Number		
Defining Variables:	1	2	3
Loaded Sorts:	51/80	14/80	9/80
Variance:	30%	14%	9%

Note: Total variance = 53%.

When using Q methodology, purely statistical criteria, however, should not be entirely relied upon. Factors may be produced that are statistically significant but lacking in meaning, and factors may be overlooked that are unimportant in terms of the proportion of the variance explained, but may hold special theoretical interest. Although the proportion of explained variance in factor three is much smaller than factor two, and particularly factor one, a three-factor solution was determined to be the optimal number of factor solutions based on the resulting theoretical analysis. Distinct categories of beliefs about environmental education concepts emerged. In sum, Q tends to emphasize the theoretical significance of factors while foregoing sole reliance on the statistical significance (McKeown & Thomas, 1988).

Description of the Participants

The 40 educators who participated in the study were asked to complete an information sheet (See Appendix B) and the consolidated results were tabulated

(Appendix C). Because of the large percentage of actual and ideal Q sorts that loaded on factor one, and to the absence of dominant distinguishing demographic characteristics of the participants among the three factors, the demographic information is included to in its entirety (Appendix C Table, C- I) to provide descriptive data about the participants as a whole and as members of the three distinct belief systems which emerged from the data analysis. Condensed participant information is given on Table II, which follows, to give insight into the type of educators who volunteered for this study.

The dominant demographic characteristics were found to be inconclusive in distinguishing the belief systems of the participants who loaded on each of the resulting three factors. Furthermore, a consolidation of the demographic information based on nations, the United States and the United Kingdom (Appendix C, Table C-II), revealed similar inconclusive results. Finally, a consolidation of participant information whose sorts loaded high (0.65-0.85) was constructed and similar findings resulted (Appendix C, Table III). Two discrepancies, however, were found under the participation category. Fourteen out of 40, or 35%, of participants took an active part in a social or a civic issue, while the high loaders resulted in 61% participation, or 10 participants out of 14. Nine

TABLE II

CONDENSED PARTICIPANT INFORMATION

Years of Teaching					
1-6	7-12	13-18	19-24	25-30	31-36
9	10	7	7	4	3
Gender					
Female	Male				
28	12				
Age Range					
18-26	27-35	36-44	45-53	54-62	63+
4	6	12	14	3	1
Highest Degree Obtained					
Bachelors	Masters	Doctorate	Other		
29	9	0	5		
Environmental Issue Source					
Television		Conservation Organizations		Newspapers	
7		7		7	
Religious Affiliation					
Church of England (Protestant)		Catholic		Roman Catholic	
8		9		7	
In the Past Year (top three):					
Purchased a product based on environmental implications or reasoning		Voted in an election		Made a contribution to an environmental organization or group	
35		31		22	

participants out of 40, or 22%, contacted an elected official about an environmental issue, while the high loaders resulted in 13 out of 14, or 90%, participation. With the exception of the high loaders, the belief systems of the participants who loaded on each of the resulting three factors are not distinguished by particular demographic variables.

The participants included 28 females and 12 males who were certified teachers of grades K-12, or, equivalently, nursery through Six Form College in the United Kingdom. Thirteen participants were from England, two were from Wales, and five were from Northern Ireland. Seven of the participants were from North Dakota, seven were from South Dakota, three were from Nebraska, two were from Texas and one was from Oklahoma. The number of years of teaching experience ranged from 1.5 years to 36 years, and ages ranged from the 20s to the 60s. Nine educators had obtained a Master's degree, which was the highest degree obtained. Education was given as the major area of study. Bachelor's degrees numbered 29, again with education as the major area of study.

The predominant sources of environmental information were television (7), newspapers (7) and conservation organizations (7). The second most common sources of environmental education were television (6) and conservation organizations (6). The third source was given as television (6) and books (6). Television played a major role as a source for environmental education information, although the average amount of time spent per week watching public television was given as 1.8 hours in the United Kingdom and 4.5 hours in the United States. Participation in environmental education programs in the United States was dominated by Project WILD (17), Project W.E.T. (12) and Project Learning Tree (9). Participation in environmental education programs in the United Kingdom appeared to be evenly split among a variety of programs.

Out of 40 educators, 34 claimed affiliation with a religion and four educators claimed no religious affiliation. One educator claimed to be "lapsed" and another to have "no preference." The most common action taken as a result of personal beliefs involved the purchase of a product based on environmental implications or reasoning (i.e., organic produce), with a total of 35 educators. Thirty-one participants voted in an election, and 22 made a contribution to an environmental organization or group. Twenty joined or continued membership in an environmental organization, and 14 took an active part in a social or a civic issue. The last two categories included 13 educators who volunteered time with an environmental organization or project, and nine who contacted an elected official about an environmental issue. Thirty-seven Caucasians, one African American and one Native American were involved in the study. One participant listed "other" as a choice, but did not specify a race. No Hispanic or Asian educators were involved in the study.

Discussion of Factors

Q methodology uses the statistical application of correlational and factor analytical techniques. Each Q-sort, an independent experiment, is unique to the individual respondent. There are 2x3x4x4x5x6x5x4x4x3x2 or 1,382,400 possible combinations that can occur. A respondent is likely to replicate his or her Q sort despite the large number of possible combinations of the 42 statement cards. If a respondent, given that the administration of the sort is separated by a day or two, is instructed to take the same Q sort twice the test-retest reliability coefficients would be roughly .80 to .90. It is highly

unlikely that a respondent would ever correlate with himself or herself as highly as 1.00 (Frank, 1956; Steller & Meurer, 1974).

Once the Q sorts were completed, data analysis was accomplished through factor analysis of the correlation matrix, followed by principal components analysis. A VARIMAX rotation was then completed, and the rotated factor matrix was QANALYZED, which differentiates the factors based on the original Q sort statements through calculated z-scores. Persons are correlated using Q, and the resulting factors on which they load are indicative of their point of view. The loadings express the extent to which each Q sort is associated with each factor, but the focus of data interpretation is on the factor scores for each statement (Brown, 1993).

Factor interpretation proceeds on the basis of factor loadings in most research applications. In Q, however, interpretations are based primarily on the factor scores, which are essentially weighted z-scores for each sample in the Q sample. The weighted z-scores are reconverted into an array of scores (factor array), or model Q sort, corresponding to the plus five (+5) to minus five (–5) values used in the original continuum. Factor scores are computed by designating as defining variants only those Q sorts that are significantly loaded on a given factor. Only pure or high loads were used to calculate the z-scores. Those Q sorts are then merged in computing an array for that type. Because of the differences in the magnitude of significant loadings, some Q sorts are more closely associated with the viewpoint of a particular factor than are others. The differing magnitudes are calculated to determine the factor scores, which are computed as z-scores, but converted into whole numbers to facilitate comparisons between factor arrays. Those scores are then compared to determine that the Q sample items are

distinguishing, or placed in significantly different locations in the opinion continuum for any two factors. Factors are then analyzed from the determination of those distinguishing statements. Data analysis is dependent on how the participants in the study performed, which determines how many different factors, or families, exist. Focus was given on assessing the emerging theories or patterns associated with the factor loadings. These factors represent points of view, and persons are assumed to share a common perspective when they are significantly associated with a given factor (McKeown & Thomas, 1988).

The resulting factors in this study represent the groupings of UK and U. S. educators and their beliefs about concepts in environmental education. Factor interpretation of the three factors was accomplished through a combination of statistical data and qualitative information obtained from the demographic information and the exit interview questions. Appendix D, Table I, contains the factor matrix indicating the loadings of each of the actual and ideal sorts and the normalized factor (z) scores associated with the rank statement totals with each factor for each of the three revealed factors, which were used to formulate a description of the factors, or families, in which the respondents were correlated. The ranked statements for each of the three factors are recorded onto separate Q sort form boards as shown in Figures 2-4. The distinguishing statements are marked with a star (*) and the consensus statements are marked with a plus sign (+) to aid in the interpretation of the beliefs of those who loaded on each of the three separate factors. Forty educators sorted the Q set according to two Conditions of Instruction, resulting in a total of 80 Q sorts.

The significance of a factor, or "strength" of a factor, is related to the percent of total variance (Brown, 1980). In this study, a three-factor solution emerged, accounting

for 53% of the total variance as shown on Table I, pg. 104 of this chapter. The participants' demographic data are summarized from the Information Sheet and the description of the three factors, or belief types, which emerged from the factor analysis, is described and summarized.

					13*					
				26	30	21				
		28*	38	6*	24	40*	16	9*		
	14+	12*	37+	31	19*	4+	34	15	23	
17	32	20	35	18*	25*	22	39*	29	33*	1
11	5	8	2	42*	10*	41*	27	7*	3*	36*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Least Likely					Neutral					Most Likely

Note: Numbers denote statements; * = distinguishing statements, + = consensus statements.

Figure 2. Q Sort Matrix - Factor One: Interdependence Loadings.

					30					
				28	42*	4+				
		20	38	36*	40*	6*	34	13*		
	32	11*	29*	35	9*	18	41	31*	15	
14+	3*	39*	25*	24*	26	10*	16	27	7*	23
8*	2*	17*	37+	12*	5*	33	21	22	19*	1
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Least Likely					Neutral					Most Likely

Note: Numbers denote statements; * = distinguishing statements, + = consensus statements.

Figure 3. Q Sort Matrix - Factor Two: Ecology Loadings.

					22					
				33	1*	27				
		13*	40*	21*	3*	41	38*	26*		
	35*	19*	37+	31	39*	42*	15	30*	36*	
17	20	5	2	28	4+	25*	9*	18	6*	34*
11	14+	8	16*	7*	32*	24	23*	12*	29	10*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Least Likely					Neutral					Most Likely

Note: Numbers denote statements; * = distinguishing statements, + = consensus statements.

Figure 4. Q Sort Matrix - Factor Three: Conservation Loadings.

Factor Matrix

The Factor Matrix (Appendix D, Table I) indicates the summary Q sorts. Only pure or high loads were used to calculate the z scores for all three factors, or belief types. These belief types, which emerged, were not based on a priori assumptions, but emerged based on the participants' resulting load. The coding system indicates the participants' number, their nation (US represents the United States and UK represents the United Kingdom), their gender (F represents female and M represents Male), and the "r" and "a" represent their real and actual sorts, respectively. The "X" on the Factor Matrix indicates on which factor the participants loaded their two sorts, actual and ideal. The absence of an "X" indicates that the participant did not load on that factor.

Results of Research Question One

According to Educators, What Beliefs Emerge Related to Primary-12 Environmental Education Classes in the United Kingdom and the United States?

Educators in the United Kingdom and the United States rank ordered a set of environmental statements twice, resulting in a three-factor solution, which emerged, from data analysis, accounting for 53% of the total variance. The resulting factors represent the groupings of educators who hold similar beliefs about environmental education. A discussion of the factor interpretations of Factors One: Interdependence: Responsibility for the Natural Environment, Factor Two: Ecology: Knowledge of the Natural

Environment, and Factor Three: Conservation: Responsible Environmental Action follows.

Factor One, Interdependence: Responsibility for The Natural Environment

Out of 80 sorts, 51 loaded on factor one, Interdependence. The title of this factor was constructed based on the belief system of those participants who loaded their Q sorts on this factor, which center on the awareness of the interconnectedness of all living things and particularly on the belief that people have a moral responsibility to take care of the planet.

The following information gives a breakdown of the participants whose sorts loaded on the Interdependence factor. The average number of years of teaching by the 21 female and 8 male participants who loaded Q sorts on factor one, Interdependence, was 15 years. Sixty-eight percent were between the ages of 45 and 53, 27% between the ages of 36 and 44, and 18% were between the ages of 27 and 35. Twenty participants have bachelor's degrees, eight have master's degrees and one has a teaching certificate. The predominant religions were Catholic and Methodist. Environmental information was obtained primarily through conservation organizations, television and books. The majority of the participants were Caucasian.

The participants who loaded their two sorts on factor one actively sought out environmental education information, determined from their primary sources of environmental information, which were listed as conservation organizations, television and books. All of the 21 educators have purchased a product based on environmental

implications and reasoning, and half of them have joined or continued membership in an environmental organization or project and taken an active part in a social or a civic issue.

Factor one, Interdependence, reveals a holistic, globally minded, interdependent belief towards the environment. The environment is viewed as delicate, precious and irreplaceable. People are seen as having a moral responsibility to take care of the planet, which includes "all living things," because of their respect for Earth and as a result of the interrelationship among humans and the environment. The key dominating beliefs of Interdependence include feelings of respect and value for the environment; the interdependence of all living things; and people's moral responsibility to take care of the environment for present and future generations. The beliefs of the participants who loaded their sorts on the Interdependence factor were exemplified in the writing of a participant from the United Kingdom, who wrote; "We have not inherited it (the Earth) but borrowed it from our children."

The beliefs of the Interdependence factor are revealed through the rank statement totals, which include the normalized factor (z) scores and statement rankings (Appendix D), and with the distinguishing and consensus statements (Appendix D). Statements most likely found in the educators' environmental education programs were placed in the +5 and +4 columns on the Q sort form board matrix, and, therefore, had the highest normalized (z) scores. The statements least likely found were placed in the -5 and -4 columns on the Q sort form board matrix, and, therefore, had the lowest normalized (z) scores. Statement loadings are found in Appendix D Figure I. The five statements that Interdependence participants believed should be most likely and least likely found in their

environmental education programs, along with the distinguishing statements, are given in Table III.

The stewardship approach toward the natural environment can be found in statements #33 and #36, which assert that human beings are responsible for maintaining the diversity of life and must take care of Earth for future generations. Statement #3 further supports the belief that humans are responsible for taking care of the environment through accountability for their environmental decisions. The beliefs in the interrelationship and interdependence among all living things are evidenced in statement numbers 1 and 23. Implicit in these statements is the belief that human beings are a part of the interconnectedness of nature, not separate from it.

Participants who loaded on factor one, Interdependence, believe that the foundation of environmental education programs lay in teaching students to value and respect the natural world. Factor one loaders believe in a stewardship approach toward the natural world, which stems from feelings of personal and moral responsibility for future generations. Environmental education teachers with the belief system of factor one participants focus their environmental education programs on the promotion of positive environmental attitudes and feelings, relying on the affective domain of education.

TABLE III

FACTOR ONE, INTERDEPENDENCE: RESPONSIBILITY FOR THE NATURAL ENVIRONMENT – FIVE HIGHEST, LOWEST AND DISTINGUISHING STATEMENTS

No.	Statement	z Score
Five Highest Ranked (Most Likely Found)		
1	Living things are interdependent with each other and their environment.	1.840
36	Each of us should live a life guided by respect for the earth and all living things, now and in the future.	1.790
23	All living things are affected by and interact with their environment.	1.609
33	As human beings, we are a part of the diversity of life, and are responsible for maintaining it.	1.500
3	Humans have a moral responsibility for their environmental decisions.	1.335
Five Lowest Ranked (Least Likely Found)		
11	Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations.	-1.987
17	There is a maximum human population matched to each resource base. Population cannot exceed this level if a satisfactory standard of living for all people is to be maintained.	-1.598
5	Increasing population and per capita use of resources have brought about changed land-to-people or resource-to-population ratios.	-1.400
32	Economics is not just about producing wealth, and ecology is not just about protecting nature; they are both relevant in improving the quality of human life.	-1.342
14	Knowledge of social structures, institutions, and culture of a society must be brought to bear on environmental considerations.	-1.333
Five Most Distinguishing Statements		
36	Each of us should live a life guided by respect for the earth and all living things, both now and in the future.	1.79
23	All living things are affected by and interact with their environment.	1.61
33	As human beings, we are a part of the diversity of life, and are responsible for maintaining it.	1.50
3	Humans have a moral responsibility for their environmental decisions.	1.33
9	Humans have a responsibility to develop an appreciation of and respect for the rights of others.	1.33

Note: Based on normalized factor (z) scores.

Factor one, Interdependence, shares with factor two, Ecology: Knowledge of the Natural Environment, the belief that all living things are interdependent, which is evidenced in the following statement which was ranked highly in both factors:

- #1 Living things are interdependent with each other and their environment.

Respect for the earth and all living things is a belief that factor one, Interdependence, educators also share with factor three, Conservation: Responsible Environmental Action. This is found in the statement ranked high by both factors:

- #36 Each of us should live a life guided by respect for the earth and all living things, now and in the future.

Participants who loaded on factor one, Interdependence, differentiate themselves from the other two factors through the distinguishing statements. Four of the distinguishing statements overlap with the five highest ranked statements, giving support to factor one's beliefs concerning peoples' responsibility to take care of the environment, the interdependence of all living things, and the importance of respecting the environment. Distinguishing statements are those statements, which set apart, or distinguish, this factor from the other factors.

The belief that people are responsible for caring for Earth, evidenced in the distinguishing statements and the highest ranked statements, characterize and differentiate factor one from factors two and three. In addition, the following distinguishing statement found in factor one, Interdependence, supports the recurring reference to humans and their responsibility for stewardship of the Earth.

- #9 Humans have a responsibility to develop an appreciation of and respect for the rights of others (+3).

Statements which focus on concepts related to human population and family planning, and the impacts of differing cultures and societies on the environment were ranked lowest by educators whose sorts loaded on factor one, Interdependence. During the facilitation of the Q sorts, several educators verbally expressed their hesitancy to teach concepts related to the increasing human population, although they believed that it is important in the context of environmental education. The reason cited for this choice dealt with the controversial nature of population control related to religious doctrine. Several educators also verbally expressed their hesitancy to teach concepts related to social structures and cultures because of the possibility of negative consequences as a result of teaching controversial and sensitive topics.

To aid in the interpretation of factors, participants were given the opportunity to make crucial comments related to their personal opinions concerning environmental education. The comments made by participants loading their sorts on factor one support the description of factor one, Interdependence, and the beliefs and attitudes that these participants share. The overarching beliefs which emerged from the Interdependence factor can be divided into (1) feelings of respect and value for the environment, (2) the interdependence of all living things, and (3) people's moral responsibility to take care of the environment for present and for future generations.

All of the beliefs expressed by those educators who had high Q sort loads on factor one, Interdependence, were the foundation of the beliefs inherent in this factor. Five participants had high Q sort loads (.70-.88) on factor one, Interdependence. Two

were females from the United Kingdom who taught Infant level (ages 5-7), one was a female from the United Kingdom who taught Ages 9-11, one was a male from the United Kingdom who taught all levels, and one was a female from the United States who taught first grade. When asked what their students should know about the environment and how they believe they influence their students through their environmental education programs, their answers exemplify factor one beliefs.

The two female Infant educators from the United Kingdom believe that the environment should be valued and preserved, and that humans have a responsibility for taking care of their environment. They believe that children should be taught to appreciate the interdependence of nature and the things around them, and what they can do to work together to construct solutions to environmental problems having long-term implications. The female Ages 9-11 educator from the United Kingdom believes that students should be taught that the environment is precious and irreplaceable, and essential to the well being of society. Furthermore, taking away part of an ecosystem may become a global issue.

The male educator from the United Kingdom has been teaching all age levels, and believes in educating students about "the processes behind life and resources on our planet and the interrelationships of all things, and how our actions impact upon our environment and others environments." He also believes that students should "contribute towards the continued existence of species, resources and the concept of themselves as caretakers of the environment for future generations." The first grade educator from the United States wrote that students should be taught "that we are responsible to care for the world and that we must individually take responsibility for this."

The beliefs of all of the educators who loaded sorts on factor one, Interdependence, supported the attitudes of the participants concerning the respect and value of the environment, the interdependency of all living things and the responsibility of humankind to preserve the environment of the earth. The educators who loaded on Interdependence believed that they influenced their students by teaching them to value the earth and to gain an appreciation of their natural surroundings. The most cited concept dealt with the responsibility of humankind to take care of the environment for present and future generations. Finally, peoples' moral responsibility to take care of the environment for present and for future generations was believed to be an important component in environmental education by the educators whose sorts loaded on factor one. The participants who loaded their sorts on factor one, Interdependence, particularly stressed the importance of educating their students to care for their environment, not just locally, but to "care for the world," because "our well-being and future generations well-being depend on how we take care of our environment." These educators focused on the importance of developing their students' sense of responsibility related to their role as caretakers of the environment for future generations.

Factor Two, Ecology: Knowledge of the Natural Environment

Out of 80 sorts, 14 loaded on factor on factor two, Ecology. The title of this factor was constructed based on the emergent belief systems of those participants who loaded their Q sorts on this factor, which center on facts and knowledge of the natural environment. The following information gives a breakdown of the participants who loaded their sorts on the Ecology factor.

The average number of years taught by the five female and four male participants who loaded Q sorts on factor two, Ecology was four years. Six participants have bachelor's degrees and three have a master's degree. The majority of the participants were Catholic. Environmental information was obtained primarily through newspapers, conservation organizations and television.

Factor two educators are described as individuals who believe that the environment is precious and irreplaceable. They view the natural environment as valuable and the interrelationships of all living things as an important component in environmental education. Unlike the educators who loaded on factor one, Interdependence: Responsibility for the Natural Environment, those educators who loaded on factor two, Ecology: Knowledge of the Natural Environment, do not believe that humans have a moral responsibility to take care of the environment. Responsibility is a recurring theme in factor one, but is not evidenced in the statements factor two educators ranked as most likely to be found in their environmental education classes. The primary belief of these educators is that environmental education should be based on facts and knowledge of the natural environment.

As with factors one and three, the beliefs of the Ecology factor are revealed through the rank statement totals and the distinguishing statements. Statements most likely found in the educators' environmental education programs were placed in the +5 and +4 columns on the Q sort form board matrix, and, therefore, had the highest normalized (z) scores. The statements least likely found were placed in the -5 and -4 columns on the Q sort form board matrix, and, therefore, had the lowest normalized (z) scores. Statement rankings are found in Appendix D. The five statements Ecology

participants most agreed with and least agreed with, along with the distinguishing statements, are given on Table IV.

The beliefs of educators who loaded on factor two, Ecology: Knowledge of the Natural Environment, do not believe that humans have a moral responsibility to take care of the environment. Factor one educators believe people it is the responsibility of people to care for the earth. The statement which most distinguishes factor two, Ecology, from factor one, Interdependence, is a statement that educators ranked as least likely to be found in their environmental education classes, which states:

- #3 Humans have a moral responsibility for their environmental decisions.

References to people are not found in the five highest ranked statements in factor two, Ecology. The participants who loaded on this factor ranked statements related to the interrelatedness of all living things and the value of the natural environment, as evidenced in the following highest ranked statements:

- #23 All living things are affected by and interact with their environment (+5).
- #15 The natural environment is irreplaceable (+4).

TABLE IV

FACTOR TWO, ECOLOGY: KNOWLEDGE OF THE NATURAL ENVIRONMENT – FIVE HIGHEST, LOWEST, AND DISTINGUISHING STATEMENTS

No.	Statement	z Score
Five Highest Ranked (Most Likely Found)		
23	All living things are affected by and interact with their environment.	1.934
1	Living things are interdependent with each other and their environment.	1.900
15	The natural environment is irreplaceable.	1.482
7	Plants are the ultimate sources of food, clothing, shelter, and energy in most human societies.	1.366
19	Environment is the sum of all external conditions and influences affecting organisms. The environment may be divided into biotic (living) and abiotic (non-living) components.	1.334
Five Lowest Ranked (Least Likely Found)		
8	Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts.	-1.915
14	Knowledge of social structures, institutions, and culture of a society must be brought to bear on environmental considerations.	-1.681
2	Social values and customs influence personal conservation behavior.	-1.609
3	Humans have a moral responsibility for their environmental decisions.	-1.242
32	Economics is not just about producing wealth, and ecology is not just about protecting nature; they are both relevant in improving the quality of human life.	-1.039
Five Most Distinguishing Statements		
23	All living things are affected by and interact with their environment.	1.93
15	The natural environment is irreplaceable.	1.48
7	Plants are the ultimate sources of food, clothing, shelter, and energy in most human societies.	1.37
19	Environment is the sum of all external conditions and influences affecting organisms. The environment may be divided into biotic (living) and abiotic (non-living) components.	1.33
13	In any environment, one component such as space, water, air or food may become a limiting factor.	1.31

Note: Based on normalized factor (z) scores

Furthermore, the beliefs of participants who loaded on factor two, Ecology, may be summed up as knowledge of the natural environment. These educators could be characterized as those who believe that environmental education should be based on environmental knowledge and whose environmental education classes would be composed primarily of environmental facts and knowledge of the natural environment. These beliefs are evidenced by the statements participants ranked as highest and therefore most likely to be found within their environmental education classes:

- #7 Plants are the ultimate sources of food, clothing, shelter, and energy in most human societies (+4).
- #19 Environment is the sum of all external conditions and influences affecting organisms. The environment may be divided into biotic (living) and abiotic (non-living) components (+4).

Factor two, Ecology: Knowledge of the Natural Environment, shares with Factor one, Interdependence, the belief that all living things are interdependent, which is evidenced in the following statement which was ranked highly in both factors:

- #1 Living things are interdependent with each other and their environment (+5).

Participants who loaded on factor two, Ecology, differentiated themselves from the other two factors through the distinguishing statements. Four of the distinguishing statements overlap with the five highest ranked statements, giving support to the beliefs of educators loading on factor two that the environment is irreplaceable, and the natural environment and the interrelationships of all living things are important components in environmental education. Furthermore, support is given to the belief that environmental

education should be based on environmental knowledge. Distinguishing statements are those statements, which set apart, or distinguish, this factor from the other factors.

Participants who loaded on factor two, Ecology, could be characterized as educators who believe that the natural environment has intrinsic value and is not defined by human use. Their philosophy of teaching environmental education is based on environmental knowledge rather than on people's relationship to the natural world or the stewardship approach to the environment. Those educators who loaded on factor two could be described as scientifically-minded, or those whose environmental education classes would be composed primarily of environmental facts and knowledge of the natural environment. Societal values and cultures as they relate to conservation behavior would be least likely found in their environmental education classes, as would the relationship between economics and ecology. Support for this viewpoint can be found in the following statements, which were ranked as least likely to be found in the environmental education programs of those educators who loaded on the Ecology factor:

- #8 Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts (-5).
- #14 Knowledge of social structures, institutions, and culture of a society must be brought to bear on environmental considerations (-5).
- #2 Social values and customs influence personal conservation behavior (-4).

- #32 Economics is not just about producing wealth, and ecology is not just about protecting nature; they are both relevant in improving the quality of human life (-4).

To aid in the interpretation of factors, participants were given the opportunity to make crucial comments related to their personal opinions concerning environmental education. The comments made by participants whose Q sorts loaded on factor two support the description of factor two, Ecology, and the beliefs and attitudes that these participants share. These answers exemplify the beliefs of these educators who advocate knowledge-based environmental education. The beliefs of the participants whose sorts loaded on factor two believe that students should be aware of the "basic biological concepts that underpin ecology." Educational concepts in environmental education classrooms of those educators who loaded their sorts on factor two, Ecology, relate to content rather than feelings or attitudes. These educators attempt to "provide both sides of environmental issues and let the students decide for themselves," believing "it is not the educator's place to influence student opinions."

Factor Three, Conservation: Responsible Environmental Action

Out of 80 sorts, nine loaded on factor three, Conservation, accounting for nine percent of the total variance. The title of this factor was constructed based on the emergent belief systems of those participants who loaded their Q sorts on this factor, which center on the belief that responsible environmental action should be a key component of environmental education.

The following information gives a breakdown of the participants who loaded their Q sorts on factor three, Conservation. The number of years taught by the participant who loaded actual and ideal sorts on factor three was 14 years. The five female participants and two male participants have been teaching for an average of 20 years. The majority of participants are between the ages of 36-44 years. Four participants have bachelor's degrees, one participant has a teaching certificate, and one has a master's degree. The majority of the participants are Catholic and Caucasian. Environmental information was obtained primarily through newspapers, television and magazines.

Educators who loaded on factor three, Conservation: Responsible Environmental Action, believe that people should live their lives guided by respect for Earth and all living things, and that responsible environmental action should be a key component of environmental education. Active conservation of natural resources through the reduction of wasteful consumption, recycling, and the preservation of the environment through safe waste disposal and energy conservation should be critical components of environmental education, according to the beliefs of these educators,

As with factors one and two, the beliefs of factor three, Conservation, are revealed through the rank statement totals and the distinguishing statements, which include the z scores and the factor arrays. Statements most likely found in the educators' environmental education programs were placed in the +5 and +4 columns on the Q sort form board matrix, and, therefore, had the highest normalized (z) scores. The statements least likely found were placed in the -5 and -4 columns on the Q sort form board matrix, and, therefore, had the lowest normalized (z) scores. The five statements Conservation

participants ranked as most likely and least likely to be found in their environmental education classes, along with the distinguishing statements, are given in Table V.

Educators who loaded on the factor three, Conservation, can be described as action oriented and future focused in their environmental beliefs. They are the educators who attempt to instill in their students a respect for the environment, and to move beyond attitudes and knowledge to active involvement in environmental issues. Their ideology could be summed up in one of the statements ranked as most likely to be found in their environmental education program, which reads, "Responsible environmental actions are the obligation of all levels of society, starting with the individual."

Factor three, Conservation: Responsible Environmental Action, shares the belief with factor one, Interdependence that people should have respect for Earth and all living things and that this belief should be reflected in the ways in which people live. This is found in statement #36, ranked highly by both factors.

- #36 Each of us should live a life guided by respect for the Earth and all living things, now and in the future.

Participants who loaded on factor three, Conservation, differentiate themselves from the other two factors through the distinguishing statements. Four out of the five highest ranked, or most likely found, statements overlapped with four out of the five most distinguishing statements, giving support to this factor's beliefs. Distinguishing statements are those statements, which set apart, or distinguish, this factor from the other factors. These statements epitomize the beliefs of factor three, which involves responsible

TABLE V

FACTOR THREE, CONSERVATION: RESPONSIBLE ENVIRONMENTAL ACTION – FIVE HIGHEST, LOWEST, AND DISTINGUISHING STATEMENTS

No.	Statement	z Score
Five Highest Ranked (Most Likely Found)		
34	Effective ways to conserve both renewable and nonrenewable resources include reducing wasteful consumption and recycling materials whenever possible.	1.526
10	Safe waste disposal, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes, and heat is important if the well being of humans and the environment is to be preserved.	1.381
36	Each of us should live a life guided by respect for the earth and all living things, now and in the future.	1.268
6	Energy, its production, uses, and conservation are essential in the maintenance of our society.	1.156
29	Responsible environmental actions are the obligation of all levels of society, starting with the individual.	1.111
Five Lowest Ranked (Least Likely Found)		
11	Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations.	-1.871
17	There is a maximum human population matched to each resource base. Population cannot exceed this level if a satisfactory standard of living is to be maintained.	-1.783
14	Knowledge of social structures, institutions, and culture of a society must be brought to bear on environmental considerations.	-1.585
20	Social and technological changes alter the interrelationships between the importance of and uses for natural resources.	-1.492
35	Environmental degradation leads to the deterioration of not only natural systems, but also the cultural environment, as cultural conditions are dependent on natural surroundings.	-1.400
Five Most Distinguishing Statements		
34	Effective ways to conserve both renewable and nonrenewable resources include reducing wasteful consumption and recycling materials whenever possible.	1.53
10	Safe waste disposal, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes, and heat, is important if the well being of humans and the environment is to be preserved.	-1.38
36	Each of us should live a life guided by respect for the earth and all living things, now and in the future.	1.27
6	Energy, its production, uses, and conservation are essential in the maintenance of our society.	1.16
26	The management of natural resources to meet the needs of successive generations demands long-range planning.	1.08

Note: Based on normalized factor (z) scores

environmental behavior based on the knowledge of effective strategies designed to improve the environment. They are:

- #34 Effective ways to conserve both renewable and nonrenewable resources include reducing wasteful consumption and recycling materials whenever possible (+5).
- #10 Safe waste disposal, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes, and heat is important if the well being of humans and the environment is to be preserved (+5).
- #36 Each of us should live a life guided by respect for Earth and all living things, now and in the future (+4).
- #6 Energy, its production, use, and conservation are essential in the maintenance of our society (+4).

The fifth statement out of the five most distinguishing statements reinforces the active, future focused conservation theme of factor three:

- #26 The management of natural resources to meet the needs of successive generations demands long-range planning (+3).

The five lowest ranked, or least likely found, statements relate to social structures, cultures, and population issues. The first statement can be found in the lowest ranked categories in all three factors. Again, several educators expressed verbally that they believed teaching controversial and sensitive topics related to people's social and cultural beliefs may result in negative consequences.

- #14 Knowledge of social structures, institutions, and culture of a society must be brought to bear on environmental considerations (-4).

The following two statements can be found in the lowest ranked, or least likely found, categories in factor one, Interdependence, and factor three, Conservation:

- #11 Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations (-5).
- #17 There is a maximum human population matched to each resource base. Population cannot exceed this level if a satisfactory standard of living is to be maintained (-5).

The final two lowest ranked statements, or least likely found statements, in factor three deal with the relationship between natural resources and social and technological changes, and the cultural environment and environmental degradation.

- #20 Social and technological changes alter the interrelationships between the importance of and uses for natural resources (-4).
- #35 Environmental degradation leads to the deterioration of not only natural systems, but also the cultural environment, as cultural conditions are dependent on natural surroundings (-4).

To aid in the interpretation of factors, participants were given the opportunity to make crucial comments related to their personal opinions concerning environmental education. The comments made by participants loading their two individual sorts on this factor epitomize the beliefs of the participants who loaded on factor three, Conservation. Factor three educators believe that students need to know that their actions affect the

environment and that what they do, as individuals, matters. They believe that one person can make a difference, and the actions they take will influence the actions of others. They attempt to influence their students by their actions and not by words alone and strive to influence their students to continue to learn about environmental education. One educator who loaded sorts on factor three, Conservation, stated that, in her classroom, "students have helped find solutions to environmental problems. By recycling and reusing many items they feel they are part of the solution."

Results of Research Question Two

In What Ways Do Educators Believe Their Perception of the Ideal Primary-12 Environmental Education Classes in the United States and the United Kingdom Differ from the Actual?

Data analysis revealed that, out of a total of 40 participants in this study, 22 loaded their actual and ideal sorts on factor one, Interdependence; 5 out of 40 loaded their actual and ideal sorts on factor two, Ecology; and 1 out of 40 participants loaded their actual and ideal sorts on factor three, Conservation. Twenty-eight participants, or 70% of the total number of participants in this study, loaded their actual and ideal sorts on the same factor. Table VI summarizes the sort loadings.

TABLE VI

SUMMARY OF ACTUAL AND IDEAL Q SORTS
LOADING ON THE SAME FACTOR

Factor	Actual	Ideal
One: Interdependence	5ukf, 6ukf, 9ukf, 11ukf, 12ukf, 13ukf, 14ukm, 15ukm, 19ukf, 21ukf, 22usf, 24usf, 25usm, 26usf, 28usf, 31usf, 32usm, 34usf, 35usf, 37usf, 39usf, 40usm	5ukf, 6ukf, 9ukf, 11ukf, 12ukf, 13ukf, 14ukm, 15ukm, 19ukf, 21ukf, 22usf, 24usf, 25usm, 26usf, 28usf, 31usf, 32usm, 34usf, 35usf, 37usf, 39usf, 40usm, 18ukm
Two: Ecology	2usf, 3ukf, 4ukm, 29usf, 30usm	2usf, 3ukf, 4ukm, 29usf, 30usm
Three: Conservation	38usf	38usf

For the majority of the educators, the concepts included in their environmental education program are the same as those they would include in their perception of the ideal environmental education program. In spite of the participants' list of barriers that have been preventing them from implementing their perception of the ideal environmental education program, the majority of the educators loaded their actual and ideal sorts loaded on the same factor, resulting in congruent loads. The following information relates to those participants who loaded their actual and ideal sorts on different factors.

As Table VII indicates, four females and one male participant loaded their actual sort on the Interdependence factor. Of the five educators who loaded their actual sort on

this factor, three ideal sorts loaded on factor three; Conservation, and two ideal sorts did not load. Two females loaded their actual sorts on factor two, Ecology. Both of their ideal sorts loaded on factor three. Two males loaded their actual sorts on factor two, Ecology. One of the ideal sorts did not load, and one loaded his ideal sort on factor one, Interdependence. Two participants loaded their actual sorts on factor three, Conservation. One ideal sort did not load and the remaining sort loaded on factor one, Interdependence.

TABLE VII

SUMMARY OF ACTUAL AND IDEAL Q SORTS
LOADING ON DIFFERENT FACTORS

Factor	Actual	Ideal
One: Interdependence	8UKF, *1USF, 23UKM, 27USF, *36USF	18UKM, 16UKF
Two: Ecology	*33USM, 7UKF, 18UKM, 20UKF	
Three: Conservation	*17UKM, 16UKF	8UKF, 20UKF, 23UKM, 27USF, 7UKF

Note: *denotes second sort did not load

Results of Research Question Three

In What Ways Can Educators Who Hold Such Beliefs about Environmental Education in the United States and the United Kingdom Be Described Using Demographic Attributes, Such as Nation of Training and Experience (The United Kingdom and the United States), Age, Years of Teaching Experience, Environmental Education Training, Education Level and Major, Number of Hours Spent Watching Educational Television, Gender, Level of Environmental Activism, Major Sources of Environmental Education Information, and Religion?

Although the demographic information was calculated in three ways: consolidated from the total number of educators who participated in the study, separated into nation of origin, and consolidated from participants whose sorts loaded high (0.65-1.0), no distinguishing demographic variables were found. The demographic information was found to be inconclusive in distinguishing the belief systems of the participants who loaded on the three factors. No dominant defining demographic characteristics distinguished each of the resulting belief systems of the three factors.

Summary

This chapter discussed the factor interpretation determined from using Q methodology to respond to the research questions. Research question number one asked, "According to educators, what beliefs emerge related to primary-12 classes in environmental education in the United Kingdom and United States?" A three-factor

solution was revealed, through factor analysis, as the optimum choice because more sorts were accounted for, leading to a statistically more favorable solution. Seventy-four sorts out of 80 loaded, leaving six sorts, which did not load into any of the three factors. Fifty-three percent of the variance was accounted for in the three-factor solution.

The resulting three factors in this study represent the groupings of UK and U. S. educators and their beliefs about concepts in environmental education. Factor one, Interdependence: Responsibility for the Natural Environment, loaded 51 out of 80 possible sorts. Factor one beliefs center on the feelings of respect and value for the environment, an awareness of the interconnectedness of all living things, and the belief that people have a moral responsibility to take care of the planet for present and future generations.

Out of 80 sorts, 14 loaded on factor on factor two, Ecology: Knowledge of the Natural Environment. Factor two beliefs center on the intrinsic value of the natural environment, not defined by human use, and the interrelationship of all living things. Their philosophy of teaching environmental education is based on environmental knowledge rather than on people's relationship to the natural world.

Nine sorts out of a possible 80 loaded on factor three, Conservation: Responsible Environmental Action. Factor three beliefs center on responsible environmental action resulting from a respect for the Earth and all living things. Active conservation of natural resources by reducing wasteful consumption and recycling should be a key component of environmental education, according to the beliefs of the educators whose sorts loaded on this factor. They teach their students to move beyond attitudes and knowledge to active involvement.

Research question number two asked, "In what ways do educators believe their perception of the ideal primary-12 environmental education classes in the United States and the United Kingdom differ from the actual?" Twenty-eight participants, or 70% of the total number of educators in this study, loaded their actual and ideal sorts on the same factor, resulting in congruent loads. For the majority of educators in this study, the actual and ideal do not differ in their environmental education programs, in spite of the barriers they listed that have prevented the educators from teaching to the ideal. The barriers are discussed in Chapter V.

The third question posed in this study asked, "In what ways can educators who hold such beliefs about environmental education in the United States and the United Kingdom be described using demographic attributes such as nation of training and experience (the United Kingdom and the United States), age, years of teaching experience, environmental education training, education level and major, number of hours spent watching educational television, gender, level of environmental activism, major sources of environmental education information, and religion?"

Although the demographic information was calculated in three ways, no distinguishing demographic variables were found. The demographic information was found to be inconclusive in distinguishing the belief systems of the participants who loaded on the three factors. No dominant defining demographic characteristics distinguished each of the resulting belief systems of the three factors. The demographic information has been included to provide descriptive data about the participants as a whole and as members of the three distinct belief systems.

CHAPTER V

SUMMARY, DISCUSSION OF RESEARCH FINDINGS, IMPLICATIONS AND RECOMMENDATIONS

Summary of the Study

This study involved rank ordering 42 environmental statements by 20 educators in the United States and 20 United Kingdom educators to determine the beliefs about environmental education concepts in the United States and the United Kingdom as held by educators teaching environmental education. A particular focus was given to educators' beliefs concerning concepts taught in their classrooms and those concepts that are perceived as ideal. The third focus of the study was on determining if the 40 educators, who hold such beliefs about environmental education, can be described using demographic attributes. Three instruments were used in this study to increase understanding and depth of meaning of the educators' beliefs concerning environmental education concepts. The instruments included a Q sort, demographic information and exit interview questions.

Discussion of Findings

Three distinct categories of beliefs about environmental education concepts were revealed through factor analysis. A three-factor solution loaded 74 sorts out of 80 and was determined to be the optimum choice because more sorts were accounted for, leading to a statistically more favorable solution, as well as less theoretical dilution of the meaning of each factor. Fifty-three percent of the variance was accounted for in the three-factor solution. Factor interpretation of the three factors was accomplished through a combination of statistical data and qualitative information obtained from the demographic information and the exit interview questions. The participants included 28 females and 12 males who were certified educators of grades K-12, or, equivalently, nursery through Six Form College in the United Kingdom. They were asked to rank order a set of environmental concept statements twice. The resulting three factors in this study represent the groupings of UK and U. S. educators and their beliefs about concepts in environmental education.

Results of Research Question One

Research question number one asked: According to educators, what beliefs emerge related to primary-12 environmental education classes in the United Kingdom and the United States? Educators rank-ordered a set of environmental statements twice, resulting in a three-factor solution which represent the groupings of educators who hold similar beliefs about environmental education. The resulting factors are Factor One, Interdependence: Responsibility for the Natural Environment; Factor Two, Ecology:

Knowledge of the Natural Environment; and Factor Three, Conservation: Responsible Environmental Action.

Fifty-one out of 80 sorts loaded on factor one, Interdependence: Responsibility for the Natural Environment. The beliefs of the educators whose sorts loaded on this factor center on the awareness of the interconnectedness of all living things and particularly on the belief that people have a moral responsibility to take care of the environment. Out of 80 sorts, 14 loaded on factor on factor two, Ecology: Knowledge of the Natural Environment. The educators whose sorts loaded on factor two believe that the environment is precious and irreplaceable and is not defined by human use. The foundation of this belief system involves facts and knowledge of the natural environment. Out of 80 sorts, 9 loaded on factor three, Conservation: Responsible Environmental Action. The beliefs of those educators whose sorts loaded on this factor center on the belief that responsible environmental action should be a key component of environmental education.

Results of Research Question Two

The second research question posed in this study reads: In what ways do educators believe their perception of the ideal primary-12 environmental education classes in the United States and the United Kingdom differ from the actual? Data analysis revealed that, out of a total of 40 participants in this study, 22 loaded their actual and ideal sorts on factor one, Interdependence; 5 out of 40 loaded their actual and ideal sorts on factor two, Ecology; and 1 out of 40 participants loaded their actual and ideal sorts on factor three, Conservation. Therefore, 28 participants, or 70% of the total number of participants in

this study, reported that they perceived their teaching practice to reflect the ideal. Congruent loads were the result, in spite of the participants' list of barriers that they believe have been preventing them from implementing their perception of the ideal environmental education program.

Results of Research Question Three

The third question posed in this study asked: In what ways can educators who hold such beliefs about environmental education in the United States and the United Kingdom be described using demographic attributes of nation of training and experience (the United Kingdom and the United States), age, years of teaching experience, environmental education training, education level and major, number of hours spent watching educational television, gender, level of environmental activism, major sources of environmental education information, and religion? The demographic information was calculated by consolidating the information of the total number of educators who participated in the study, by separating the demographic information into nation of origin, and by consolidating the demographic information of those participants whose sorts loaded high (0.65-1.0). No distinguishing demographic variables resulted from the three calculations. The belief systems of the participants who loaded on each of the resulting three factors were not distinguished by particular demographic variables.

Conclusions

Globally, the focus on environmental education, including national and international environmental education programs, has inundated educators with formal and informal curricular materials related to the environment. Environmental education programs and curricular materials, however, vary widely in quality and content. Quality environmental education has been undermined by problems such as under-prepared teachers, inaccurate materials, and frivolous activities (deBettencourt, 1999).

The identification of environmental education concepts has been a focus of countries in their development of environmental education. Nelson (1993) conducted a study of environmental educators' beliefs and understandings and found that curriculum and instructional decisions were influenced by educators' beliefs and understanding concerning environmental education. The beliefs educators hold influence their perceptions and judgments and have been found to guide pedagogical decisions (Pajares, 1992; Rich, 1990). Teachers' beliefs affect their behavior and choices of pedagogy, but there exists a lack of information regarding their beliefs about environmental education concepts to what happens in environmental education in the classroom.

Environmental education is process more than content and is infused into various curricula, particularly in the sciences. It is a process of moving toward stewardship view of the relationship of people with nature (Disinger, 1987). Environmental education is an integration of disciplines that synthesizes information, which can occur more readily than when disciplines are isolated (Roth, 1987). Cognitive understanding is not sufficient; affective and behavioral development is necessary to affect significant value, belief,

behavioral, and cognitive shifts in individuals, enabling epistemological change (Naidoo, Kruger, & Brookes, 1990).

Implications of the Study

The three distinct categories of beliefs about environmental education concepts included that emerged from the study include: Factor One, Interdependence: Responsibility for the Natural Environment; Factor Two, Ecology: Knowledge of the Natural Environment; and Factor Three, Conservation: Responsible Environmental Action. The beliefs of the educators whose sorts loaded on these three factors could be described relative to the affective, cognitive, and behavioral domains, respectively.

Environmental education is concerned with affective matters as well as cognitive and behavioral matters. Factor one beliefs center on the awareness of the interconnectedness of all living things and particularly on the belief that people have a moral responsibility to take care of the environment. Participants who loaded on factor one, Interdependence, believe that the foundation of environmental education programs lay in teaching students to value and respect the natural world, and that they have a personal and moral responsibility to take care of it for future generations. Results of this study indicate that the majority of educators believe they should focus their environmental education programs on the promotion of positive environmental attitudes and feelings, relying on the affective domain of education.

Research findings related to people's feelings and beliefs about the environment suggest that for environmental educators interested in changing environmental attitudes, emotions and beliefs, rather than knowledge, need to be targeted as sources of

information on which to base their environmental programs (Pooley & O'Connor, 2000). Educators, however, may be teaching their environmental education programs based on the promotion of positive environmental attitudes and feelings because they lack the knowledge necessary to effectively teach environmental education content. Environmental educators typically lack the depth and breadth of background because most prepared to be science teachers or social studies teachers, or in the case of elementary teachers, reading-writing-arithmetic teachers (Disinger, 2001).

Educators whose sorts loaded on Factor Two, Ecology: Knowledge of the Natural Environment believe that the environment is precious and irreplaceable and is not defined by human use. These educators could be characterized as those who believe that environmental education should be based on environmental knowledge and whose environmental education classes would be composed primarily of environmental facts and knowledge of the natural environment. Results of this study indicate that fewer educators may have loaded sorts on this factor, related to the cognitive domain of education, because they lack the knowledge-base necessary to focus their environmental education programs on content rather than feelings. Environmental education has traditionally assumed that increasing environmental knowledge results in an awareness of the environment and its associated problems, thereby motivating people to act toward the environment in more responsible ways. A widely accepted model links increased knowledge to favorable attitudes towards the environment, which in turn leads to the promotion of action related to improved environmental quality (Ramsey & Rickson, 1977).

Educators whose sorts loaded on Factor Three, Conservation: Responsible Environmental Action believe that responsible environmental action should be a key component of environmental education. Educators who loaded on the factor three, Conservation, can be described as action-oriented and future-focused in their environmental beliefs. They are the educators who attempt to instill in their students a respect for the environment, and to move beyond attitudes and knowledge to active involvement in environmental issues. The ultimate goal of environmental education is believed to be the promotion of environmentally responsible behavior. Its immediate goal, however, is most often the cultivation of positive environmental attitudes, which will hopefully lead to a change in behavior (McAndrew, 1993). Results of this study indicate that, because this factor loaded the fewest sorts, the promotion of environmental behaviors is not seen as an important concept in environmental education among the beliefs of those educators loading sorts on factor three.

This environmental education study is supported by research done by Newhouse (1990) and Iozzi (1989) in which it was found that environmental education, compared with other disciplines, emphasized the affective rather than the cognitive domain. Rather than focusing on the development of basic environmental knowledge supporting informed behavior, a values-education approach, rather than a focus on environmental knowledge supporing informed behavior, to teaching environmental education has generally been adopted by environmental educators (Iozzi 1989; Newhouse, 1990).

The results of the second research question indicated that the majority of the educators (70%) loaded their actual and ideal sorts loaded on the same factor, resulting in congruent loads. For the majority of educators in this study, the actual and ideal do not

differ in their environmental education programs, therefore they are teaching their perception of the ideal environmental education class. Theoretically, this finding may lead to the conclusion that they are content with their perception of teaching practice. Results of this study indicate that changing these educators' perceptions would be difficult.

The results of the third research question indicated that no distinguishing demographic variables resulted from the three calculations of the demographic information. The belief systems of the participants who loaded on each of the resulting three factors were not distinguished by particular demographic variables. Research indicates that the lack of diversity in culture and ethnicity may have been a factor in the results.

Teachers' beliefs affect their behavior and choices of pedagogy, but there exists a lack of information regarding their beliefs about environmental education concepts to what happens in environmental education in the classroom. The purpose of this study was to determine educators' beliefs related to the concepts that are included in environmental education programs, and those concepts perceived as ideal by educators in the United States and the United Kingdom. Revealing educators' key beliefs concerning the concepts, or lack of concepts, related to the affective, cognitive and behavioral domains in environmental education aids in the development of environmental education curricula and instruction. Furthermore, it aids in planning programs for environmental education aimed at training improving the professional preparation and teaching practices of inservice and preservice educators.

Recommendations for Further Study

This study used the Q statements developed by Chou's 1991 study, which compared the perception of the structure of concepts held by university faculty in the United States and the Republic of China by determining the underlying constructs appropriate for environmental education (K-16). Chou classified and analyzed the statements in the Q sort rather than the beliefs of the participants who were involved in the study, which was done in this study. Five constructs from each site were identified from the data obtained from Ohio State University and the National Taiwan University. Four out of the five identified constructs were the same from each site. They were (1) Environmental Ethics, (2) Population and Quality of Life, (3) Interdependence, and (4) Environmental Management. The remaining two constructs from Ohio State University and the National Taiwan University were Socio-Culture and Resource Conservation, respectively. This study extends and expands on Chou's study through the determination of educators' beliefs concerning environmental education concepts, which was not accomplished in Chou's descriptive correlational study using R-methodology.

Barriers to teaching their perception of the ideal environmental education program were listed by educators in this study. The barriers included time, budget constraints and lack of resources. Twenty-eight participants, however, or 70% of the total number of participants in this study, reported that they perceived their teaching practice to reflect the ideal. In spite of the barriers listed by educators, congruent loads were the result. Recommendations for further research include a study on educators' perceived barriers concerning the ideal environmental education program.

Recommendations for further research include:

1. Replication of this study with educators from different cultures to determine if beliefs concerning environmental education concepts are related to socioligical and cultural influences, or if there are global beliefs concerning concepts in environmental education.
2. Replication of this study with educators espousing different religions to determine if White's proposal that peoples' intrinsic perspective on nature is anthropocentric because of the Judeo/Christian view (Kempton, Boster, & Hartley, 1996).
3. Replication of this study with faculty from Ohio State University and the National Taiwan University to determine their beliefs concerning environmental education concepts and how those differ from other educators.
4. Replication of this study with educators from different parts of the United States to see if regions are indicative of a particular belief system.
5. Replication of this study with educators from states implementing state-based environmental education standards to evaluate their results related to those educators whose states are not including environmental education in the curriculum.
6. The refinement of statements because of the resulting unloaded sorts in this study. This could have been due to the lack of clarity in the statements, or the possibility that individuals with unloaded sorts share

beliefs with all three factors that prevented them from loading on one factor.

7. Replication of this study with only elementary, middle, or secondary students to determine if the broad range grade levels taught by educators in this study resulted in the dilution of factors.

8. Replication of this study with government leaders and those who work in an environmental field would gain insight into the differing beliefs related to teaching environmental concepts.

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APPENDIXES

APPENDIX A

INSTITUTIONAL REVIEW BOARD

APPROVAL FORM

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD

Date:	January 3, 2000	IRB #: ED-00-183
Proposal Title:	"KEY PERCEPTIONS IN ENVIRONMENTAL EDUCATION AMONG GLOBE EDUCATORS IN TWO COUNTRIES: A Q METHODOLOGY STUDY"	
Principal	Lowell Caneday	
Investigator(s):	Pamela Christol	
Reviewed and Processed as:	Exempt	

Approval Status Recommended by Reviewer(s): Approved

Signature:

Carol Olson, Director of University Research Compliance — **January 3, 2000** **Date**

Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modification to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Intuitional Review Board.

APPENDIX B

DATA COLLECTION MATERIALS

Q-Sort Statements with Corresponding Numbers

1. Living things are interdependent with each other and their environment.

2. Social values and customs influence personal conservation behavior.

3. Humans have a moral responsibility for their environment decisions.

4. Natural resources, both in quantity and quality, are important to all standards of living.

5. Increasing population and per capita use of resources have brought about changed land-to-people or resource-to-population ratios.

6. Energy, its production, uses, and conservation is essential in the maintenance of our society.

7. Plants are the ultimate sources of food, clothing, shelter, and energy in most human societies.

8. Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts.

9. Humans have a responsibility to develop an appreciation of and respect for the rights of others.

10. Safe waste disposal, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes, and heat, is important if the well being of humans and the environment is to be preserved.

11. Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations.

12. The production, distribution and use of energy have environmental, political, social, and economic consequences.

13. In any environment, one component such as space, water, air or food may become a limiting factor.

14. Knowledge of social structures, institutions, and culture of a society must be brought to bear on environmental considerations.

15. The natural environment is irreplaceable.

16. Natural resources are interdependent and the use or misuse of one will affect the others.

17. There is a maximum human population matched to each resource base. Population cannot exceed this level if a satisfactory standard of living for all people is to be maintained.

18. No single energy source can meet all our need while maintaining the quality of our environment. Therefore, a comprehensive plan for both present and future energy needs should be developed.

19. Environment is the sum of all external conditions and influences affecting organisms. The environment may be divided into biotic (living) and abiotic (non-living) components.

20. Social and technological changes alter the interrelationships between the importance of and uses for natural resources.

21. Humans have far greater ability to alter or adjust to environments than does wildlife: thus, humans have a responsibility to consider effects of their activities on other life forms.

22. Most resources are vulnerable to depletion in quantity, quality, or both.

23. All living things are affected by and interact with their environment.

24. Conservation responsibilities should be shared by individuals, businesses and industries, special interest groups, and all levels of government and education.

25. Individual lifestyle decisions, including recreational choices, transportation options, housing selections, vocation, food clothing, and energy use, affect the environment directly and indirectly.

26. The management of natural resources to meet the needs of successive generations demands long-range planning.

27. Forests are an important part of the global ecosystem that supports us and of which we are a part. Deforestation (clearing an area of all trees) will cause an immediate loss of wildlife habitat and natural resources. Long-term effects may include desertification and climate change.

28. Humans tend to select short-term economic gains, which often result in long-term environmental, social and economic losses.

29. Responsible environmental actions are the obligation of all levels of society, starting with the individual.

30. Individual citizens should be stimulated to become well informed about resource issues, problems, management procedures, and ecological principles.

31. Biodiversity is important for the continued well being of the earth and its inhabitants. The greater the number of existing species, the more resilient the biosphere and its ecosystems remain. Greater diversity also means more possibilities for selection of natural resources for human use.

32. Economics is not just about producing wealth, and ecology is not just about protecting nature; they are both relevant in improving the quality of human life.

33. As human beings, we are a part of the diversity of life, and are responsible for maintaining it.

34. Effective ways to conserve both renewable and nonrenewable resources include reducing wasteful consumption and recycling materials whenever possible.

35. Environmental degradation leads to the deterioration of not only natural systems, but also the cultural environment, as cultural conditions are dependent on natural surroundings.

36. Each of us should live a life guided by respect for the earth and all living things, now and in the future.

37. When environment and development concerns are merged, a better set of goals for both evolve. These include a better quality of life, satisfaction of basic human needs, sustainability of development, respect for the biosphere, and concern for the needs of future generations.

38. Government alone cannot solve all environmental problems. Participation of individuals, communities and non-government groups is needed to foster environmental health.

39. We are ethically responsible to other individuals and society, and that larger community, the biosphere.

40. Our well being is dependent on the environment. If we allow the quality of our environment to deteriorate, ultimately the quality of the human condition will also decline. This decline may be gradual or abrupt, perceived or unrecognized, permanent or repairable.

41. All human activities have been a major factor affecting plant and animal succession, environmental processes, and the biosphere, from primitive farming to the most recent technological innovations.

42. Inappropriate use of technology has resulted in diverse and major environmental problems (species extinction, radiation and chemical poisoning, wasted renewable and non-renewable resources) and social problems (unemployment, mass urbanization).

INFORMATION SHEET

The purpose of this information is to help the researcher gain more understanding in the interpretation of data. All responses will be kept confidential and will not be identified with your name.

Directions: Please complete each of the following items by placing a checkmark, or fill in the blank, next to the response that most closely describes you.

1. How many years have you been teaching? _____ years.

2. Gender: ___ a. female ___ b. male

3. Age: ___ a. 18-26 ___ b. 27-35 ___ c. 36-44 ___ d. 45-53 ___ e. 54-62
___ f. 63 years or older

4. Highest degree obtained:

___ a. Bachelor's Major area of study_____
___ b. Master's Major area of study_____
___ c. Doctorate Major area of study_____
___ d. Other (please describe)_____

5. Where do you obtain most of your environmental information? Please place a number one (1) after the PREDOMINATE source, a number two (2) after the next most predominate source, and a three (3) next to the third most predominate source):

___ a. Professional journals
___ b. Books
___ c. Magazines
___ d. Television
___ e. Radio
___ f. Informal education sources (museums, nature centers, zoos)
___ g. Conservation organizations
___ h. Newspapers
___ i. Educators
___ j. Other (please describe)_____

6. List up to five environmental education program(s), other than GLOBE in which you have voluntarily participated (such as Project WILD, Project Learning Tree):

_____ a.
_____ b.
_____ c.
_____ d.
_____ e.

7. How many hours per week do you spend watching Public Broadcasting System (PBS) programs, or other educational programs?
_____hours

8. Religious Affiliation (denote denomination):_____

9. Please check any of the following activities in which you have participated in the past 12 months (check all that apply):

a.___Voted in an election.
b.___Contacted an elected official about an environmental issue.
c.___Joined or continued membership in an environmental organization.
d.___Volunteered time with an environmental organization or project.
e.___Made a contribution to an environmental organization or group.
f.___Took an active part in a social or a civic issue
g.___Purchased a product based on environmental implications or reasoning (i.e. organic produce)

10. Please check all that apply.
a.___Asian
b.___African
c.___Caucasian
d.___Native American
e.___Hispanic
f.___Other:_____

**Please include your phone number and/or e-mail address for the possibility of a personal interview after the results of the study are analyzed. Thank you.

Name:_____ Email:_____

Teaching Assignment (Grade/Age Level):_____ Phone:_____

December 21, 1999

Dear Educator(s):

Global environmental concerns have generated interest in environmental education and have resulted in attempts to develop educational curriculum at the local, national, and international levels. Educators have first-hand experience at teaching their students about environmental education, and this gained experience should be considered when developing educational programs.

Your input is needed in helping to determine the underlying components that are necessary components in the development of environmental education programs and materials. Please fill out the attached Participation Form if you and/or other teachers at your school are interested in participating in this study. I will visit your school to assist you and other teachers in completing the brief exercise of rank ordering statements and answering questions related to environmental education.

To ensure the confidentiality of the responses, identification numbers will be used when reporting the results of the study. Your help will be greatly appreciated. Thank you for your time.

Sincerely,

Pamela Christol
Oklahoma State University
christol@aesp.nasa.okstate.edu

Follow-Up Letter

Dear Educator,

A letter was sent to your school recently requesting your help in an environmental education study. I would like to take this opportunity to again request your participation in this study. Global environmental concerns have generated interest in environmental education and have resulted in attempts to develop educational curriculum at the local, national, and international levels. Educators have first-hand experience at teaching their students about environmental education, and this gained experience should be considered when developing educational programs.

Your input is needed in helping to determine the underlying components that are necessary components in the development of environmental education programs and materials. Please fill out the attached Participation Form if you and/or other GLOBE trained teachers at your school are interested in participating in this study. I will visit your school to assist you and other teachers in completing the brief exercise of rank ordering statements and answering questions related to environmental education.

To ensure the confidentiality of the responses, identification numbers will be used when reporting the results of the study. Your help will be greatly appreciated. Thank you for your time.

Sincerely,

Participant Agreement

I, _____, hereby authorize Pamela Christol to perform the following procedure as part of the investigation entitled "Key Perceptions in Environmental Education Among Educators in Two Nations: A Q Methodology Study."

This study will investigate educators' perceptions of the necessary components of an environmental education program. Participation will involve rank ordering statements during the procedure, which may take less than two hours to complete. After the ordering of the statements, three Exit Interview Questions will be asked to further address the topic of this study. A follow-up phone call may be possible, depending on the results of the data, in order for participants to elaborate on their ideas concerning environmental education. Identification of each participant will be by an assigned code, and only the researcher will have access to the information connecting the codes to participants' names and schools. Strict confidentiality will be maintained throughout the study, and personal information will be destroyed at its conclusion.

I understand that my participation in this study is voluntary, and that I am free to withdraw from participating at any time without penalty.

I may contact the principal of this study, Pamela Christol, at: 605-978-9240 or christol@aesp.nasa.okstate.edu in order to withdraw, or to answer any questions I might have concerning this study.

I may contact Sharon Bacher at the OSU Institutional Review Board for questions concerning my rights as a participant involved in research studies at:
203 Whitehurst Hall
Stillwater, OK 74078
405-744-5700

Date signed: _____

Signature: _____

Witness: _____

INTERVIEWER SCRIPT

I begin by saying:

To use the statements and cards provided for the Q sort, please locate and move to a flat area on which to work. First, spread the numbered cards across the flat area with the cards marked -5 on the far left and the cards marked +5 on the far right. The other cards will be spread in the middle. When you have organized the cards, they will be placed as indicated below:

(Flat Area)

-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Least					Neutral					Most

After participants have had time to find an area and spread out the cards, tell them:

On each slip of paper is a statement. As you follow instructions, you will be sorting your statements according to the condition of instruction given for each of the two sorts. The first sort will instruct you to think about what is currently happening in your environmental education program. The second sort will ask you to consider your perception of an ideal environmental education program. Here are the steps. Please take your time. Read through all of the statements to get a feeling for what they say. You do not have to keep them in any order.

1. The first Condition of Instruction asks: "Which statements are currently represented in your environmental education program?" Think about this question as you sort the statements into three (3) nearly equal piles so that:

    a. those statements on your left are those which are LEAST likely to be found in the environmental education program currently taught in your classroom.

    b. those statements on your right are those, which are MOST likely to be found in the environmental education program currently taught in your classroom.

    c. those statements in the middle are those, which are neither strongly represented nor weakly represented in your environmental education program.

Give them time to sort the statements into piles. Then tell them:

2. Now spread the statements in the right-hand pile so that you can read them easily. Choose two (2) statements with which are the most likely found in your program and place it under the +5 card.

3. Spread the statements in the far left-hand pile so that you can read them easily. Choose two (2) statements which are the least likely found in your program and place it under the –5 card.

4. Go to the right-hand pile and choose the three (3) statements, which are the next most likely found in your environmental education program and place them under the +4 card.

5. Go to the left-hand pile and choose the three (3) statements, which are the next least likely found in your environmental education program and place them under the –4 card.

6. Go to the right-hand pile and choose the four (4) statements, which are the next most likely found in your environmental education program and place them under the +3 card.

7. Go to the left-hand pile and choose the four (4) statements, which are the next least likely found in your environmental education program and place them under the –3 card.

8. Go to the right-hand pile and choose the four (4) statements, which are the next most likely found in your environmental education program and place them under the +2 card.

9. Go to the left-hand pile and choose the four (4) statements, which are the next least likely found and place them under the –2 card.

10. Go to the right-hand pile and choose the five (5) statements, which are the next most likely found in your environmental education program and place them under the +1 card.

11. Go to the left-hand pile and choose the five (5) statements, which are the next least likely found and place them on the under the –1 card.

12. You should now have six (6) statements left over. Place these under the card marked zero (0).

Now instruct them to:

Read back over each pile, starting on the left-hand side, to make sure that you have placed the statements where you really wanted them. If you decide to change any of them around, please make sure that the number of statements matches the number designated for each card when you are finished.

**Please RECORD YOUR RESULTS on the form board provided by writing the statement number in the corresponding boxes on the form board.

(Make sure ALL participants have recorded their results before continuing. Tell them where to find the number and where to put it on the form board).
"Shuffle" your cards around to begin a new sort.

Tell them that this is the beginning of the new sort and that they should think about the following question:

"Given all possible resources and support, which statements would be represented in your perception of an *ideal* environmental education program?"

Give them time to think about the new condition of instruction. Tell them to begin the new sort by starting the process over. Tell them:

1. Think about this question as you sort the statements into three (3) piles so that:

    a. those statements on your left are those, which would be LEAST likely found in your ideal environmental education program.

    b. those statements on your right are those, which would be MOST likely found in your ideal environmental education program.

    c. those statements in the middle are those, which would be neither STRONGLY represented nor WEAKLY represented in your ideal environmental education program. This simply means that you feel very NEUTRAL about these statements and their relevance to your *ideal* environmental education program.

Give them time to sort the cards into piles. Then tell them:

2. Now spread the statements in the right-hand pile so that you can read them easily. Choose two (2) statements, which would be most likely included in your ideal environmental education program and place it under the +5 card.

3. Spread the statements in the far left-hand pile so that you can read them easily. Choose two (2) statement which would be least likely included in your ideal environmental education class and place it under the –5 card.

4. Go to the right-hand pile and choose three (3) statements, which would be the next most likely included in your ideal environmental education program and place them under the +4 card.

5. Go to the left-hand pile and choose three (3) statements which would be the next least likely included in your ideal environmental education program and place them on the –4 card.
6. Go to the right-hand pile and choose four (4) next statements, which would be the next most likely included in your ideal environmental education program and place them under the +3 card.

7. Go to the left-hand pile and choose four (4) statements would be the next least likely included in your environmental education program and place them under the –3 card.

8. Go to the right-hand pile and choose the next four (4) statements, which would be the next most likely included in your environmental education program and place them under the +2 card.

9. Go to the left-hand pile and choose the next four (4) statements which would be the next least likely included and place them under the –2 card.

10. Go to the right-hand pile and choose five (5) statements, which would be the next most likely included in your ideal environmental education program and place them under the +1 card.

11. Go to the left-hand pile and choose five (5) statements which would be the next least likely included and place them on the under the –1 card.

12. You should now have six (6) statements left over. Place these under the card marked zero (0).

Now instruct them to:

Read back over each pile, starting on the left-hand side, to make sure that you have placed the statements where you really want them. If you decide to change any of them around, please make sure that the number of statements matches the number designated for each card when you are finished.

**Please RECORD YOUR RESULTS on the form board provided by writing the number next to each statement in the corresponding boxes on the form board.

(Make sure all participants have recorded their results. Tell them where to find the number and where to put it on the form board).

After the last sort, tell participants:

Now please complete the Information Sheet and respond to the Exit Interview Questions. Extra paper will be provided if it is needed.

APPENDIX C

CONSOLIDATED PARTICIPANT INFORMATION

TABLE C-I

CONSOLIDATED PARTICIPANT INFORMATION

Description of Respondents' Background Information

Years of Teaching Experience	Number of Educators
1-6	9
7-12	10
13-18	7
19-24	7
25-30	4
31-36	3

Gender
28 females
12 males

Age
18-26: 4
27-35: 6
36-44: 12
45-53: 14
54-62: 3
63 years or older: 1

Highest degree obtained

Bachelor's: 29
Major areas of study:
Education: 8
Biology: 5
English/Science: 1
Biological/Physical Science: 1
Education; History; English: 1
English: 1
Zoology: 1
Chemistry: 2
Physics: 1
Education/Psychology: 1
Environmental Science and Geography: 1
Elementary Educational Psychology: 1
Education/Earth Science/Geography: 1
Art/Special Education: 1
Biology/Special Education: 1

Master's 9
Major area of study

Parasitology: 1
Biology: 1
M.B.A.: 1
Elementary Education: 3
Secondary Education: 1
Special Education: 2
Geology: 1

Doctorate 0

Other

Postgraduate Certificate of Education: 3
Certificate of Education: 2

Where do you obtain most of your environmental information? Please place a number one (1) after the PREDOMINATE source, a number two (2) after the next most predominate source, and a three (3) next to the third most predominate source):

	#1	#2	#3
Professional journals:	3	5	1
Books:	4	5	7
Magazines:	2	4	6
Television:	7	6	7
Radio:	0	2	0
Informal education sources:	2	3	4
Conservation organizations:	7	6	2
Newspapers:	7	2	6
Educators:	2	4	3
Other (please describe):	3	1	2

Described as environmental classes; Association of Science Education; Individual research; Internet; Workshops;

List up to five environmental education program(s) in which you have voluntarily participated (such as Project WILD, Project Learning Tree…)

US

Project WILD:	17
Project WET:	12
Project Learning Tree:	9
Jason/Rainforest:	3
Cornell University Classroom Feederwatch:	2

Environmental Literacy in Elem. Education: 1
Research Education (Yellowstone Park): 1
Leopold Education Project: 1
Natural Resource Defense Council: 1
Arbor Day Foundation: 1
Owls: 1
University of ND environment coursework/ Independent study: 1
Earth Day: 1
Earth Wellness Festival: 1
Star Lab: 1
State Sponsored Outdoors Education Class: 1
Project WOW (Wonders of Wetlands): 1
Project Underground: 1
Smile: 1
South Dakota Source (Project Learning Tree): 1

UK

Keep Britain Tidy: 2
Wildlife Watch: 2
Esso School Grounds Day: 1
Acid Rain Survey: 1
Children in Parliament: 1
Learning Through Landscapes: 1
Southeastern Acid Rain: 1
ASE: Science Across Europe: 1
Earth Center Visits: 1
Earth Education: 1
Wildlife Watch 2000: 1
Learning Through Landscapes: 1
Shell Better Britain: 1
Earthwatch: 1
Environmental Agency: 1
School Grounds: 1
County Nature Conservation Trust: 1
Young Peoples Trust for Natural Conservation: 1
British Isles Bee Breeders Association: 1
Tree Planting: 1
Spotting Endangered Species: 1
World Wildlife Institute: 1
Education for Mutual Understanding: 1
Endangered Species Poetry/World Wildlife Institute: 1
Agenda 21: 1

How many hours per week do you spend watching Public Broadcasting System (PBS) programs, or other educational programs?

UK Average: 1.8
US Average: 4.5

Religious Affiliation (denote denomination)

Church of England (Protestant)	8
Catholic	9
Roman Catholic	7
Methodist	5
None	4
Lapsed	1
Southern Baptist	1
Assemblies of God	1
Lutheran	1
United Methodist	1
Protestant (reformed)	1
No preference	1

Please check any of the following activities in which you have participated in the past 12 months (check all that apply)

Purchased a product based on environmental implications or reasoning (i.e. organic produce)	35
Voted in an election	31
Made a contribution to an environmental organization or group	22
Joined or continued membership in an environmental organization	20
Took an active part in a social or a civic issue	14
Volunteered time with an environmental organization or project	13
Contacted an elected official about an environmental issue	9

Please check all that apply:

Caucasian	37
African	1
Other	1
Native American	1
Hispanic	0
Asian	0

TABLE C-II

CONSOLIDATED PARTICIPANT INFORMATION
BASED ON NATION OF ORIGIN

Description of Respondents' Background Information			
Years of Teaching Experience		Number of Educators	
		US	UK
	1-6	5	4
	7-12	5	5
	13-18	4	3
	19-24	1	6
	25-30	3	1
	31-36	2	1
Gender	females	14	13
	males	6	7
Age	18-26:	1	3
	27-35:	3	3
	36-44:	5	7
	45-53:	8	6
	54-62:	2	1
	63 years or older:	1	0
Highest degree obtained			
	Bachelor's:	14	15
	Master's	6	3
	Doctorate	0	0
	Other	Postgraduate Certificate of Education: 3	
		Certificate of Education: 2	

Where do you obtain most of your environmental information? Please place a number one (1) after the PREDOMINATE source, a number two (2) after the next most predominate source, and a three (3) next to the third most predominate source):

	#1		#2		#3	
	US	UK	US	UK	US	UK
Professional journals:	2	4	3	2	0	1
Books:	1	4	1	6	4	3
Magazines:	1	0	2	3	2	4

Television:	4	4	3	3	6	1
Radio:	0	0	0	2	0	0
Informal education sources:	2	1	2	0	2	2
Conservation organizations:	3	5	4	2	1	1
Newspapers:	3	4	3	0	2	4
Educators:	2	0	2	2	2	2
Other (please describe):	2	0	0	1	1	2

Described as environmental classes; Association of Science Education; Individual research; Internet; Workshops;

List up to five environmental education program(s) in which you have voluntarily participated (such as Project WILD, Project Learning Tree…)

US

Project WILD:	17
Project WET:	12
Project Learning Tree:	9
Jason/Rainforest:	3
Cornell University Classroom Feederwatch:	2
Environmental Literacy in Elem. Education:	1
Research Education (Yellowstone Park):	1
Leopold Education Project:	1
Natural Resource Defense Council:	1
Arbor Day Foundation:	1
Owls:	1
University of ND environment coursework/ Independent study:	1
Earth Day:	1
Earth Wellness Festival:	1
Star Lab:	1
State Sponsored Outdoors Education Class:	1
Project WOW (Wonders of Wetlands):	1
Project Underground:	1
Smile:	1
South Dakota Source (Project Learning Tree):	1

UK

Keep Britain Tidy:	2
Wildlife Watch:	2
Esso School Grounds Day:	1
Acid Rain Survey:	1
Children in Parliament:	1
Learning Through Landscapes:	1
Southeastern Acid Rain:	1
ASE: Science Across Europe:	1

Earth Center Visits: 1
Earth Education: 1
Wildlife Watch 2000: 1
Learning Through Landscapes: 1
Shell Better Britain: 1
Earthwatch: 1
Environmental Agency: 1
School Grounds: 1
County Nature Conservation Trust: 1
Young Peoples Trust for Natural Conservation: 1
British Isles Bee Breeders Association: 1
Tree Planting: 1
Spotting Endangered Species: 1
World Wildlife Institute: 1
Education for Mutual Understanding: 1
Endangered Species Poetry/World Wildlife Institute: 1
Agenda 21: 1

How many hours per week do you spend watching Public Broadcasting System (PBS) programs, or other educational programs?

UK Average: 1.8
US Average: 4.5

Religious Affiliation (denote denomination)

	US	UK
Church of England (Protestant)	0	5
Catholic	9	1
Roman Catholic	1	6
Methodist	4	3
None	1	2
Lapsed	0	1
Southern Baptist	1	0
Assemblies of God	1	0
Lutheran	1	0
United Methodist	0	0
Protestant (reformed)	1	1
No preference	1	0

Please check any of the following activities in which you have participated in the past 12 months (check all that apply)

	US	UK
Purchased a product based on environmental implications or reasoning (i.e. organic produce)	16	19
Voted in an election	14	17
Made a contribution to an environmental organization or group	10	12
Joined or continued membership in an environmental organization	9	11
Took an active part in a social or a civic issue	7	7
Volunteered time with an environmental organization or project	6	7
Contacted an elected official about an environmental issue	3	6

Please check all that apply:

	US	UK
Caucasian	17	20
African	1	0
Other	1	0
Native American	1	0
Hispanic	0	0
Asian	0	0

TABLE C-III

CONSOLIDATED PARTICIPANT INFORMATION
HIGH LOADERS (0.65-0.85)

Description of Respondents' Background Information

Years of Teaching Experience	Number of Educators
1-6	3
7-12	2
13-18	3
19-24	4
25-30	2
31-36	1

Gender
11 females
3 males

Age
18-26: 1
27-35: 2
36-44: 4
45-53: 5
54-62: 1
63 years or older: 1

Highest degree obtained:

Bachelor's:	10
Master's	4
Doctorate	0

Sources of Environmental Information:

	#1	#2	#3
Professional journals:	3	0	1
Books:	1	4	0
Magazines:	0	2	2
Television:	3	1	2
Radio:	0	1	0
Informal education sources:	1	3	1
Conservation organizations:	1	3	2
Newspapers:	3	0	2

Educators:	1	1	1
Other (please describe):	1	0	2

Described as environmental classes; Association of Science Education; Individual research; Internet; Workshops;

Participation in Environmental Education Programs:

Project WILD:	5
Project WET:	5
Project Learning Tree:	5

Please check any of the following activities in which you have participated in the past 12 months (check all that apply)

Purchased a product based on environmental implications or reasoning (i.e. organic produce)	12
Voted in an election	2
Made a contribution to an environmental organization or group	6
Joined or continued membership in an environmental organization	3
Took an active part in a social or a civic issue	10
Volunteered time with an environmental organization or project	3
Contacted an elected official about an environmental issue	13

Caucasian:	1
Other:	1

APPENDIX D

TABLES

TABLE D-I

FACTOR MATRIX WITH AN X INDICATING A DEFINING FACTOR LOADING

Q Sort	Factor 1 Loadings	Factor 2	Factor 3
1. 1USFa	0.6428X	0.4608	0.0857
2. 1USFi	0.1765	-0.0003	0.0288
3. 2USFa	0.5635	0.6481X	0.0289
4. 2USFi	0.5363	0.7095X	0.1692
5. 3UKFa	-0.0422	0.5450X	0.3280
6. 3UKFi	0.0250	0.5950X	0.2216
7. 4UKMa	0.1271	0.6191X	-0.1490
8. 4UKMi	0.2764	0.7690X	-0.0573
9. 5UKFa	0.7485X	0.3952	0.1145
10. 5UKFi	0.7022X	0.3874	0.0844
11. 6UKFa	0.5205X	0.2677	0.0216
12. 6UKFi	0.5701X	0.3699	0.2995
13. 7UKFa	0.2155	0.4602X	0.2982
14. 7UKFi	0.0769	0.4139	0.4622X
15. 8UKFa	0.4775X	0.2045	0.0001
16. 8UKFi	0.2175	-0.1831	0.4687X
17. 9UKMa	0.7526X	0.4098	0.2013
18. 9UKMi	0.7890X	0.1890	0.3775
19. 10UKa	0.5403	0.5058	0.2590
20. 10UKFi	0.5328	0.3815	0.3734
21. 11UKFa	0.6981X	0.2619	0.0275
22.11UKFi	0.5181X	0.3701	0.2852
23. 12UKFa	0.8149X	0.1384	0.3004
24. 12UKFi	0.7829X	0.2087	0.3426
25. 13UKFa	0.7482X	0.4178	0.0588
26. 13UKFi	0.7306X	0.4173	0.1495
27. 14UKMa	0.5843X	0.4281	-0.0862
28. 14UKMi	0.5752X	0.3750	0.1901
29. 15UKMa	0.7397X	0.4237	0.0882
30. 15UKMi	0.5952X	0.4042	0.2861
31. 16UKFa	0.4525	-0.0548	0.6581X
32. 16UKFi	0.6127X	0.0099	0.5119
33. 17UKMa	0.0048	0.4748	0.6008X
34. 17UKMi	0.1016	0.5214	0.5278
35. 18UKma	0.1596	0.8574X	-0.1432
36. 18UKMi	0.4490X	0.0627	0.1372
37. 19UKFa	0.6888X	0.3492	0.2436

38. 19UKFi	0.8098X	0.3352	0.2469
39. 20UKFa	0.2909	0.6818X	-0.1226
40. 20UKFi	0.0744	0.2793	0.6108X
41. 21UKFa	0.4223X	0.1505	0.3712
42. 21UKFi	0.6029X	0.1210	0.3676
43. 22USFa	0.5233X	0.0471	0.0487
44. 22USFi	0.4625X	0.0527	0.2474
45. 23UKMa	0.5963X	0.1698	0.3882
46. 23UKMi	0.0237	0.1154	-0.3097X
47. 24USFa	0.5982X	0.5654	0.0969
48. 24USFi	0.5859X	0.3998	0.1357
49. 25USMa	0.5817X	0.0001	-0.1509
50. 25USMi	0.3726X	-0.0151	0.3438
51. 26USFa	0.6912X	0.1702	0.3602
52. 26USFi	0.5287X	-0.1183	0.4762
53. 27USFa	0.6862X	0.0754	0.1669
54. 27USFi	0.0576	0.0093	0.3118X
55. 28USFa	0.4985X	0.1632	0.4599
56. 28USFi	0.3981X	-0.1802	0.2323
57. 29USFa	0.1455	0.7494X	0.0834
58. 29USFi	0.0433	0.7073X	0.0474
59. 30USMa	0.1988	0.4504X	0.3804
60. 30USMi	0.286	0.3305X	0.2905
61. 31USFa	0.6017X	0.0472	0.1157
62. 31USFi	0.7347X	0.1446	0.2310
63. 32USMa	0.6637X	0.1009	0.3756
64. 32USMi	0.5702X	0.0880	0.3303
65. 33USMa	0.0642	0.6139X	-0.0563
66. 33USMi	0.3462	0.3524	0.1990
67. 34USFa	0.5771X	0.4346	0.1282
68. 34USFi	0.5498X	0.2081	0.3696
69. 35USFa	0.8770X	-0.0548	0.1848
70. 35USFi	0.8686X	-0.0487	0.1812
71. 36USFa	0.6457X	0.3700	-0.0628
72. 36USFi	0.5063	0.4437	0.2549
73. 37USFa	0.6436X	0.2697	-0.2805
74 .37USFi	0.6599X	0.3405	0.0368
75. 38USFa	0.0736	0.1678	0.7650X
76. 38USFi	0.4386	0.0420	0.6114X
77. 39USFa	0.7520X	0.1926	0.2925
78. 39USFi	0.6917X	0.3534	0.2836
79. 40USMa	0.6349X	0.5158	0.0185
80. 40USMi	0.7606X	0.1832	0.0729
% explained variance	30	14	9

TABLE D-II

RANK STATEMENT TOTALS WITH EACH FACTOR

No.	Statement	No.	Factors 1		2		3	
1	Living things are interdependent with each other and	1	1.84	1	1.90	2	0.41	20
2	Social values and customs influence personal conserva	2	-0.81	33	-1.61	40	-0.91	32
3	Humans have a moral responsibility for their environm	3	1.33	5	-1.24	39	0.36	21
4	Natural resources, both in quantity and quality, are i	4	0.26	16	0.47	14	0.07	23
5	Increasing population and per capita use of resources	5	-1.40	40	-0.42	24	-1.30	36
6	Energy, its production, use, and conservation are esse	6	-0.28	26	0.44	15	1.16	4
7	Plants are the ultimate sources of food, clothing, she	7	0.89	9	1.37	4	-0.38	29
8	Natural resources affect and are affected by the mater	8	-1.16	37	-1.91	42	-1.31	37
9	Humans have a responsibility to develop an appreciation	9	1.33	6	-0.07	22	0.76	12
10	Safe waste disposal, including the reduction of harm	10	-0.13	24	0.39	17	1.38	2
11	Family planning and the limiting of family size are i	11	-1.99	42	-0.97	35	-1.87	42
12	The production, distribution and use of energy have en	12	-1.10	35	-0.60	29	0.85	9
13	In any environment, one component such as space,	13	0.20	19	1.31	6	-1.20	34
14	Knowledge of social structures, institutions, and cult	14	-1.33	38	-1.68	41	-1.58	40
15	The natural environment is irreplaceable.	15	1.17	7	1.48	3	0.79	11
16	Natural resources are interdependent and the use or	16	0.77	10	0.76	12	-1.10	33
17	There is a maximum human population matched to	17	-1.60	41	-0.99	37	-1.78	41
18	No single energy source can meet all our need while	18	-0.53	28	0.41	16	0.86	8
19	Environment is the sum of all external conditions	19	-0.11	22	1.33	5	-1.29	35
20	Social and technological changes alter the interrelation	20	-1.11	36	-0.88	34	-1.49	39
21	Humans have far greater ability to alter or adjust to	21	0.55	14	0.49	13	-0.30	26
22	Most resources are vulnerable to depletion in quantity	22	0.26	17	1.02	9	0.50	19
23	All living things are affected by and interact with the	23	1.61	3	1.93	1	0.74	13
24	Conservation responsibilities should be shared by indi	24	0.11	21	-0.56	28	0.57	18
25	Individual lifestyle decisions, including recreational	25	-0.13	23	-0.77	32	0.68	17
26	The management of natural resources to meet the	26	-0.15	25	-0.12	23	1.08	6
27	Forests are an important part of the global ecosystem	27	0.60	13	1.12	8	0.71	14
28	Humans tend to select short term economic gains,	28	-1.03	34	-0.42	25	-0.38	28
29	Responsible environmental actions are the	29	0.97	8	-0.77	31	1.11	5
30	Individual citizens should be stimulated to become	30	0.18	20	0.08	19	1.04	7
31	Biodiversity is important for the continued	31	-0.37	27	1.20	7	-0.30	27
32	Economics is not just about producing wealth,	32	-1.34	39	-1.04	38	0.00	24
33	As human beings, we are a part of the diversity of	33	1.50	4	0.10	18	-0.07	25
34	Effective ways to conserve both renewable and	34	0.74	11	0.94	10	1.53	1
35	Environmental degradation leads to the deteriorating	35	-0.79	32	-0.54	27	-1.49	38
36	Each of us should live a life guided by respect for the	36	1.79	2	-0.50	26	1.27	3
37	When environment and development concerns are	37	-0.78	31	-0.78	33	-0.70	31
38	Government alone cannot solve all environmental pro	38	-0.70	30	-0.71	30	0.81	10
39	We are ethically responsible to other individuals and	39	0.65	12	-0.99	36	0.09	22
40	Our well-being is dependent on the environment. If w	40	0.49	15	-0.07	21	-0.69	30
41	All human activities have been a major factor affecting	41	0.24	18	0.80	11	0.70	15
42	Inappropriate use of technology has resulted in div	42	-0.61	29	0.08	20	0.70	25

TABLE D-III

FACTOR Q SORT VALUES FOR EACH STATEMENT

No.	Statement	Factor Arrays No.	1	2	3
1	Living things are interdependent with each other and their e	1	5	5	0
2	Social values and customs influence personal conservation be	2	-2	-4	-2
3	Humans have a moral responsibility for their environmental d	3	4	-4	0
4	Natural resources, both in quantity and quality, are important	4	1	1	0
5	Increasing population and per capita use of resources have b	5	-4	0	-3
6	Energy, its production, use, and conservation are essential	6	-1	1	4
7	Plants are the ultimate sources of food, clothing, shelter,	7	3	4	-1
8	Natural resources affect and are affected by the material we	8	-3	-5	-3
9	Humans have a responsibility to develop an appreciation of a	9	3	0	2
10	Safe waste disposal, including the reduction of harmful and	10	0	1	5
11	Family planning and the limiting of family size are important	11	-5	-3	-5
12	The production, distribution and use of energy have environm	12	-3	-1	3
13	In any environment, one component such as space, water, air	13	0	3	-3
14	Knowledge of social structures, institutions, and culture of	14	-4	-5	-4
15	The natural environment is irreplaceable.	15	3	4	2
16	Natural resources are interdependent and the use or misuse o	16	2	2	-2
17	There is a maximum human population matched to each reso	17	-5	-3	-5
18	No single energy source can meet all our need while maintain	18	-1	1	3
19	Environment is the sum of all external conditions and influence	19	0	4	-3
20	Social and technological changes alter the interrelationship	20	-3	-3	-4
21	Humans have far greater ability to alter or adjust to enviro	21	1	2	-1
22	Most resources are vulnerable to depletion in quantity, qual	22	1	3	0
23	All living things are affected by and interact with their en	23	4	5	2
24	Conservation responsibilities should be shared by individual	24	0	-1	1
25	Individual lifestyle decisions, including recreational choice	25	0	-2	1
26	The management of natural resources to meet the needs of suc	26	-1	0	3
27	Forests are an important part of the global ecosystem that s	27	2	3	1
28	Humans tend to select short term economic gains, which often	28	-3	-1	-1
29	Responsible environmental actions are the obligation of all	29	3	-2	4
30	Individual citizens should be stimulated to become well info	30	0	0	3
31	Biodiversity is important for the continued well-being of the	31	-1	3	-1
32	Economics is not just about producing wealth, and ecology is	32	-4	-4	0
33	As human beings, we are a part of the diversity of life, and	33	4	1	-1
34	Effective ways to conserve both renewable and nonrenewable	34	2	2	5
35	Environmental degradation leads to the deterioration of not o	35	-2	-1	-4
36	Each of us should live a life guided by respect for the earth	36	5	-1	4
37	When environment and development concerns are merged, a	37	-2	-2	-2
38	Government alone cannot solve all environmental problems.	38	-2	-2	2
39	We are ethically responsible to other individuals and society	39	2	-3	0
40	Our well-being is dependent on the environment. If we allow	40	1	0	-2
41	All human activities have been a major factor affecting plan	41	1	2	1
42	Inappropriate use of technology has resulted in diverse and	42	-1	0	1

VITA

Pamela G. Christol 2

Candidate for the Degree of

Doctor of Philosophy

Thesis: Q METHODOLOGY STUDY OF BELIEFS AMONG ENVIRONMENTAL EDUCATORS IN TWO NATIONS

Major Field: Environmental Science

Biographical:

Personal Data: Born to James L. and Leona M. Christol on February 11, 1959. Family includes older brothers Gary and Larry and their wives and children: Janice, Jennifer, Paula, Alison and Kyle. Graduated from Norman High School in 1977.

Education: Graduated from Norman High School, Norman, Oklahoma in May, 1977; received Bachelor of Science and Master of Elementary Education from University of Oklahoma, Norman, Oklahoma in December 1987 and August 1994 respectively. Completed the requirements for the Doctor of Philosophy in Environmental Science at Oklahoma State University, Stillwater, Oklahoma in December 2002.

Experience: Program Coordinator/Assistant Professor of Curriculum and Instruction, School of Education, University of Houston-Clear Lake, 2002-present; Researcher, Environmental Institute of Houston, Jan.- Aug. 2002; Aerospace Education Services Program Specialist, National Aeronautics and Space Administration/Oklahoma State University, 1998-2001; Graduate Assistant, Oklahoma State University Department of Health, Physical Education and Recreation Instructor of Outdoor Education Course, Fall 1998; Graduate Assistant, Oklahoma State University Department of Health, Physical Education and Recreation, Instructor of Block Class, Spring 1997; Math/Science Coordinator, Oklahoma State University National Youth Sports Program, Summer 1997; Supervisor of

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