ASSESSING THE VALUE OF THE ENVIROSCAPE WATERSHED LEARNING MODULE

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Title of Study: ASSESSING THE VALUE OF THE ENVIROSCAPE WATERSHED LEARNING MODULE

Major Field: Environmental Science

Scope and Method of Study: The researcher's evaluation of the West Atlanta Watershed Alliance's (WAWA) programs highlighted that few if any of the offered educational programs included a program evaluation, especially the most promising, the Enviroscape ® Watershed learning module. The education programs that were customized and developed by the education staff did not offer evaluations either. Additionally, these programs did not offer a pre or posttest. Students would visit the center, experience the "learning" and then leave. The problem was that no system was in place to assess the transfer of content or whether learning occurred. The purpose of this education study was to determine if the Enviroscape® Watershed learning module increases content knowledge, by collecting data from urban-suburban schools from third, fourth and fifth grade students. The sample population consisted of 62 elementary students in grades three, four and five from urban and suburban school districts. These participants were involved in the Watershed Alliance Outdoor Activity at the Bush Mountain Outdoor Activity Center from the years of 2011 to 2012.

Findings and Conclusions: The researcher, in partnership with the designer of the Enviroscape ® Module, and the OAC Education director, was able to collect data from trained education facilitators at school sites from suburban and the Urban Atlanta Areas. Educators were recruited to participate in the study based on their prior experience with environmental activities at the center, and were teaching third, fourth and fifth graders. A slight increase was found between the pretest and posttest of participants' scores on the science content knowledge. After conducting a T-Test analysis of the data however, it was concluded that no significant difference existed between the scores. The results also showed no significant increase in the mean scores between urban and suburban participants' content knowledge science scores. Furthermore, the results of an ANOVA analysis of the data showed that there was not a significant difference between the groups in the science content knowledge for participants in the third, fourth and fifth grades.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The researcher served as an Instructional Leader at an urban elementary school in Atlanta, Georgia. One of the tasks assigned was to develop and improve the field trips taken by the students. A district initiative required the students to participate in two or three trips that were sponsored by the district. After the students attended these "mandatory" trips, teachers had to search the city to find curricula aligned locations that offered rich content and experiences. During this search, the researcher discovered the West Atlanta Watershed Alliance's (WAWA) Outdoor Activity Center (OAC). The WAWA OAC was established in 1975 as the Bush Mountain Outdoor Activity Center. The mission of the OAC has been to involve children and adults in environmental issues through education about conservation, ecology and the natural environment. This 26-acre urban nature preserve includes about two miles of trails, as well as a team-building ropes course and a children's nature themed playground. Among the learning facilities are a tree house classroom, a 650-gallon freshwater aquarium, an Aquaponics station and a multi-purpose building. The facility is located approximately five miles from downtown Atlanta, at 1442 Richland Road, Atlanta, GA 30310. The WAWA OAC offers several on and off-site student programs.

Statement of the Problem

The researcher's evaluation of the WAWA programs highlighted that few if any of the offered educational programs included a program evaluation, especially the most promising, the Enviroscape® Watershed learning module. The education programs that were customized and developed by the education staff did not offer evaluations either. Additionally, these programs did not offer a pre- or posttest. Kinder (2012) discovered similar results in an informal survey of 70 non-formal educators from watershed organizations, nature centers in 30 states. "I found that over half rely primarily on short programs to educate elementary age audiences, however, only three indicated the use of formal assessment to measure the value of these programs" (p. 6). Students would visit the center, experience the "learning" and then leave. The problem was that no system was in place to assess the transfer of content or whether learning occurred.

Purpose of the Study

The purpose of this education study was to determine if the Enviroscape® Watershed learning module increases content knowledge, by collecting data from urban-suburban schools from third, fourth and fifth grade students.

Objectives of the Study

To accomplish this purpose, the following research questions had to be answered:

1. Does the learning module increase student content knowledge?

2. Does a difference in content knowledge exist between urban and suburban schools?

3. Does a difference in content knowledge exist between third, fourth and fifth grade students?

Assumptions

The researcher assumes that all participants in the study are reading on grade level.

Limitations

The researcher recognizes the following limitations with the study:

- The sample, albeit convenient, does not facilitate or guarantee the academic proficiency of the students.
- The sample does not take into consideration the background and prior knowledge and skills of the participating students.
- This research is not focused on the instructional practices of the Education Director presenting the study activity.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this education study was to investigate if the Enviroscape® Watershed learning module increases content knowledge from third, fourth and fifth grade students in urban-suburban schools. When instruction is made relevant, students will learn. As a result they will develop recognition of personal responsibility and authority to initiate change. The researcher reviewed the literature in an attempt to document research of students' learning through practical experience and, thus, ultimately improving their thinking and support of the subject matter being studied.

This chapter is divided into seven sections:

1. Guidelines to Developing Environmental Education
2. Critical Thinking
3. Critical Thinking Disposition
4. National Science Education Assessment Results
5. The Outdoor Activity Center
6. Existence of A Great Need for Improved Environmental Education
7. Summary

Guidelines to Developing Environmental Education

The guide, "The Early Childhood Environmental Education Programs': Guidelines for Excellence that were created by the North American Association for Environmental Education (NAAEE)" indicated that the developmentally appropriate Environmental Education program is child-directed and inquiry-based. The guide also states that via "Guideline 2.3 – Child-Directed and Inquiry-Based" an Environmental Education program should include the following:

- Open-ended activities, choice, and hands-on learning
- Taking materials outdoors or bringing natural materials inside to extend learning
- Materials and activities provide children with an opportunity to begin to build inquiry skills. They may vary from child-directed to provider-directed, depending on the activity and the knowledge and experience of the provider and the children. For instance, the child may provide the question but have no context for developing a way to answer his/her own question.

Additionally, the NAAEE's Guide (Guideline 6.3- Environmental Literacy) indicates that early childhood environmental educators possess the understandings, skills, and attitudes associated with environmental literacy and teaching. An effective Environmental Education program includes environmentally literate teachers who should possess the following skills:

- Mastery in questioning, analysis and interpretation skills
- Understanding of environmental processes and systems
- Skills for addressing environmental concerns
- A high degree of personal and civic responsibility

Guideline 6.6-Assessment and Evaluation states that environmental educators should possess the knowledge and skills to assess learner progress and evaluate the effectiveness of their own programs. Some of the key indicators include:

- A variety of education outcomes, including attitudes, beliefs, actions, and environment in learning are assessed as well as knowledge about the environment.
- Listening to the children's comments and asking them clarifying questions as they work.

Children who learn to value nature will more likely become adults who advocate for and practice environmental stewardship and sustainability. Environmental education programs that afford students the opportunity to interact with nature first hand can provide the significant life experiences that will lead to environmental sensitivity (Kinder, 2012, p. 47).

A review of the literature has revealed research around attitudinal studies on Environmental Education and issues. No incidence could be found regarding the impact of critical thinking and the decision making process in regards to environmental action. It is further anticipated by the researcher that, through education on the impacts of certain human actions and interactions with the environment as exhibited via the learning experience, the affected participants in the study will transfer their knowledge to improved environmental stewardship. This change in action via critical thought is hypothesized to sustain behaviors over time. Much of the identified research focused on the participants' feelings rather than knowledge. For example, "I'd rather turn off the lights than leave them on when I leave the room" (Andrejewski, 2011, p. 62). A typical behavior based response was, "In the last week I recycled items at home or I could take shorter showers to save water if I wanted to" (Andrejewski, 2011, p. 62).

A critique of the state of evaluation in Environmental Education concluded that most published evaluation efforts have been based on "a narrow and short-term 'objectives-outcomes' model of evaluation" (Fien et al, 2001, p. 380). Many published articles on evaluations of EE efforts have relied on pre- and post-intervention surveys to address changes in knowledge and attitudes, including the majority of the articles reviewed from the three selected journals (see, e.g. Aivazidis, et al, p. 47). Members of the science community agree that human behavior has the potential to dramatically influence a person's overall health. Thus, developing an understanding of children's environmental attitudes and behaviors becomes an essential component of providing for a healthier planet.

Students must be able to transfer knowledge obtained to other situations and solve problems based on knowledge of a wide range of topics and skills. A student must be able to transfer what he or she learns about river and stream conservation to using less water in the shower or to patronize a car wash that uses recycled water. For example, if we were asked to examine an issue involving habitat loss, we would need to know a variety of facts: What is a habitat, where is the habitat, what is the natural history of the area, and in what ways do (*living organisms including)* people use the habitat?" (Basile, 2000, p. 22) "Therefore, teaching for transfer is the aim because we want to empower students over a wide range of intellectual challenges" (p. 21).

Three types of knowledge exist: declarative, procedural and schematic or contextual. Declarative knowledge relies on specific sources of information or facts. Procedural knowledge refers to the processes that are used to solve problems, and schematic knowledge is the ability to use prior knowledge and skills from related problems solved. Basile (2000) states, "This is an important element in Environmental Education for children as they move toward decision making, action, and citizenship. In our habitat example, successful reasoning depends on learning a method to solve the problem-solving techniques such as cause-and-effect diagramming or force-field analysis" (p. 22).

Additionally, the literature review shows an absence of focus on content specific evaluation of environmental issues and awareness. In a study by Renaud & Murrary (2008) it is suggested that improvement in critical thinking skills is more clearly detected with terms focusing on specific course content rather than on general content (Ku, 2009). It is further suggested and hypothesized through additional evaluation that the impacted research participants or students that experience critical thinking tasks and content will be better equipped to make informed decisions in given situations, thus transferring into changed behavior towards the environment.

Critical Thinking

Worldwide demand exists for higher-education curricula to engage students in learning activities that nurture critical thinking skills (Ku, 2009). High school students in Florida who had an environment-based curriculum also demonstrated gains in critical thinking skills, an ability the researchers believed may be a better indicator of program success than test scores (Andrejewski, 2011; Ernest & Monroe, 2004). Critical thinking is a prerequisite to much of the analysis, synthesis and evaluation of students higher up in Bloom's taxonomy of learning (Andrejewski, 2011; Paul, 1985). Research conducted by Andrejewski (2011) discusses that in an attempt to ascertain the effects of environment-based education in a variety of school districts, the State Education and Environmental Roundtable identified 40 schools across 12 states that used the "environment as the integrating context (EIC) in school curricula" and measured student performance on standardized tests (Andrejewski, 2011; Lieberman & Hoody, 1998, p. 8). Students in these schools gained in achievement significantly not only in science, but also in social studies, reading, and math.

Teaching for critical thinking is an important goal of modern education, as it equips students with the competency necessary to reason about social affairs in a rapidly changing world (Ku, 2009). According to research on critical thinking by Ku, "the disposition to think critically includes the motivation of a person and it accounts for how critical thinking is triggered, good timing-attempting the right kind of thinking at the right moment" (p. 71). Increases in student academic performance are often accompanied by increases in development of problem solving skills, critical thinking, and decision-making (Andrejewski, 2011; Lieberman & Hoody, 1998).

/William Hammond states that, “When students are invited to move their education beyond the walls of the classroom and engage in genuine action, they are given the opportunity to synthesize knowledge, skill, and character; to test their preconceptions and misconceptions against real experience; and to learn to follow and to lead as members of a learning organization” (Hudson, 2001, p.286). When students are asked more inferring or interpreting questions, their active involvement in critical thinking will increase. Questions that challenge students to use their skills and knowledge often become motivational factors in learning and stimulate future learning (Poudel et al., 2005).

The skills of critical thinking and problem solving are the greatest need as generations advance in the evolving environment to solve the problems of environmental sustainability. Those skills are most effectively developed when students are presented with learning experiences that use hands-on, inquiry based methods to address authentic problems. Unfortunately, many elementary and middle school classroom teachers are unfamiliar with or uncomfortable teaching science using such methods of instruction. These skills in critical thinking are vital for students to perform well in school, and also needed in future workplaces, social and interpersonal contexts where sound decisions are to be made carefully and independently on a daily basis (Ku, 2009).

Ku (2009) and Norris (2003) hypothesized that through rigorous and hands-on involvement with engaging activities the result will lead to improving the critical thinking dispositions of the students to ultimately change their behaviors relevant to environmental issues. In particular, the need for critical thinking measurement to account for individuals’ inclination to use appropriate thinking skills in appropriate situations ought to be emphasized. To achieve the goal of educating students to become critical thinkers, change in assessment practices has been recommended. For instance, a report of the recent educational reforms in Hong Kong highlighted the need "to put more emphasis on the assessment of [students'] ability to apply what they have learned to solve problems" (Education Bureau, 2003, p. 31).

Without appropriate assessment that allows the growth of students' critical thinking ability to show, it would be difficult to examine the effectiveness of any programs that aim to enhance skills in critical thinking (Ku, 2009). One of the obstacles is a lack of proper assessment that effectively and objectively measures students' strengths and weaknesses in critical thinking (Ku, 2009: Ennis, 2003; Halpern, 2003; Norris, 2003). According to Hartman, Miller, and Nelson (2000), students who are involved in hands-on activities are able to recall more information than those exposed to demonstration only as a teaching method (Poudel, 2005).

Critical Thinking Disposition

Ku (2009) discussed that in early research by Ennis (1962), McPeck (1981) and Baron (1985) critical thinking emphasized the cognitive component, that critical thinking is a skill, a set of skills, a mental procedure, or simply rationality.   The definition of critical thinking has evolved over time. Ennis' (1962) definition of critical thinking has changed over the years from the "correct assessing statements" to a "reasonable reflective thinking that is focused on deciding what to believe and do" (p.71).   In later work by Ennis, an intentional and motivational aspect of critical thinking is emphasized, which has been termed by other scholars as "critical thinking disposition" (e.g., Facione, 1990a;

Halpern, 1998; Perkins, Jay & Tishman, 1993). The changes in how theorists define critical thinking reflect the emergence of a more holistic view on the conceptualization of critical thinking: besides the ability to engage in cognitive skills, a critical thinker must also have a strong intention to recognize the importance of good thinking and have the initiative to seek better judgment (Ku, 2009).

Research shows that increased awareness and knowledge of environmental action strategies contribute to increased motivation to take action. Self-esteem and pupils' beliefs and values are other factors related to taking action (Palmburg, 2000; Dresner & Gill et al, 1994). To achieve the major goals of Environmental Education, young children need to develop (a) behaviors and actions that contribute favorably to the environment and (b) skills to think critically about environmental issues. Environmental Education (EE) teaches children and adults how to learn about and investigate their environment, and to make intelligent, informed decisions about how they can take care of it (Hug, 2010). The National Project for Excellence in Environmental Education, an organization that was initiated by the North American Association for Environmental Education (NAAEE), states that Environmental Education is a process that aims to develop an environmentally literate citizenry that can compete in our global economy; has the skills, knowledge, and inclinations to make well-informed choices; and exercises the rights and responsibilities of members of a community.

National Science Education Assessment Results

The National Center for Education Statistics (NCES) is the primary federal entity for collecting and analyzing data related to education in the United States and other nations. The NCES is charged by a Congressional mandate to collect, collate, analyze, and report complete statistics on the condition of American education; conduct and publish reports; and review and report on education activities internationally. One of the activities that is conducted by the NCES is the National Assessment of Educational Progress (NAEP). The NAEP is the largest nationally representative and continuing assessment of what America's students know and can do in various subject areas. Assessments are conducted periodically (every two years) in math, reading, science, writing, the arts, civics, economics, geography, and U.S. History. NAEP results, national and state, are based on representative samples of students at grades 4, 8, and 12 for the main assessments (math, science, reading and writing) (nces.ed.gov, June 13, 2011). These three grades are the only grades used by NAEP during the bi-annual assessment of national educational achievement. The 2009 assessment is identified as the benchmark as the assessment was updated to take into account progress in national science curriculum, Next Generation Science Standards, and the development of new Science Frameworks. These new Science Frameworks organize science content into broad categories reflecting the content generally exposed to students in grades k-12. These categories are physical, life, and earth and space sciences.

The National Center for Education Statistics developed a science assessment to account for the newly developed Science Frameworks and the Next Generation Science Standards. A proficiency scale score was established in the range of 0 to 300. The scale scores and standard deviation for assessed grades 4, 8, and 12 were developed independently and cannot be compared across grade levels. The standard deviation for the fourth grade assessment is 35. The fourth graders were given the assessment to set the baseline for future comparison. The mean scale score for the156,500 fourth graders in 9,330 schools assessed was 150. Seventy-two percent of the fourth graders performed in the “basic” proficiency range, while 34% and only one percent performed in the Proficient and Above Proficient range, respectively. (Science 2009, NCES 2011-451)

The Outdoor Activity Center

Agricultural and environmental challenge tests stimulate critical thinking in students and motivate them to learn more about these issues (Poudel et al., 2005). To help cultivate a climate for those goals to be realized, teachers and administrators should identify and use easily accessible outdoor sites in the immediate school area to provide authentic environmental learning opportunities for their students (Bodzin, 2008). The Outdoor Activity Center (OAC) in Atlanta, is open for visits for programs free and at a nominal fee. The Outdoor Activity Center is managed by the West Atlanta Watershed Alliance, a non-profit Environmental Justice and Stewardship organization formed in 1995. This grassroots community action organization arose from the efforts to halt discriminatory waste water treatment practices in West Atlanta, Georgia (WAWA 2011). The OAC provides an educational environment that often hosts free events for the neighborhood and for fee student programs and professional development opportunities for teachers. The OAC accepts students from schools throughout the Atlanta Metropolitan area. Established in 1975 as the Bush Mountain Outdoor Activity Center

(OAC), the mission of the OAC has been to involve children and adults in environmental issues through education about conservation, ecology, stewardship and the natural environment. This 26-acre urban nature preserve includes about 2.0 miles of trails, as well as a team-building ropes course and a children's nature themed playground. Among the learning facilities are a tree house classroom, a community-run vegetable garden, a 650-gallon freshwater aquarium, a multi-purpose building and a Bioponica© system--a unique sustainable urban farming system. The facility is located approximately five miles from downtown Atlanta, at 1442 Richland Road, Atlanta, GA 30310.

The OAC offers Environmental Education programs and projects in the following formats:

1. children and youth ecological field studies;
2. outreach to under-served schools;
3. programs for special audiences;
4. teacher in-services;
5. Saturday family workshops, both environmental and arts;
6. metro public events;
7. exhibit development and interpretation;
8. community youth and adult volunteer projects (with colleges/university, EPA, corporations, etc.).

The Bush Mountain OAC will be the location of this study. The explorations used in this study will be derived from the EnviroScape ® Watershed/Nonpoint Source Model developed by the Bush Mountain OAC. The activities will feature content focused on Nonpoint source landscape topography, storm water pollution and run-off, storm drain functions, and best management practices. Along with these concepts the EnviroScape® model will also address the overall watershed concept. Research reveals that the watershed concept is not common knowledge and, thus, students would not learn about watersheds at home or in their communities (Endreny, 2009, p. 503). Endreny (2009) further refers to the "watershed concept" as an understanding of what defines a watershed. "A watershed is a system of smaller bodies of water and surrounding land that drain into a larger body of water" (Endreny, 2009, p. 510). Hands-on activities, which motivate students while enhancing their critical thinking skills and are vital to the success of agricultural and environmental challenge programs (Poudel et al., 2005), are used extensively in the explorations. The students participating in the activities used in this study will take a pre-and posttest regarding their ability to think critically relating to environmental sustainability issues and environmental science.

This literature review reveals a need for improved environmental awareness on the part of young children and adolescents. Fisman (2005) examined changes in environmental awareness among third and fifth grade students in a local urban EE program that included a schoolyard investigation unit and found a significant positive effect of the program on students' awareness of the local environment and on their knowledge of environmental concepts.

The attitudes of elementary and middle school students towards Environmental issues change slightly after exposure to various hands-on outdoor activities. The assumption brought further by many researchers is that a significant increase in the attitudinal growth of the students occurs after Environmental Education (EE) activities.

What is not evident is whether the exposure, involvement and experimentation with the environment alter their critical (analysis) thinking towards the environment.

"The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results, which are as precise as the subject and the circumstances of the inquiry permit. Thus, educating good critical thinkers means working towards this ideal. It combines developing Critical Thinking skills with nurturing those dispositions which consistently yield useful insights and which are the basis of rational and democratic society" (Facine, 2010, p. 22).

Research conducted on school gardening and the conversations with the students by Rahm (2002) revealed that as students participated in an eight-week summer youth gardening program their level of discourse improved over the course of the study. He states, "The project embedded informal science education in gardening conversation that flowed in a natural and organic way, involving sense making through discourse" (p. 179). Having an impact on making mind set changes about the environment is not an easy task. In research conducted by Barbas (2009), he states that the change in knowledge, attitudes, beliefs and feelings about any environmental issue is certainly a complex and longitudinal process.

Environmental Education must teach about science itself and the use of the scientific method--an important supplement to belief systems and value judgments---to help evaluate and respond to environmental threats. Educational materials that omit the important role of science and the general rules of scientific inquiry are damaging to the field of Environmental Education (Hudson, 2001). Problem solving, for example, is an important requisite objective of the educational process, and research by Gardner and others suggests that hands-on environmental activities are an effective means of enhancing problem solving skills (Hudson, 2001, p. 286). Furthermore, a federally chartered nonprofit organization, the National Environmental Education Foundation, describes several studies that indicate that grade point average (GPA), science grades, reading and writing skills, critical thinking, motivation, and attitudes about learning and behavior improved consistently through Environmental Education (Patterson, 1999).

Hands-on activities, such as monitoring water quality, measuring air pollution, or observing the effect of litter on wildlife, raise students' awareness of their own environmental context and its relevant problems (Ballantyne et al., 2001). Research cited by Knapp (2000) indicates that participation in outdoor activities, such as those at a Watershed Learning Center (WLC), can lead to a stronger knowledge of and empathy towards environmental issues and willingness to protect the environment (Palmberg & Kuru, 2000). Researchers showed that participation in outdoor learning experiences is a promising technique for improving children's environmental attitudes and knowledge (Ruchter, 2010; Bogner et al., 1998). Little research has been conducted, however, to identify the effective skill development around critical thinking abilities as related to environmental science concerns and issues.

The WLC Outdoor Activity Center concept supports studies which show that participation in outdoor activities can lead to a stronger knowledge of and empathy towards environmental issues and willingness to protect the environment (Palmberg &

Kuru, 2000). The WLC program is designed to teach critical thinking skills, as well as concepts, using hands-on exercises and field experiences. Increasing students' respect and sense of responsibility for nature, and bringing schools and other community organizations together to broaden community stewardship for the environment are also important program goals (Kenney et al, 2003).

An understanding of the watershed concept is essential to comprehending issues about water quality, point and non-point source pollution, and the impact of land use practices and personal actions on watersheds (Patterson & Harbor, 2005). Unfortunately, most Americans do not know what watersheds are, and only 22% know that storm water runoff is the most common source of pollution in streams, rivers, and oceans (National Education Training Foundation, 1999).

Additionally, in research in the field of place-based Environmental Education, Biggs & Tap (1986) have contended that continual, repeated activities with the local environment can have a stronger effect on student learning and attitudes than occasional experiences in novel natural areas. These findings support the use of outdoor schoolyards for learning about the environment because they provide a familiar natural setting that is easily accessible from the classroom (Bodzin, 2008). Fishman (2005) examined changes in environmental awareness among third and fifth grade students in a local urban Environmental Education program that included a schoolyard investigation unit and found a significant positive effect of the program on students' awareness of the local environment and on their knowledge of environmental concepts (Bodzin, 2008).

Agricultural Education and EE should include all the necessary educational components that promote behavioral changes, enhance cognitive development, raise personal motivation, and develop the student's ability to interact and observe agricultural and environmental processes and activities in a social context (Poudel et al., 2005). By engaging in agricultural and environmental action research or problem-based learning, students develop scientific thinking, problem-solving skills, and positive attitudes in addressing agricultural and environmental issues (Poudel, 2005). Poudel (2005) continues to state that "positive attitudes and critical reflection on the complexities of these issues help motivate students to learn more about agricultural and environmental problems. Interactions among students, scientists and students, or teachers and students are helpful in problem diagnosis and enhancing critical thinking" (p. 12).

The need to include science in educational efforts does not, however, excuse educators from the obligation to communicate in an understandable way that invites further inquiry from those who might be intimidated by scientifically complex subjects (Hudson, 2001). Although higher order cognitive skills are useful in many areas of life, in schools they are most often a focus of reform in the math and science curricula. An overemphasis on factual knowledge has led to weakness in processing skills and critical thinking in the average U.S. student (Blair, 2009; Culin, 2002; Gibbs & Fox, 1999).

Environmental Education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its problems, aware of how to help solve those problems, and motivated to work toward their solution (Marcinkowski, 2010). Additional research conducted by Billig et al., (2008) uncovered that relatively few EE approaches immerse students in Grades K-12 in efforts to solve environmental problems. Notable among those that do are action research, service–learning, and environmental issue-and action instruction as advanced by Hungerford and his colleagues, whose elements can be combined as in place-based education (Marcinkowski, 2010, p. 45).

From an educational perspective, these approaches provide learners with opportunities to apply, expand, refine, and reflect on cognitive and affective aspects of their participation in environmental problem-solving. Second, some leaders in the field have expressed an interest in determining the actual environmental rather than educational benefits of participation in environmental problem solving, particularly among older students (e.g. NEEAC, 2005).

A Great Need Exists for Improved Environmental Education

Whether urban or rural, the landscape in which children find themselves is the staging ground for their imagination, their story, their sense in the world (Blair, 2009; Mergen, 2003). Many authors and researchers believe that children today lack exposure to the natural world that shapes environmental values and puts science in context (Blair, 2009; Bundschu-Mooney, 2003; Finch, 2004; Kahn, 2002; Kellert, 2002; Orr, 2002). Current adults had more opportunities than children today to interact with nature directly, rather than through “virtual realities.” Yet children today probably have access to more information about the environment than their parents and grandparents did, through televised nature shows, IMAX films, and computer games and graphics (Andrejewski, 2011, Nabham & Trimble, 1994). What these and other outdoor-oriented programs share is an understanding that the constitution of families and the nature of “family time” have changed. Outdoor education programs, in particular, must be designed to provide opportunities for families with increasingly crowded schedules to spend time together (Hudson, 2001).

Although such programs are not generally perceived as opportunities where children and adolescents can influence adult environmental learning and action, evidence suggests that students are capable of transferring information and skills learned in the classroom to the home environment (Ballantyne, 2006, 1998; Gentry & Benenson, 1993). Within Environmental Education research further evidence indicates that young people can effectively influence the environmental understanding and actions of their parents (Ballantyne, 2006, 1998; Kruger, 1992; Sutherland & Ham, 1992; Uzzell, 1994). For example, Uzell (1994) found that parents of students who had participated in an experimental Environmental Education program at school were significantly more likely to report increased awareness and concern for a local environmental problem than a control group of students whose parents had not participated in the program (Ballantyne, 2006, 1998).

The challenge that faces environmental educators is to develop strategies which help individuals, irrespective of age, become competent and motivated to act in an environmentally responsible manner as well as to share their informed views and skills with others (Ballantyne, 2006, 1998). Kinder (2012) expanded the Hunger and Volk (1990) research by constructing an approach to implementing an Environmental Education program that incorporates the variables which influence behavior. The phases presented in the Hunger and Volk model are three phases: entry level, ownership and empowerment. In the empowerment phase, participants are empowered with knowledge of environmental action strategies and skills. They learn which actions are desirable and begin to feel that their personal actions will lead to a positive change in the environment. This leads to an internal locus of control and intent to act. This is an important phase because if people do not understand what actions will protect and improve the environment, they are not likely to act accordingly (Kinder, 2012, p. 5).

Everyone knows that Americans are concerned about safe drinking water. A survey conducted by the National Environmental Education and Training Foundation (NEETF), however, showed that only "about one in four American adults knows that the leading cause of water pollution is surface water running off the land from farm fields and city streets (NEETF, 1997).

If one of the goals of education is to nurture the growth of productive members of society, then programs such as (Environmental Education) are most certainly viable and valuable (Hudson, 2001). If Environmental Education keeps pace with the changing audience, the overall environmental movement will benefit by staying relevant to future generations and by inspiring individuals to take action to conserve natural resources and protect the environment (Hudson, 2001). Research conducted by Chawla (1998) identified that adults who had significant and positive exposure to nature through childhood experiences---often with significant adults---that socialized them to view nature in positive and meaningful ways, were more likely to be environmentally sensitive, concerned, and active. The President of the National Environmental Education Foundation (NEEF) stated that "without understanding environmental issues, students lack the personal connections that would compel them to take individual action" (Paterson, 2010, p. 39). According to Dewey and modern constructivism, teaching has to be anchored to the everyday life of pupils. Pupils learn best from the problems that arise from their lives which they themselves solve (Palmberg, 2000). Research indicates that science instruction is more effective when it extends beyond the classroom and integrates textbook learning with real-life issues, a technique referred to as experiential learning (Poudel, 2005; Alroe, 2000).

Research in the United States indicates four out of five Americans are heavily influenced by incorrect or outdated environmental misconceptions (Carleton-Hug, 2009, p. 162). Despite children spending considerable time in formal education settings, it is estimated that children get more environmental information (83%) from the media than from any other source, whereas the media is the only source of environmental information for most adults (Carleton-Hug, 2009, p.162). Media sources including Internet, print media, television and radio are integral components of modern culture, yet the quality and veracity of information vary widely.

In both cases, the pre-visit preparation of the students can vary widely. Some groups have received a great deal of background material from their classroom teacher, whereas others arrive at the EE program with no preparation for the learning objectives, further complicating evaluations to discern the effectiveness of individual EE programs. In an evaluation of four place-based education programs Powers (2004a) noted that this disparity of group preparedness presented a distinct challenge for evaluating the effectiveness of EE programs (Carleton-Hug, 2009, p162). The West Atlanta Watershed Alliance Outdoor Activity Center experiences similar opportunities for improvement.

Researchers who conduct EE research studies have frequently examined the relations among environmental knowledge, attitudes and behaviors (Eagles & Demare, et al, 1999) and they have identified responsible environmental behaviors as evidence of effective EE (Gotch & Hall et al, 2004). Integrating environmental education into the elementary school curriculum can be an effective way of meeting the goals of environmental education (Kinder, 2012). "During these years, children are excited about learning, are developing attitudes about the world around them, and are capable of forming opinions about the environment and understanding citizen responsibilities" (p. 5).

Summary

The purpose of this education study was to determine if the Enviroscape® Watershed learning module increases content knowledge, by collecting data from urban-suburban schools from third, fourth and fifth grade students. The researcher's evaluation of the literature on the West Atlanta Watershed Alliance's (WAWA) programs highlighted that few, if any, of the offered educational programs included a program evaluation, especially the most promising, the Enviroscape® Watershed learning module. The education programs that were customized and developed by the education staff did not offer evaluations either. Students would visit the center, experience the "learning" and then leave. The problem is that no system is in place to assess the transfer of content or whether learning occurred. The researcher reviewed the literature in an attempt to document research of students' learning through practical experience and thus ultimately improving their thinking and support of the subject matter being studied.

Through a review of literature the researcher determined that many researchers focused on the attitudinal perceptions of impacts to the environment rather than critical thinking tasks. Additionally, the researcher determined that through the experiences of hands-on application of skills and concepts students are more likely to retain knowledge.

Environmental Education activities provide an optimal application of the three types of knowledge, Declarative, Procedural and Contextual, or the use of facts, processes and prior knowledge in order to think critically. When applied to environmental issues this critical thinking disposition will impact decision making about the environment ultimately leading to changed behavior. Teaching of critical thinking is an important goal of modern education, as it equips students with the competency necessary to reason about social affairs in a rapidly changing world (Ku, 2009).

As students are exposed to increased hands-on activities and critical thinking tasks they are more equipped to make informed decisions and retain critical knowledge necessary to make these decisions. Hands-on activities, such as monitoring water quality, measuring air pollution, or observing the effect of litter on wildlife, raise students' awareness of their own environmental context and its relevant problems (Ballantyne et al.,2001). Furthermore, students that are exposed to the learning modules presented at the Outdoor Activity Center (OAC) are provided with opportunities to be exposed to a variety of environmental activities that require hands-on application and critical thinking and application of prior knowledge. Therefore, the researcher will seek to determine the effectiveness of one of the activities commonly presented at the OAC in an effort to measure the impact of the learning modules on content knowledge. A student that is equipped with accurate Declarative Knowledge (facts), can apply the appropriate Procedural Knowledge (processes) within the applicable context (Contextual) Knowledge is able to make informed (Critical Thinking) decisions reflected in his/her actions.

CHAPTER III

METHODOLOGY

Introduction

The purpose of this education study was to determine if the Enviroscape® Watershed learning module increases content knowledge, by collecting data from urban-suburban schools from third, fourth and fifth grade students. In the study a content knowledge test was given prior to the module and after the presentation of the module by educators. The educators presenting the module were certified by Project Water Education for Teachers.

The application for review of human subjects research was submitted to the Institutional Review Board (IRB) at Oklahoma State University in December 2011. The application IRB #: GU 1112 was approved on January 06, 2012. A copy of the approved cover letter, the West Atlanta Watershed Alliance (WAWA) approval letter to the IRB and the Parent/Guardian Permission Form Oklahoma State University are included in Appendix C. The approved WAWA and IRB PRETEST and POSTTEST surveys are included in Appendix B.

The data were collected via pretest and posttest. The posttest questions were the same questions as presented in the pretest. The questions were designed to cover the full scope of the content presented in the learning experience activity.

Does the Project Water Education for Teachers (WET) Based Enviroscape ® Watershed Non-Point Source Pollution Learning Module increase student achievement? This research study will evaluate, through pretest and posttests, the effectiveness of the activities using environmental science themes on the higher order/critical thinking skills of elementary school children in grades three to five, conducted at the West Atlanta Watershed Alliance Urban Outdoor Activity Center. Each participant will receive a pretest and posttest designed to identify critical thinking characteristics and processes based on his/her exposure to these environmental activities. The pretest will be given along with a pre-assigned "ID" (provided and maintained by the center director; the researcher will not have access to the list) to the participants as they enter the Urban Outdoor Center. The participants will conduct a learning experience and at the conclusion of the experience the participants will take the posttest. Each assessment will be identified using the same individual identification code. In the event the students do not remember their identification codes, the center director will be on hand to assist. A one-to-one comparison will occur between the pre- and posttests. Additionally, each group will receive a pre- and posttest designed to identify critical thinking characteristics and processes based on their exposure to these environmental activities. The essential question of these assessments is: Does the exposure and active engagement with the activities improve the content knowledge of the affected students?

The educational module that was chosen was the Enviroscape ® Watershed module. This learning experience module was selected because of its relative connection to the Common Core Georgia Performance Standards for the elementary students. Additionally, it was selected because of its compactness and portability. The Enviroscape ® module is self-contained and offers relevance and real world connections to the students.

Research Questions

The Research Questions are:

1. Does the learning module increase student content knowledge?
2. Does a difference in content knowledge exist between urban and suburban schools?
3. Does a difference in content knowledge exist between third, fourth and fifth grade students?

Population of Study

The population for this study consisted of students who had mainly participated in activities conducted by the Watershed Alliance Outdoor Activity at the Bush Mountain Outdoor Activity Center. The population participated in the activities during the school years of 2011 to 2012. These years were used because the Enviroscape® Watershed learning modules were being used to test the knowledge and skills of elementary students on environmental issues. This represents a cross-section of urban and suburban elementary school students. These third, fourth and fifth grade students came from several schools in the Atlanta Metropolitan Area, including Atlanta Public Schools, Fulton County, Dekalb County, Clayton County and Cobb County schools. Additional students were involved through enrichment programs that include the City of Atlanta Parks & Recreation, faith-based organizations, Boys & Girls Clubs, Scouts and 4-H.

Sample of the Population

The sample population consisted of 62 elementary students in grades three, four and five from urban and suburban school districts in northeast Georgia. Seventy students were given the pretest and posttest, five students did not have a corresponding posttest and one student did not provide a grade or sit for the pretest. Two additional students also, did not indicate their grade level. These participants were involved in the Watershed Alliance Outdoor Activity at the Bush Mountain Outdoor Activity Center from the years of 2011 to 2012. The researcher, in partnership with the designer of the Enviroscape ® Module, was able to collect data from trained education facilitators at school sites from suburban and the Urban Atlanta Area. Educators were recruited to participate in the study based on their prior experience with environmental activities at the center, and were teaching third, fourth and fifth graders.

Reliable data for 2011 and 2012 years enabled the researcher to conduct the research study. The selected participants represented elementary students from urban and suburban school districts, and Charter Schools. The sample population came from a cross-section of the Atlanta Metro areas of northeast Georgia. All participants met the criteria of selection as outlined in the researcher's consent letter recruiting students in grades three-five and asking for volunteers to participate in the research study (See

Appendix A). All participants had to get a signed consent letter from their parents or guardians to participate in the research study.

Research Design

The research design used for this study is a pretest and posttest experimental research design. According to Creswell (2008), the pretest-posttest experimental research design is widely used in quantitative research for the purpose of comparing groups and measuring the change from the experimental treatment of the participants. The practical advantage of this design is that it deals effectively with intact groups and the research design does not disrupt the existing research setting. Further, this design reduces the effects of the experimental procedures and improves the threats to external validity of the design. Also, the researcher can determine if a difference exists between the means of the pretest and the posttest.

Instrumentation for Data Collection

The Project Water Education for Teachers (ProjectWET) based Enviroscape® Watershed Non-Point Source Pollution Learning Module was created by the New York State Board of Regents for the living environment area (New York State Education Department, 2011). This Enviroscape® Watershed module has 20 items that test the student's knowledge and understanding on living environment issues. The items on the Enviroscape® Watershed module test give the student a question or statement and are followed by four multiple-choice items and the construct-response items. The Enviroscape® Watershed module asks student such questions and statements as: "What percentage of water on Earth is fresh?" "Which of these is a direct cause of water pollution?" "Which process changed the shape of the rock layer over time?" and "The best place to wash your car is?" Students read the statement or questions and circle the best answer from the list of choice items.

The questions developed for the pre- and posttest were gathered from released state standardized test questions and aligned to the content of the Enviroscape® Watershed Non-Point Source module. Additionally some questions were adapted from the Enviroscape ® task. These questions were also reviewed and validated for connection to the content delivered through the learning module by educators trained by the Project Wet and the developer of the model. The posttest questions were developed from randomized questions that were presented in the pretest. The test instrument was based on content. In other words the posttest featured the same questions that were present in the pretest, only in random order from the pretest.

Collection of Data

The data used for this study were collected via a pretest and posttest at the testing school site. The questions in both tests were multiple-choice items. The posttest questions were the same questions as presented in the pretest. In the posttest, however, they were in random order compared to the pretest. The questions were designed to cover the full scope of the content presented in the learning experience activity. The pretest was administered to the participants prior to the beginning of the learning experience activity. At the conclusion of the hands-on activity, instruction for the posttest was administered.

This research study determined the effective impact of hands-on, inquiry based instructional activities developed and conducted by the West Atlanta Watershed Alliance's urban Outdoor Activity Center or on school site. Additionally, the researcher sought to improve teacher and student participation by offering authentic research-based activities. According to Hartman, Miller, and Nelson (2000), students who are involved in hands-on activities are able to recall more information than those exposed to demonstration only as a teaching method.

Analysis of Data

The data from the research study, using the pretest-posttest research design, were entered into an Excel Spreadsheet. Then the data were entered into the Statistical Package for Social Science (SPSS) and analyzed. The variables on the pretest and the posttest on the Watershed modules were tested and analyzed. The data were then put into tables for interpretation.

This research study used a Paired Sample T-Test and Analysis of Variance (ANOVA) to evaluate, through pre-and posttests, the effectiveness of the activities. The pretest results of each student were compared to their posttest results. The data were analyzed to assess the degree of difference between the one-to-one comparisons.

Summary

The methods and procedures used in this research study were provided in this chapter. Specifically, the purpose of the study, the research questions, a description of the research design, the population and the sample, instrumentation, data collection and research procedures, statistical analysis and the data analysis and the were presented in this chapter.

Chapter IV presents the results of the research study in table format and detail narrative and also presents a summarization of the research findings of the study.

Chapter V presents a detailed discussion of the research findings of the study, conclusions, implications, and recommendations for further research.

CHAPTER IV

FINDINGS

The purpose of this education study was to investigate if the Enviroscape® Watershed learning module increases content knowledge from third, fourth and fifth grade students in urban-suburban schools. In the study a content knowledge test was given prior to the module and after the presentation of the module by educators. The findings include the results from the pretest and posttest data from the third, fourth and fifth grade students. The results were compared to previous research studies.

Research Question

The following are the Research Questions for this study:

1. Does the learning module increase student content knowledge?
2. Does a difference in content knowledge exist between urban and suburban schools?
3. Does a difference in content knowledge exist between third, fourth and fifth grade students?

Demographics Data

The sample population consisted of 62 elementary students in grades three, four and five from urban and suburban school districts in northeast Georgia. These participants were involved in the Watershed Alliance Outdoor Activity at the Bush Mountain Outdoor Activity Center from the years of 2011 to 2012. These years were used because the Enviroscape® Watershed learning modules were being used to test elementary students' knowledge and skills on environmental issues. Table 1 shows that 26 third graders, 19 fourth graders, and 17 fifth graders participated. Also, 46 participants came from urban areas and 16 of the participants came from suburban areas of northeast Georgia.

Table 1. *Demographic Description of Student Participants*

	Third grade (*n* = 26)		Fourth grade (*n* = 19)		Fifth grade (*n* = 17)		Total (*n* = 62)	
Characteristic	*n*	%	*n*	%	*n*	%	*n*	%
Suburban/Urban								
Suburban	16	100.0	0	0.0	0	0.0	16	25.8
Urban	10	16.1	19	30.6	17	27.4	46	74.2

Results of Data Analysis

The students' pretest and posttest scores were used to analyze research question 1. Research question 1 asks: Does the learning module increase student content knowledge? A paired-sample t test was conducted to compare the pretest and posttest scores to evaluate whether the mean was a significant difference from the pretest to the posttest for all groups (third, fourth and fifth grade students). The mean for the pretest was 34.84 (SD = 11.593) for all groups (see table 2). The mean for the posttest was

37.42 (SD = 17.550). The results of the test were not significant from 62, t (61) = -1.067, p = .290 at the .05 level of significance (see table 3).

Table 2. *Pretest Posttest Mean and Standard Deviation*

Source	N	Mean	Std. Deviation	Std. Error Mean
Pretest	62	34.84	11.593	1.472
Posttest	62	37.42	17.550	2.229

A paired sample t-test was conducted on the pretest and the posttest scores to evaluate whether their mean was significant. The sample mean differences for the pretest were 34.84 and the mean differences for the posttest were 37.42. The results of the test were not significant (.290) at the .05 level of significance (table 3).

Table 3. *Paired Sample T Test (Pretest and Posttest)*

T	df	Sig.(2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
1.068	61	.290	-2.58	-7.41	2.25

P < .05

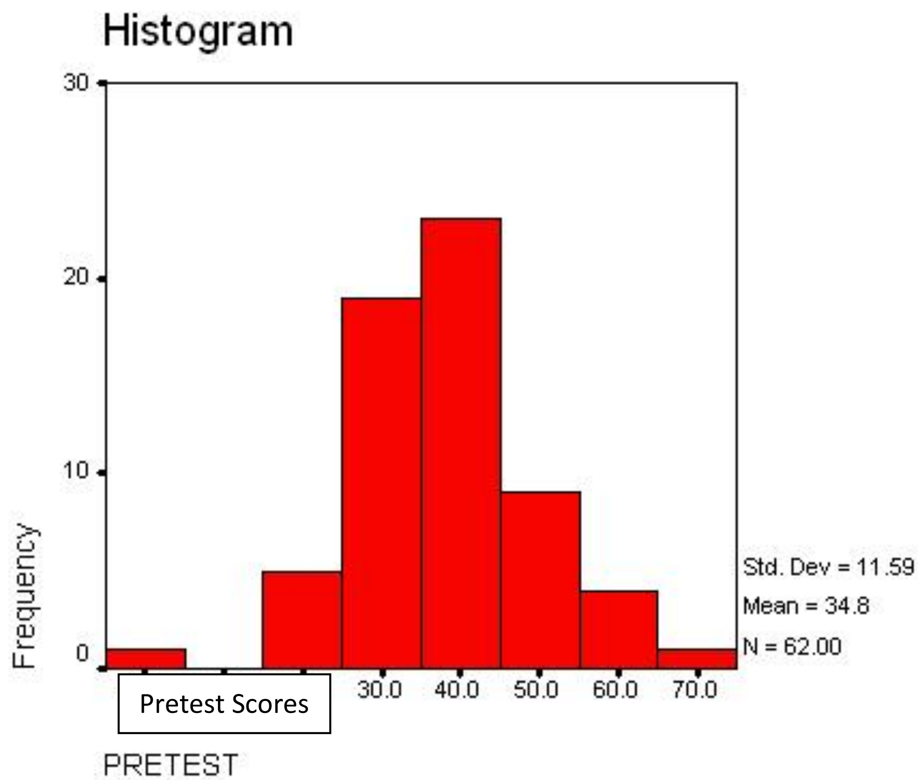

Figure 1: *Pretest Scores for all Groups*

Note: Figure1 represents a frequency distribution of the posttest data.

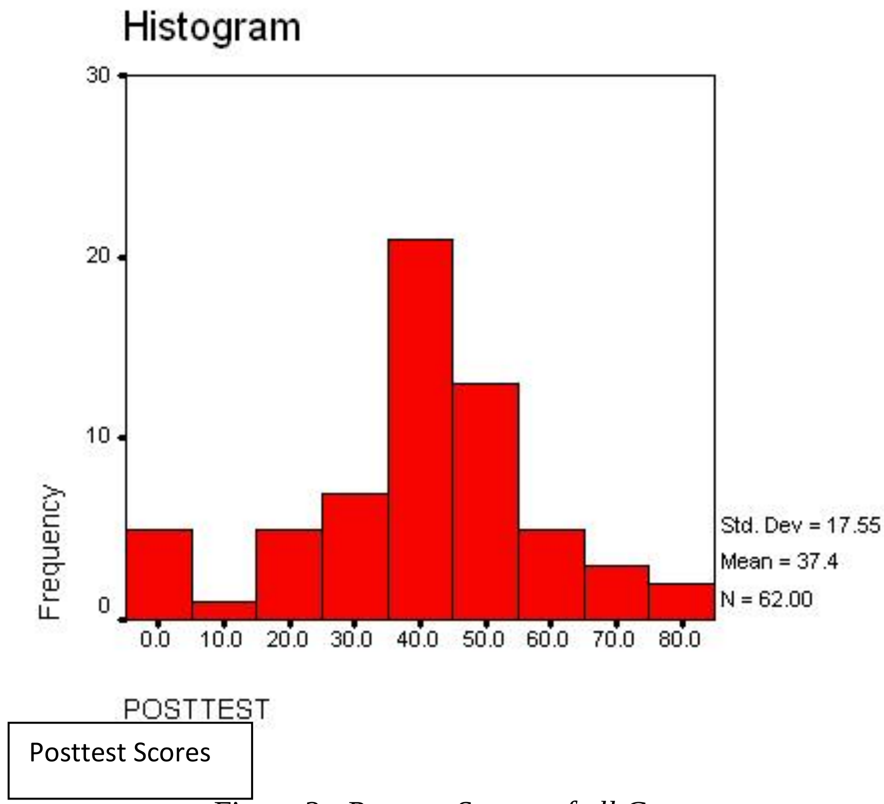

Figure 2: *Posttest Scores of all Groups*

Note: Figure 2 represents a frequency distribution of the posttest data.

Research Question 2 asks: Does a difference in the content knowledge learned exist between urban and suburban schools? To answer this question a paired sample t test was conducted on the pretest and posttest for the urban and suburban students to determine whether the mean value were significant. The mean for the urban group was 35.87 (SD = 18.114) (See table 4). The mean for the suburban group was 41.88 (SD = 15.478). The sample was not significant (.242) at the .05 level of significance (See Table 5).

Table 4. *Urban and Suburban Participants*

	Mean	N	Std. Deviation	Std. Error of Mean
Urban	35.87	46	18.114	2.671
Suburban	41.88	16	15.478	3.870

A one sample t-test was conducted on the suburban and the urban scores to evaluate whether the mean was significant. The one sample t-test was not significant, .242 at the .05 level of significance. The sample mean differences for the pretest were 35.87 and the mean differences for the posttest were 41.88.

Table 5. *Urban and Suburban One Sample t-Test*

	Test Value = 62					
	T	df	Sig.(2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Pretest	-1.067	60	.290	-3.59	-10.310	3.136
Posttest	-1.183	60	.242	-6.01	-16.161	4.150

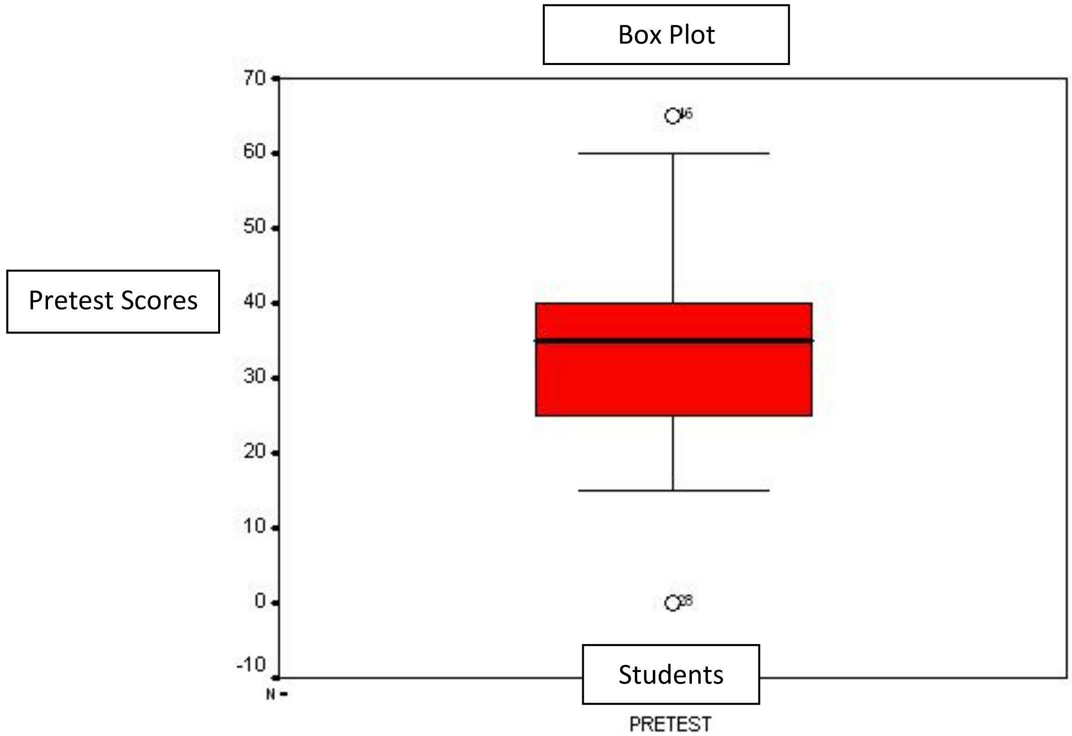

Figure 3. Pretest/Postest

Research question 3 asks: Does a difference in content knowledge exist between third, fourth and fifth grade students? A one-way analysis of variance (ANOVA) was calculated on participants' scores on the third, fourth and fifth grade students to evaluate whether the significant difference exists between pretest to the posttest for all groups (third, fourth and fifth grade students). The mean for the third grade students was 39.62 (SD = 15.743); the mean for fourth grade students was 36.05 (SD =19.761); the mean for fifth grade students was 35.59, (SD = 18.276) (See Table 6).   The result of the analysis of variance (ANOVA) showed that no significant difference occurred among the three groups. The F-value for the of students was [F(2,59)=.346, p=.709]. (Table 7).

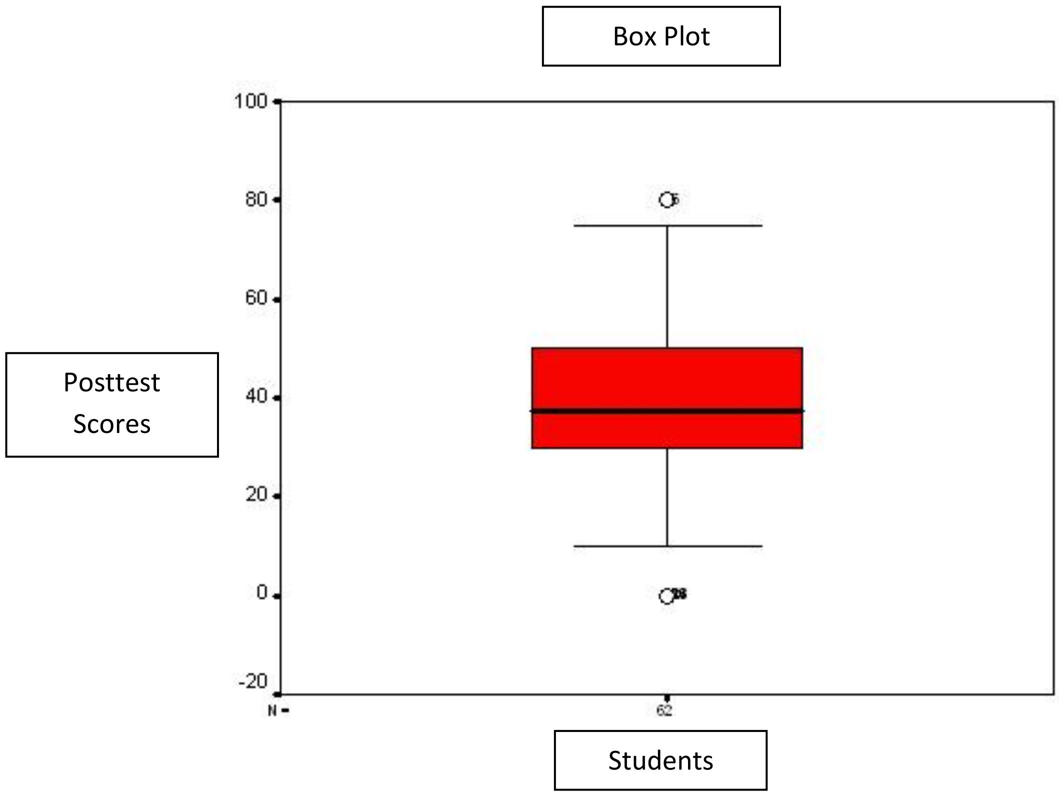

Figure 4. Pretest / Posttest

Table 6. *Mean and Standard Deviation of all Groups (One Sample Statistics)*

	N	Mean	SD	Error
Grade 3	26	39.62	15.743	3.087
Grade 4	19	36.05	19.761	4.533
Grade 5	17	35.59	18.276	4.433

Table 7. *Content Knowledge for All Grades (3rd, 4th, 5th)*

	SS	df	Mean	F	Sig.
Grade 3-5	217.878	2	108.939	.346	.709

P < .05

Summary

The purpose of this education study was to determine if the Enviroscape® Watershed learning module increases content knowledge, by collecting data from urban-suburban schools from third, fourth and fifth grade students. In the study a content knowledge test was given prior to the module and after the presentation of the module by educators. The findings include the results from the pretest and posttest data from the third, fourth and fifth grade students. The results were compared to previous research studies. The study provided data to demonstrate that several of the participants' scores were increased from the pretest to the posttest, yet not significantly. Furthermore, no significant difference occurred between the mean scores between students in grades three, four and five. Results of this study did not support evidence that the content knowledge of the participants from urban and suburban areas was increased significantly by using the Enviroscape® Watershed learning modules.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

The purpose of this education study was to determine if the Enviroscape® Watershed learning module increases content knowledge by collecting data from urban-suburban schools from third, fourth and fifth grade students. In the study a content knowledge test was given prior to the module and after the presentation of the module by educators.

Chapter V discusses the results of the three research questions and variables of this project. Chapter V is organized into four sections:

1. Summary and Discussion of Findings
2. Implications
3. Conclusions
4. Recommendations for future research.

Summary and Discussion of Findings

Research Question 1

Does the learning module increase student content knowledge? A one sample t-test was conducted on the pretest and the posttest scores to evaluate whether there were differences in the mean scores. A moderate increase occurred in the mean scores from pretest (34.84) to posttest (37.42). The results of a one-sample t-test, however, indicated that no significant increase (.290) occurred at the .05 level of significance. This moderate increase, although not significant, supports Mabie and Baker's (1996) and Kim, Chung and Kim's (2001) findings that state by "engaging students in agricultural and environmental action research or problem-based learning, students develop scientific thinking, problem-solving skills, and positive attitudes in addressing agricultural and environmental issues." Positive attitudes and critical reflection on the complexities of these issues help motivate students to learn more about agricultural and environmental problems. Interactions among students, scientists and students, or teachers and students are helpful in problem diagnosis and enhancing critical thinking (Poudel, 2005; Kim, Chung, & Kim, 2001). Several possible factors could have contributed to the insignificant findings. The researcher will discuss in the summary.

Research Question 2

Does a difference in the content knowledge exist between urban and suburban schools? A paired sample t-test was conducted on the participants' pretest and posttest content knowledge scores from urban and suburban areas. The research revealed an increase in mean scores between urban and suburban groups. Suburban groups had a higher mean score (41.88) compared to urban (35.87). The one sample t-test was not significant (.242) at the .05 level of significance. The results showed that no significant increase occurred in the urban participants' content knowledge science scores. Whether urban or rural, the landscape in which children find themselves is the staging ground for their imagination, their story, their sense in the world (Mergen, 2003). Many authors and researchers believe that children today lack exposure to the natural world that shapes environmental values and puts science in context (Bundschu-Mooney, 2003; Finch, 2004; Kahn, 2002; Kellert, 2002; Orr, 2002).

Research Question 3

Does a difference in content knowledge exist between third, fourth and fifth grade students? A paired sample t-test was conducted on the participants' pretest and posttest content knowledge scores between third, fourth and fifth grade students. The mean posttest for third grade was 39.62, fourth grade 36.05 and the fifth grade at 35.59. The one sample t-test was not significant (.242) at the .05 level of significance. A one-way analysis of variance (ANOVA) was conducted on the participants' scores in third, fourth and fifth grades. The result of the analysis of variance (ANOVA) showed that no significant difference occurred among any of the three groups. These findings support the need for increased development of rigorous environmental science content as reported by Ballantyne (2006) findings on content science knowledge. The challenge that faces environmental educators is to develop strategies which help individuals, irrespective of age, become competent and motivated to act in an environmentally responsible manner as well as to share their informed views and skills with others (Ballantyne, 2006, 1998).

Whereas no statistical significance exists in this study between students' science content knowledge for urban and suburban students, future studies using larger populations of elementary students may yield different results and findings. From a quantitative viewpoint a larger sample of elementary students could have strengthened this study. Similarly, presenting the science content knowledge at the beginning of the school year, middle of the school year, and towards the end of the year may increase the reliability of the study. Further, the addition of non-cognitive variables, such as gender, ethnicity, and family financial status, would also strengthen this study. A longitudinal study of students' science content knowledge should be conducted on students when they first enter kindergarten.

Implications

A limited amount of published research studies exist on the relationship between environmental science content knowledge and student achievement. More studies are needed to advance science content knowledge strategies for elementary students. Teachers build a sense of efficacy about their teaching abilities through experiences, training, and practice teaching. Teachers further build a sense of efficacy through developed cognitive processes relative to their ability to perform and to influence student learning (Bandura, 1997). One implication for this is that the school needs to assist teachers and students in building positive self-efficacies about science. A high level of self-efficacy encourages academic achievement. Positive self-efficacies may be built in a variety of ways. Teachers may support a sense of accomplishment among students by providing genuine positive feedback on science strategies in everyday life. Giving inadequate or nonspecific feedback may further reduce the students' self-efficacy (Schunk, 1991, 2003).

Conclusions

The purpose of this education study was to investigate if the Enviroscape® Watershed learning module increases content knowledge, by collecting data from urban-suburban schools from third, fourth and fifth grade students. A content knowledge test was given prior to the module and after the presentation of the module by educators. The findings include the results from the pretest and posttest data from the third, fourth and fifth grade students. The results were compared to previous research studies. The study provided data to demonstrate that several of the participants' scores were increased from the pretest to the posttest. Results of this study support evidence that the content knowledge of participants from urban and suburban areas was increased slightly by using the Enviroscape® Watershed learning modules. Although a slight increase in the scores from pretest to posttest, the researcher did not find a significant difference in learning. A larger more controlled study is recommended for more conclusive results.

Recommendations for Future Research

This study should be replicated using a random sampling procedure to replace the convenient sample used. A random sample procedure would eliminate bias. Also recommended is a larger sample size in all sub group populations. This study was a short-term exposure to a learning experience; a longer study should be conducted. It is also recommended that the participants experience a second learning experience after participating in additional content lessons, with follow-up assessment of learning. This research did not take into consideration the time, location at which the education experience was given, prior knowledge of the participants or content/experience of the education specialist delivering the content. Furthermore, no consistency with the delivery of the content was represented. In further studies one or more of these variables should be isolated. The researcher in this study attempted to ascertain if an increase in content knowledge occurred. The mean average difference between the pretest and posttest did increase over the short exposure to the learning experience as presented by Kinder (2012). "This study shows that providing short-term, high-quality environmental education programs is an effective way to provide fourth grade students an opportunity to learn about the environment" (p. 52). Therefore, after including more intensive focus on the content delivered through the module, additional research is suggested.

Experiential studies have validated the effectiveness of fundamental content knowledge for science education. Andrejewski (2011) reported that Florida high school students that participated in an environment-based curriculum also demonstrated gains in critical thinking skills, an ability the researchers believed may be a better indicator of program success than test scores (p. 33).

What is lacking in science instruction are broad based classroom, familial, and community self-regulated instructional strategies for maintaining science knowledge and motivation. Overall, relatively few experimental studies have provided suggestions for teaching strategies to increase students' engagement and motivation in the content area of science at the elementary school level. Though a multitude of programs have been written and implemented to teach the fundamentals of science, attempts to include instructional science motivational strategies have made little advancement.

Academicians and psychologists have provided a vast amount of evidence-based studies on academic motivation. But these findings have not been adapted for use in classroom or community environments. What's missing in education is the penchant for evidenced based paradigm shifts that have advanced the field of medicine. Pintrich (2003) explored commonly accepted and empirically supported research claims on the motivational science of learning. After review of collective claims, he determined that a specific path should exist for research on motivation science. Pintrich proposed an empirical approach to investigation of motivational science. He postulated that investigation of motivational research should include empirical evidence to support motivational claims. In addition he proposes a multidisciplinary approach to understand the student's motivation, development and personality for learning sciences. Finally, the focus of research in the academic settings should include "both goals contributing to basic scientific understanding of motivation as well as developing useful ideas and design principles to improve motivation in educational and other teaching and learning settings" (p. 669).

I believe a three-prong approach proposed by Pintrich (2003) should be applied to instructional strategies for the science of learning as well. Future instructional strategies for science motivation should follow a specific path also. Instructional strategies for reading should be designed for three customers, the student, the family, and the community. Instructional strategies should include empirical evidence. The development of strategies should include a multidisciplinary approach. The focus of instructional strategies in academic settings should include individual goals and strategic methods for improving self-regulated science plans for the student, family, and community. Trained science teachers are needed to support students in the three learning settings.

The testing for both pretest and posttest should be controlled and monitored to ensure that the study participants received the optimal opportunities for success. The instructors should ensure that the environment is quiet and conducive to maximize the learning potential. There should be an increased emphasis on delivering the learning module in a student-centered hands-on process. The instructors should reduce the degree of teacher-focused direct instruction. Achievement has been proven to increase as students engage in learning in smaller groups; delivery of this experience in small groups is therefore recommended as well. Once students are better critical thinkers as related to environmental issues, they will be better informed decision makers. These informed decisions will have a greater probability in resulting in changed actions, be it about the environment or elsewhere in society. Better citizens make a better world.

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APPENDICES

APPENDIX A

APPROVED ENVIROSCAPE SURVEY

PERMISSION LETTER

Dear EnviroScape Customers:

A researcher would like your help.

Warren Edwards, an Environmental Science, PhD candidate at Oklahoma State University is currently researching the academic achievement gained as a result of students in grades 3-5 (ages 8-11) experiencing the EnviroScape Watershed NPS Model. He needs a larger research group.
If you choose to participate simply have students return to you the permission slip-signed (click on this link to download):
http://www.enviroscapes.com/Research/Generic-PARENT-Letter.pdf.

You will then assign each student a unique letter or number that will be written on both their pre and post test, so the results can be compared. A single number or letter is fine as long as the pre and post test identifiers match and the researcher is able to compare pre and post test results. The Pre Test can be given on a separate day in advance of the EnviroScape lesson, the Post Test should be given directly following the EnviroScape lesson. (click on this link to download Pre & Post Tests):
http://www.enviroscapes.com/Research/enviroscape_oac_Pre_Post.pdf.
The pre and post tests and permission slips should be mailed or scanned in and emailed to the researcher. This research is time sensitive and results should be sent as soon as possible.

Warren Edwards
2433 Black Forest Trail SW
Atlanta, GA 30331
wpedwards210@gmail.com<mailto:wpedwards210@gmail.com>
The researcher is also looking for any additional research that may have been done on EnviroScape.

Thank you for your willingness to help the researcher collect this additional data!
Thanks for your help!

Lura Svestka
http://www.enviroscapes.com 703-631-8810<tel:703-631-8810> x10

APPENDIX B

PRE-TEST AND POST-TEST INSTRUMENTS

No. ______ Name: ________________________________ School: ________________________________

Grade: _____ Ethnicity: _________________ Sex: M Y F Y ID: A

Enviroscape

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Letting the water run while brushing your teeth can waste ______ gallons of water per minute?
   A. 1
   B. 2
   C. 3
   D. 4

2. Water percentage of earth's water is fresh?
   A. 3%
   B. 5%
   C. 10%
   D. 20%

3. The level of contaminant in drinking water below which there is no known or expected health risk is the ____________.
   A. Maximum Contaminant Level Goal
   B. Maximum Contaminant Level
   C. Treatment Technique Level Goal
   D. Treatment Technique Level

4. Typical sources of turbidity in drinking water include:
   A. Waste discharge
   B. Runoff
   C. Algae
   D. All of the above

5. How many gallons of water does each person in the U.S. use each day?
   A. 100
   B. 1,000
   C. 10,000
   D. 100,000

6. In the water cycle clouds form when water vapor
   A. evaporates
   B. changes to ice
   C. condenses
   D. freezes

7. Which of these is a direct cause of water pollution?
   A. using plastic bags instead of paper
   B. driving a car that uses a lot of gasoline
   C. not recycling your bottles and cans
   D. spraying too many chemicals on your lawn

8. Why should a town spend money to stop chemicals from getting into the river near the town?
   A. It prevents air pollution.
   B. It makes the water safer to drink.
   C. It reduces land pollution.
   D. It increases the amount of water available to use.

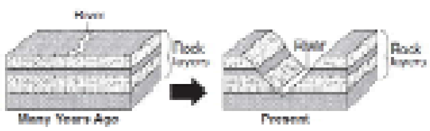
9. A river channel is now so shallow that ships are getting stuck in the mud. What is the MOST likely cause?
   A. water depositing sediment
   B. water picking up sediment
   C. wind depositing sediment
   D. wind picking up sediment

10. When are sediments likely to drop out of a river and settle on the bottom?
    A. when one river flows into another river
    B. when the river is flowing slowly
    C. when the river is moving rapidly
    D. when the river is flooded

11. Rainwater running down a bare hillside
    A. deposits sediments at the top of the hillside.
    B. deposits sediments at the bottom of the hillside.
    C. has no effect on the topography of the hillside.
    D. eventually forms a cave.

12. Which of these activities wastes the MOST water per day in the average home?
    A. Running the tap while washing dishes
    B. Using a garbage disposal
    C. A leaky toilet
    D. Long showers

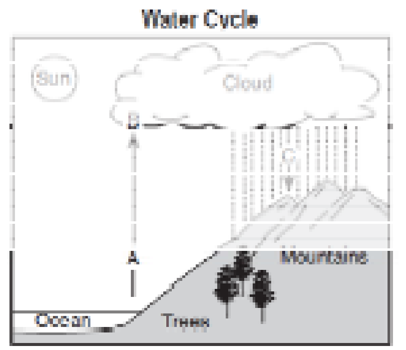
13. The diagram below shows an area of land that changed after many years.



Which process changed the shape of the rock layers over time?

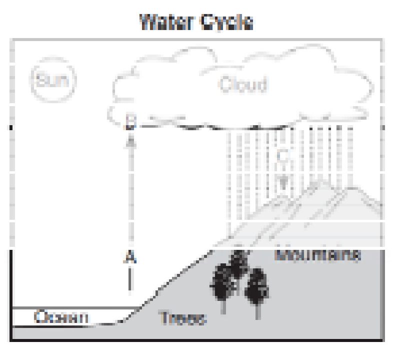
    A. condensation
    B. evaporation
    C. erosion
    D. magnetism

14. Use the water cycle diagram below to answer the question. Letters A, B, and C represent three processes in the water cycle.



Identify process A.
    A. Condensation
    B. Evaporation
    C. Precipitation
    D. Transpiration

15. Use the water cycle diagram below to answer the question. Letters A, B, and C represent three processes in the water cycle.



Identify process B.

    A. Condensation
    B. Evaporation
    C. Precipitation
    D. Transpiration

Name: ______________________ ID: A

16. What is stormwater runoff and why is it a problem?
    A. rain that runs over streets and yards and goes to the storm drains untreated then to streams and creeks
    B. rain from a storm that flows down the street
    C. rain that runs over streets and yards and goes to the storm drains then a treatment facility
    D. mud and debrief that is leftover after a storm

17. Plastics or litter in the ocean will
    A. get picked up by the coast guard
    B. dissolve in the water and disappear
    C. sink to the bottom and disappear
    D. could be eaten by marine life

18. Raking leaves into a storm drain
    A. will decompose and pollute the ocean
    B. will flow to the ocean and turn into shelter for the fish.
    C. will flow to the ocean and the fish will each it.
    D. is better than putting in the trash can because they take up to much space.

19. What percentage (%) of the earth is water?
    A. 7%
    B. 7.8%
    C. 78%
    D. 88%

20. The best place to wash your car at home is
    A. in the drive way so that the soap will not get on the grass.
    B. in the rain so that you will not use a lot of water.
    C. on the street so the water flows directly down the drain
    D. in the grass so that the soil can absorb the soap.

ID: A

Enviroscape
Answer Section

MULTIPLE CHOICE

1. ANS: D PTS: 1
2. ANS: A PTS: 1
3. ANS: B PTS: 1
4. ANS: D PTS: 1
5. ANS: A PTS: 1
6. ANS: C PTS: 1
7. ANS: D PTS: 1
8. ANS: B PTS: 1
9. ANS: A PTS: 1
10. ANS: B PTS: 1
11. ANS: B PTS: 1
12. ANS: C
    A leaky toilet can waste about 200 gallons of water every day! Ask to help your parents test your toilets for leaks. Place a drop of food coloring in the tank and if the color shows in the bowl before flushing, you have a leak.

    PTS: 1
13. ANS: C PTS: 1 NOT: NY State U_Gr4_June 2010
14. ANS: B PTS: 1 NOT: NY State U_gr4_june 2010
15. ANS: A PTS: 1 NOT: NY State U_Gr4_June 2010
16. ANS: A PTS: 1 NOT: Enviroscape Oral Quiz
17. ANS: D PTS: 1 NOT: Enviroscape Oral Quiz
18. ANS: A PTS: 1 NOT: Enviroscape Oral Quiz
19. ANS: C PTS: 1 NOT: Enviroscape Oral Quiz
20. ANS: D PTS: 1 NOT: Enviroscape Oral Quiz

No. ______ Name: ________________________________ School: ________________________________

Grade: _____ Ethnicity: _________________ Sex: M Y F Y ID: B

Enviroscape

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. Typical sources of turbidity in drinking water include:
   A. Runoff
   B. Waste discharge
   C. All of the above
   D. Algae

2. The diagram below shows an area of land that changed after many years.

   Which process changed the shape of the rock layers over time?

   A. condensation
   B. erosion
   C. evaporation
   D. magnetism

3. When are sediments likely to drop out of a river and settle on the bottom?
   A. when the river is moving rapidly
   B. when one river flows into another river
   C. when the river is flooded
   D. when the river is flowing slowly

4. What percentage (%) of the earth is water?
   A. 7%
   B. 78%
   C. 88%
   D. 7.8%

5. In the water cycle clouds form when water vapor
   A. freezes
   B. condenses
   C. evaporates
   D. changes to ice

6. Letting the water run while brushing your teeth can waste ______ gallons of water per minute?
   A. 4
   B. 1
   C. 2
   D. 3

7. A river channel is now so shallow that ships are getting stuck in the mud. What is the MOST likely cause?
   A. water depositing sediment
   B. water picking up sediment
   C. wind depositing sediment
   D. wind picking up sediment

8. The level of contaminant in drinking water below which there is no known or expected health risk is the ____________.
   A. Treatment Technique Level Goal
   B. Treatment Technique Level
   C. Maximum Contaminant Level Goal
   D. Maximum Contaminant Level

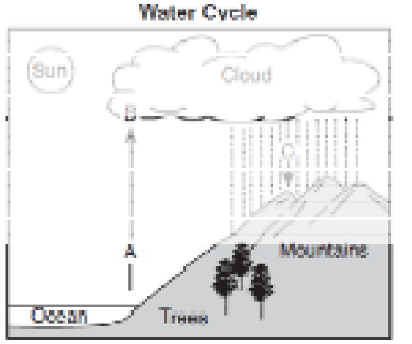
9. Rainwater running down a bare hillside
   A. deposits sediments at the bottom of the hillside.
   B. deposits sediments at the top of the hillside.
   C. eventually forms a cave.
   D. has no effect on the topography of the hillside.

10. Water percentage of earth's water is fresh?
    A. 5%
    B. 10%
    C. 3%
    D. 20%

11. Raking leaves into a storm drain
    A. will flow to the ocean and the fish will each it.
    B. will decompose and pollute the ocean
    C. will flow to the ocean and turn into shelter for the fish.
    D. is better than putting in the trash can because they take up to much space.

12. Use the water cycle diagram below to answer the question. Letters A, B, and C represent three processes in the water cycle.

Water Cycle



Identify process A.
    A. Condensation
    B. Transpiration
    C. Precipitation
    D. Evaporation

13. The best place to wash your car at home is
    A. in the grass so that the soil can absorb the soap.
    B. in the drive way so that the soap will not get on the grass.
    C. in the rain so that you will not use a lot of water.
    D. on the street so the water flows directly down the drain

14. Why should a town spend money to stop chemicals from getting into the river near the town?
    A. It makes the water safer to drink.
    B. It increases the amount of water available to use.
    C. It reduces land pollution.
    D. It prevents air pollution.

15. Which of these is a direct cause of water pollution?
    A. driving a car that uses a lot of gasoline
    B. using plastic bags instead of paper
    C. spraying too many chemicals on your lawn
    D. not recycling your bottles and cans

16. What is stormwater runoff and why is it a problem?
    A. rain that runs over streets and yards and goes to the storm drains untreated then to streams and creeks
    B. mud and debrief that is leftover after a storm
    C. rain that runs over streets and yards and goes to the storm drains then a treatment facility
    D. rain from a storm that flows down the street

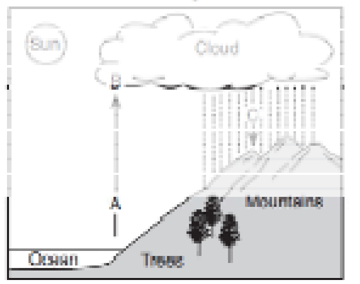
17. Which of these activities wastes the MOST water per day in the average home?
    A. Long showers
    B. Running the tap while washing dishes
    C. Using a garbage disposal
    D. A leaky toilet

18. How many gallons of water does each person in the U.S. use each day?
    A. 100
    B. 1,000
    C. 10,000
    D. 100,000

19. Plastics or litter in the ocean will
    A. sink to the bottom and disappear
    B. could be eaten by marine life
    C. dissolve in the water and disappear
    D. get picked up by the coast guard

20. Use the water cycle diagram below to answer the question. Letters A, B, and C represent three processes in the water cycle.

Water Cycle



Identify process B.

A. Transpiration
B. Evaporation
C. Precipitation
D. Condensation

Enviroscape
Answer Section

MULTIPLE CHOICE

1. ANS: C PTS: 1
2. ANS: B PTS: 1 NOT: NY State U_Gr4_June 2010
3. ANS: D PTS: 1
4. ANS: B PTS: 1 NOT: Enviroscape Oral Quiz
5. ANS: B PTS: 1
6. ANS: A PTS: 1
7. ANS: A PTS: 1
8. ANS: D PTS: 1
9. ANS: A PTS: 1
10. ANS: C PTS: 1
11. ANS: B PTS: 1 NOT: Enviroscape Oral Quiz
12. ANS: D PTS: 1 NOT: NY State U_gr4_june 2010
13. ANS: A PTS: 1 NOT: Enviroscape Oral Quiz
14. ANS: A PTS: 1
15. ANS: C PTS: 1
16. ANS: A PTS: 1 NOT: Enviroscape Oral Quiz
17. ANS: D
    A leaky toilet can waste about 200 gallons of water every day! Ask to help your parents test your toilets for leaks. Place a drop of food coloring in the tank and if the color shows in the bowl before flushing, you have a leak.

    PTS: 1
18. ANS: A PTS: 1
19. ANS: B PTS: 1 NOT: Enviroscape Oral Quiz
20. ANS: D PTS: 1 NOT: NY State U_Gr4_June 2010

Enviroscape [Version Map]

	A	B
MC	1	6
MC	2	10
MC	3	8
MC	4	1
MC	5	18
MC	6	5
MC	7	15
MC	8	14
MC	9	7
MC	10	3
MC	11	9
MC	12	17
MC	13	2
MC	14	12
MC	15	20
MC	16	16
MC	17	19
MC	18	11
MC	19	4
MC	20	13

APPENDIX C

IRB APPROVAL FORMS

Oklahoma State University Institutional Review Board

Date: Friday, January 06, 2012

IRB Application No GU1112

Proposal Title: The Effects of Watershed Management Activities on the Critical Thinking Dispositions Skills of Urban Elementary Students and Their Environment

Reviewed and Processed as: Expedited

Status Recommended by Reviewer(s): Approved Protocol Expires: 1/5/2013

Principal Investigator(s):

Warren Edwards
2433 Black Forest Trl
Atlanta, GA 30331

Steven Marks
309 Cordell North
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia M. Kennison

Shelia Kennison, Chair
Institutional Review Board

WAWA
WEST ATLANTA
WATERSHED ALLIANCE
www.wawaonline.org

Atlanta Outdoor Activity Center
1442 Richland Road, SW
Atlanta, GA 30310
Phone: 404.752.5385

Date December 7, 2011

Oklahoma State University Institutional Review Board
c/o Graduate College of Environmental Science
Stillwater, OK 74078

Please note that Mr. Warren P. Edwards, OSU Graduate Student, has the permission of the West Atlanta Watershed Alliance which facilitates public access and programs at the Outdoor Activity Center via a memorandum of understanding with the City of Atlanta Bureau of Parks Recreation and Cultural Affairs to conduct research at the Outdoor Activity Center for his study, "Effects of watershed management activities on the critical thinking disposition skills of urban elementary students and their environment". A representative from City of Atlanta Bureau of Parks Recreation and Cultural Affairs is aware of the research and will act as signed witness to this agreement.

Mr. Edwards has also agreed to provide to my office and the City of Atlanta Bureau of Parks Recreation and Cultural Affairs a copy of the Oklahoma State University IRB-approved, stamped consent document before he recruits participants, and will also provide a copy of any aggregate results.

If there are any questions, please contact my office.

Signed,

Darryl Haddock
Director of Environmental Education
West Atlanta Watershed Alliance

Quandus Burns
Recreation Specialist
City of Atlanta Bureau of Parks
Recreation and Cultural Affairs

PARENT/GUARDIAN PERMISSION FORM
OKLAHOMA STATE UNIVERSITY

PROJECT TITLE: The effects of water shed management activities on the critical thinking dispositions skills of urban elementary students and their environment.

INVESTIGATORS: Warren Edwards, B.A. Clark Atlanta University, M. S. Oklahoma State University

PURPOSE:
This research seeks to determine the effective impact of hands-on, inquiry based instructional activities conducted at an urban outdoor activity center. According to Hartman, Miller, and Nelson (2000), students who are involved in hands-on activities are able to recall more information than those exposed to demonstration only as a teaching method. This research will focus on the whether a change occurs in the students' attitudes towards environmental conservation and awareness as they participate in activities conducted at a non-profit, government funded outdoor center. The center is located within S.W. Atlanta, GA.

PROCEDURES:
This research will evaluate, through pre-and post-surveys, the effectiveness of the activities conducted at the urban center on the attitudes and awareness students have of current issues and situations involving their local environment.

Only students that have attended the City center orientation will be included in this research. At the city center the directors will assign each student an identifier to be used for the surveye The city cn ter directors will secure and maintain the list of student "codes". The researcher will not have access to this list. Furthermore, since the pre and post test will be administered the same day of the field visit, therefore there is no risk to remembering the id number. In the event a student cannot remember their number for the post survey the City Center director will be on hand to assist.

Each participant aged 8-11 will receive a pre- and post-survey questionnaire designed to identify critical thinking characteristics and processes based on their exposure to these environmental activities. The pre-survey will be given along with their pre assigned "ID" (provided and maintained by the center director, the researcher will not have access to the list) to the participants as they enter the Urban Outdoor Center. The participants will conduct a learning experience at the conclusion of the experience the participants will take the post-survey. Each survey will be identified using the same individual id code. In the event the students do not remember their id the center director will be on hand to assist. There will be a one-to one comparison between the pre and post questionnaire.

RISKS OF PARTICIPATION:
There are no known risks associated with this project which are greater than those ordinarily encountered in daily life.

BENEFITS OF PARTICIPATION:
There are no expected benefits to the participation in this study other than an increase knowledge of environmental issues and content knowledge. If you are interested, we will send you a copy of the results of the study when it is finished.

CONFIDENTIALITY:
The records of this study will be kept private. Any written results will discuss group findings and will not include information that will identify your child. Research records will be stored securely and only researchers and individuals responsible for research oversight will have access to the records. It is possible that the consent process and data collection will be observed by research oversight staff responsible for safeguarding the rights and wellbeing of people who participate in research.

COMPENSATION:
Your child will not receive any compensation

CONTACTS:
You may contact the researcher at the following address and phone number, should you desire to discuss your child's participation in the study and/or request information about the results of the study: Warren Edwards, 2433 Black Forest Trl. SW., Atlanta, GA 30331, 678.640.6460. If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu

PARTICIPANT RIGHTS:
I understand that my child's participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my permission at any time, without penalty.

CONSENT DOCUMENTATION:

I have been fully informed about the procedures listed here. I am aware of what my child will be asked to do and of the benefits of their participation. I also understand the following statements:

I have read and fully understand this permission form. I sign it freely and voluntarily. A copy of this form will be given to me. I hereby give permission for my child

____participation in this study.
(insert child's name here)

____ __________________________
Signature of Parent/Legal Guardian Date

VITA

Warren Patrick Edwards

Candidate for the Degree of

Doctor of Philosophy

Thesis: ASSESSING THE VALUE OF THE ENVIROSCAPE WATERSHED LEARNING MODULE

Major Field: Environmental Science

Biographical:

Education:
Completed the requirements for the Doctor of Philosophy in Environmental Science at Oklahoma State University, Stillwater, Oklahoma in July, 2013.

Completed the requirements for the Master of Science in Natural and Applied Science at Oklahoma State University, Stillwater, Oklahoma in May, 2002.

Completed the requirements for the Bachelor of Arts in Business Administration at Clark Atlanta University, Atlanta, GA May, 1990.

Experience:
Instructional Coach Math & Science, Bethune Elementary,
Atlanta Public Schools, June 2012- Present
Instructional Coach Math & Science Department,
Atlanta Public Schools, May 2010 - 2012
Instructional Liaison Specialist & Math & Science Coach,
Atlanta Public Schools, 2007- 2010
Aerospace Education Specialist, NASA Langley Research Center,
Hampton, VA, 2004-07
NASA Urban and Rural Community Enrichment Program,
Coordinator, NASA OSU-DC, Washington, DC 2002-04
Aerospace Education Specialist, NASA Urban and Rural Community
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Professional Memberships:
National Science Teachers Association (NSTA), National Council of Teachers of Mathematics (NCTM), Association for Supervision and Curriculum Developers (ASCD) Phi Kappa Phi Honor Society, Golden Key International Honor Society