THE IMPACTS OF A WEEK-LONG PLACE-BASED ENVIRONMENTAL EDUCATION PRORAM IN A RURAL APPALACHIAN SCHOOL

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ABSTRACT

This exploratory study investigated the impact of a week-long place-based environmental education (PBEE) program on 4th and 5th graders in a Tennessee school through the lens of gender. PBEE could be one solution to engage rural Appalachian students and close the academic achievement gap. Students were given pre- and post- knowledge, attitude, and learning preference surveys. Teachers also took pre- and post-surveys to obtain their perspective on class behavior and achievement. After a week of PBEE lessons, students demonstrated improvement in their knowledge of local wildlife, while their attitude scores remained fairly similar. Learning preference surveys showed a shift to more hands-on outdoor options. Teachers rated students as having higher knowledge, being more attentive, and having better behavior during the program as compared to the classroom. This study demonstrated what a week-long PBEE program can do within this particular population. A larger follow-up study is recommended to test these results.

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CHAPTER 1.

INTRODUCTION

The term “Appalachian” brings to mind many things—stereotypes of “hillbillies” and backward people, poverty and lack of education, bountiful natural resources such as coal and timber, and resource extraction like mining, clear cutting, and fracking (Cooper, Knotts, & Elders, 2011; Towers, 2005). Many of these aspects are exaggerated, but some may be cause for real concern. One of greatest concerns is the education of young people in Appalachia (US Department of Education Regional Advisory Committee, 2011). Lack of funding and opportunities have made providing the best quality education for Appalachian children difficult for many Appalachian schools (Shaw, DeYoung, & Rademacher, 2004; US Department of Education Regional Advisory Committee, 2011). These Appalachian rural, underserved communities are producing students that are often unprepared for the future workforce (US Department of Education Regional Advisory Committee, 2011).

Education in Appalachia has long been behind the rest of the country and still struggles to keep up. The region has historically experienced lower student participation, graduation rates, and post-secondary education enrollment (Shaw et al., 2004). Now, approximately 20% of families in the Appalachians live below the poverty line, and about 50% of students receive free or reduced price lunch (US Department of Education Regional Advisory Committee, 2011). According to the US Census Bureau (2014a), 48.7 million Americans (or 14.5%) remain in poverty, demonstrating the 5.5% disparity that still exists in the Appalachian region. High school graduation rates also demonstrate a difference, with the national average at 85% (US Census Bureau, 2012) and states within the central Appalachians remaining at an average of 80%. These statistics demonstrate that there is still much work to be done in the region to

improve the quality of life. Increasing educational worth and opportunities may be a way to help the Appalachian region catch up to the rest of the country.

Another issue that people from Appalachia face is a phenomenon known as "brain drain," in which young people migrate away from their hometowns and often never return. In the past two decades, over 700 counties in rural America lost about 10% of their populations (Carr & Kefalas, 2009). Of those young Appalachian residents that leave, approximately 58% of them are female (Petrin, Schafft, & Meece, 2014). Since males in the region are often at an academic disadvantage, more young men stay in their communities, often not attending college and taking low paying jobs (Petrin et al., 2014). Petrin et al. (2014) found high-achieving students who flourished in and benefitted from their community were more likely to express a desire to return to their hometown. These students described a deep connection to their community, family, and rural lifestyle. These findings are counter to the traditional view that Appalachia's best and brightest leave after graduation, find jobs and live elsewhere. It seems then, if educators were able to find a way to increase student achievement and enthusiasm for learning, those young people would be more likely to return home and the economy of many Appalachian communities might change for the better.

One possible way to inspire in Appalachian students' connection to their community and help students achieve in school is through the use of place-based environmental education (PBE). PBE is an interdisciplinary technique that incorporates local resources, such as places, history, people, and wildlife and plant species (Smith & Sobel, 2010). Through PBE students can learn about school subjects in the context of real life and determine the relevance of what they are learning to their lives (Gruenwald, 2003; Smith & Sobel, 2010). Research has shown that PBE can greatly influence student achievement in school systems (Sobel, 2012). Sobel's

(2012) study school in rural Maryland showcased a school that went from being a consistent underperformer to the school with the highest pass rate in the entire state.

Environmental education (EE), seeks to forge a connection between participants and nature and the outdoors (UNESCO-UNEP, 1976). This field is also interdisciplinary and can be used in conjunction with PBE. Bartosh (2003) found that schools that implemented systematic environmental education exhibited higher test scores on state standardized tests that those who used traditional teaching methods. A great example of EE and PBE can be found in the book *Eco-Literate* in the chapter *Shared Water: Moving Beyond Boundaries* (Goleman, Bennett, and Barlow, 2012). The authors describe the value of water and how fresh, drinkable water will become scarce in the future. A teacher of a fourth grade class in California helped facilitate a connection between the students and their local watershed through the use of an adopted mascot, the freshwater shrimp. The teacher did a great job of making the subject interdisciplinary—she had students analyze scientific data about shrimp, make shrimp drawings, and write shrimp poetry. The students then participated in an ecosystem restoration project in which they learned about many other components of the freshwater shrimp's habitat (Goleman, Bennett, & Barlow, 2012). Using EE in schools has the potential to not only interest students more, but to also increase test scores and achievement (Coyle, 2005).

Both EE and PBE have been proven to increase students' grades, produce better attitudes and behavior (Coyle, 2005; Sobel, 2012), and engage students in a way that traditional classroom teaching doesn't (Algona & Simon, 2010). Other researchers have studied place-based environmental education, but have defined EE and PBE separately, not as one teaching technique (Goralnik, Millenbah, Nelson, & Thorp, 2012; Malinowski & Fortner, 2010). For the purposes of this study, PBEE will be defined as the use of local environmental resources,

including places, species, and people, to facilitate a connection between humans and nonhuman nature (Smith & Sobel, 2010; UNESCO-UNEP, 1976).

Young children are often interested in animals, plants, and exploring the natural world (Goleman, Bennett, & Barlow, 2012). Educators can capitalize on this inherent curiosity through the use of place-based environmental education. Research has shown that the best time to reach students in order to impact how they feel about the environment is before age 11 (Stapp, 1978; Tilbury, 1994; Turgurian, 2014; Wilson, 1995). If one of the goals of EE is to encourage children to grow up with a love of place and empathy for other species, educators can incorporate EE as soon as children begin school as four and five year olds (Coyle, 2005). Getting children involved in their local communities and their environment could produce more high achieving students who could be proud of where they are from (Coyle, 2005; Sobel, 2012).

Gender is also of particular importance to this study. In the past few years the "war on boys" has become a pressing issue in the educational community (Rowe, 2000). In previous decades the educational community had thought that girls were being shortchanged in the classroom (Sommers, 2000). Recent statistics have come out to demonstrate the opposite. This "boys' crisis" stems from statistics that show boys underperforming girls in many aspects of education, including grades, behavior, and graduation rates (Rowe, 2000; Sommers, 2000). Boys are now likely to be a year and a half behind girls in reading and writing (Sommers, 2000). Boys are also less dedicated to school, less likely to graduate, and less likely to attend college than their female counterparts (Sommers, 2000). Research in the learning styles has found that girls tend to have the abilities to sit still and multitask and are described as verbal-emotive, while boys are often spatial-kinesthetic learners, displaying impulsivity and sometimes aggressiveness (Buzhigeeva, 2004; Gurian & Stevens, 2005; King & Gurian, 2006; Van de

Gaer, Pustjens, Van Damme, & De Munter, 2007). This knowledge has led to the increased development of teaching styles more focused on boys' abilities, which are action-oriented (Taylor & Lorimer, 2003). By exploring teaching methods that are more engaging to boys, it may be possible to achieve better grades and behavior from boys in the classroom.

Carrier (2009) performed a study to compare the methods of classroom teaching to environmental education on boys and girls in 4th and 5th grade. The results of this study suggest that boys perform exceptionally well in the outdoors with hands-on activities, and girls perform similarly well in both the classroom and outdoors. Carrier (2009) suggested that future research should investigate effective teaching strategies for boys and girls. This study will build upon Carrier's research by using PBEE as one possible strategy to make learning more engaging.

Though these rural students are physically closer to natural areas, traditional classroom methods are reducing opportunities to connect children with the environment and develop a sense of place (Corbett, 2007; Sobel, 2005). Most students live in close proximity to these natural areas, with 60% of schools in the region are considered rural (US Department of Education Regional Advisory Committee, 2011). These techniques and having an educator with knowledge of the incredible species richness and biodiversity of Appalachia may be a solution to enhancing education. In addition, other issues that plague the Appalachians may also be affected in the future, such as environmental awareness, natural resource management, and resource extraction. Fostering a sense of pride for these students' hometowns and creating a better life for Appalachians may be possible using local resources.

Place-based environmental education (PBEE) could be one solution to help these students do better in school and become actively involved in their communities. The purpose of this study was to investigate the impact of a week-long PBEE program at Briceville Elementary

School in East Tennessee, with a particular interest in fourth and fifth grade male students' knowledge of local wildlife, attitudes, and behavior. Learning about these gender differences may help educators in engaging boys who might not graduate high school or go on to college and help to bridge the gap between Appalachian students and the rest of the country. This study may lead to a model for other elementary schools within the Appalachians or other rural areas that are seeking to engage and interest their students in real-life activities.

Definitions

Brain drain: the phenomenon in which young people move away from their hometowns and do not return (Carr & Kefalas, 2009).

Place-based education (PBE): using local resources such as people, places, and species to learn about subjects in a real world context (Sobel, 2005).

Environmental education (EE): facilitating a connection between people and the environment using nature and the outdoors as a theme for interdisciplinary teaching (UNESCO-UNEP, 1976).

Place-based environmental education (PBEE): the use of local environmental resources, including places, species, and people, to facilitate a connection between humans and nonhuman nature (Smith & Sobel, 2010; UNESCO-UNEP, 1976).

War on boys: the phenomena in which male students consistently demonstrate worse behavior, lower grades, and lower graduation rates than their female counterparts (Rowe, 2000; Sommers, 2000).

CHAPTER 2.

LITERATURE REVIEW

There are several key aspects that are essential to this study—an understanding of the educational situation in Appalachia, how PBE and EE influence learning in elementary school students, and how boys and girls often learn in different ways. These subjects are vital to the creation of this study and of understanding the results. Each of these topics will be explored in depth to facilitate an understanding of this study.

The Education Situation in Appalachia: Historical Context

The Appalachian region has long been plagued with issues related to education, including lower than average participation rates, graduation rates, and funding, as well as contentious political issues (Shaw et al., 2004). Schooling was primarily undertaken as a responsibility of the church before the end of the 19th century. Until about 1950, schools throughout the mountains were run by local trustees and often did not incorporate state-wide standards. These schools were criticized by education professionals, which resulted in low attendance and completion rates in some Appalachian regions. During the sixties and seventies, the legislative agenda known as the War on Poverty popularized a perception of the area as having low educational expectations and high drop-out rates (Shaw et al., 2004). In the eighties and nineties, national educational objectives were implemented in many places in Appalachia. After the No Child Left Behind legislation was enacted, many poorer school districts were posed with the problem of rapidly increasing test scores and graduation rates in order to receive increased funding (Shaw et al., 2004). Now in the 21st century, Appalachian schools are still struggling to provide students with a quality, competitive education (US Department of Education Regional Advisory Committee, 2011).

The educational situation in the Appalachians has come a long way, but there are still discrepancies between the region and the national average. In 1980, the percent of individuals with a high school degree or better in the US was 66.5% compared to the Appalachian average of 57.3%. A 9.2% difference decreased over time to 3.6% in 2000 (Shaw et al., 2004). However, post-secondary educational rates show a different scenario. Through the same twenty-year span, while the nation and the Appalachian region both made increases in college graduation rates, the discrepancy between the two increased from a 5% difference to 6.7% (Shaw et al., 2004). This demonstrates that while more Americans were going to college, the growth rate for students going to college was not as high in the Appalachians. These statistics are sobering, but still show a slow but steady increase in the educational status of Appalachian residents.

A Description of Contemporary Appalachia

To fully understand concepts of education in Appalachia, the historical context and the current situation must be discussed. According to a report by the US Department of Education Regional Advisory Committee (2011), schools within the central Appalachian region are often rural. Tennessee, Kentucky, and West Virginia all have over 60% of school districts within rural areas, with about 30% in suburban areas and 10% or less in urban areas. The percentage of families with children below the poverty level ranges from 21.8% in West Virginia to 11% in Virginia, with Tennessee in between at 18.8%. The percentage of students receiving free or reduced price lunches remains around 50% (except for Virginia at 33.1%). The number of students who graduated high school in the 2007-2008 school year ranged from 80% to 84.5% within the region. The percentage of people with at least one college degree is between 36.5%

(Kentucky) and 51.8% (Virginia) with Tennessee at 38.8% and Kentucky at 39.4% (US Department of Education Regional Advisory Committee, 2011; see Figure 1).

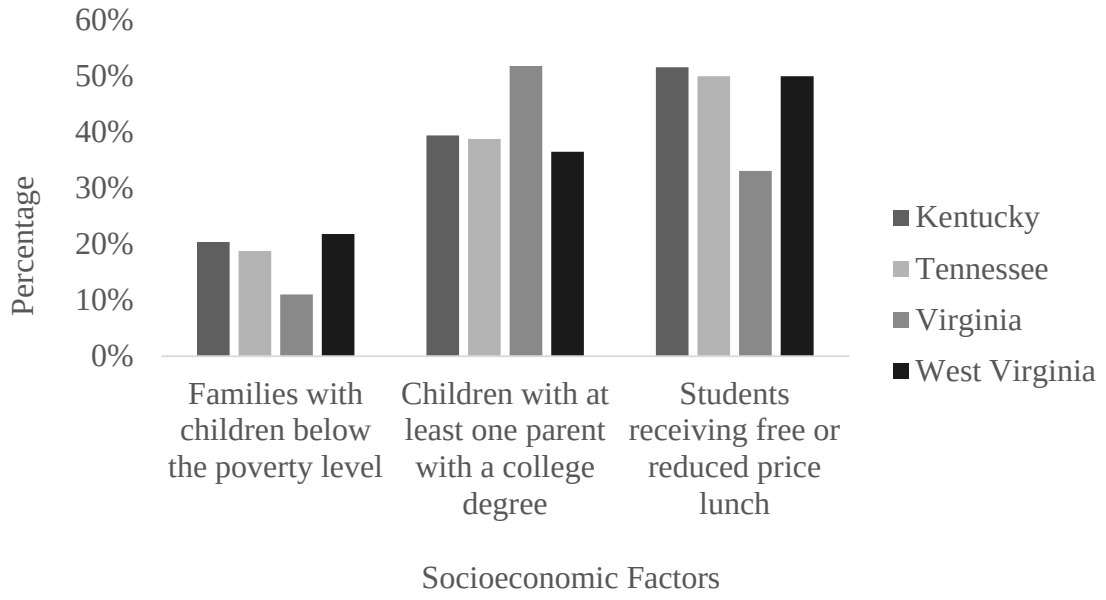

Figure 1. Comparison of socioeconomic factors in families of KY, TN, VA, and WV (US Department of Education, Regional Advisory Committee, 2011).

Resistance to schooling has historically been a problem within Appalachian schools. Hendrickson (2012), discovered three main themes that emerged from interviews with troubled students within the region. These themes included family values and expectations, misunderstandings between teachers and students, and the quality and relevance of education (Hendrickson, 2012). These recurring themes demonstrate just a few of the reasons that troubled Appalachian students tend to fall behind or underachieve. Students also sometimes feel discouraged to enter college. According to Wallace & Deikroger (2000), students within Appalachia were sometimes accused of "acting better" than their peers if they wished to go to college, were ignored when talking about college experiences, or were told that they would never complete a degree (Wallace & Deikroger, 2000). Half of the students surveyed also had work responsibilities that they had to attend to in addition to school (Wallace & Deikroger,

2000). With these and other issues within the region, it's no small wonder that the Appalachians are behind the rest of the country in education.

These statistics paint a picture of the Appalachian region's educational status. Since many of these students are already at a disadvantage academically when they begin school, there is evidence that there is still much work to be done for education in the Appalachian region.

PBE and EE in Elementary Schools

Contemporary and future students will be facing many dilemmas when they reach adulthood, but none quite so dire as our collective environmental welfare (UNESCO, 1978). With an increasing knowledge of environmental issues and human impacts within the scientific community coupled with the pattern of American students falling behind the rest of the world in math and science, the situation may seem bleak (Gardner, Larsen, Baker, & Campbell, 1983). However, there are ways for American students to catch up to these other countries in not only math and science, but many other subjects as well (Coyle, 2005; Sobel, 2012).

Environmental education (EE) is a field-based teaching strategy that connects people with nature and the outdoors (UNESCO, 1978). According to the Belgrade Charter written in 1976, "Environmental education is a process aimed at developing a world population that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, attitudes, motivations, commitments and skills to work individually and collectively toward solutions of current problems and the prevention of new ones" (UNESCO-UNEP, 1976, p. 2). The Tbilisi Declaration soon followed and expanded on the Belgrade Charter by including goals, objectives, and characteristics of EE (UNESCO, 1978). The Tbilisi Declaration (1978) focused educators' objectives on environmental awareness, knowledge,

skills, attitudes, and participation—goals that are encouraged throughout the educational system. Environmental education is also inherently interdisciplinary, in that teachers can incorporate environmental education into a variety of different subjects and use a range of teaching techniques to promote learning (UNESCO, 1978).

Place-based education (PBE) is an interdisciplinary teaching technique that actively involves students in their local communities (Sobel, 2008). Through PBE students can learn various subjects in context and learn how to apply what they have discovered (Smith and Sobel, 2010; Gruenwald, 2003). Teachers can use PBE to bring their lessons to life, as is described in detail in Sobel's (2008) book *Childhood and Nature: Design Principles for Educators.* However, researchers have yet to investigate the influences of gender and learning styles when implementing PBE. Studying the effects of PBE along gender lines may lead to insight into how boys and girls learn and which teaching styles are most effective.

PBE and EE are used separately and in conjunction with one another through PBEE. Researchers using the term place-based environmental education describe the two teaching strategies separately, instead of with one all-inclusive definition (Goralnik et al., 2012; Malinowski and Fortner, 2010). However, when used together, these avenues to learning can make a more fun, creative, and interactive learning environment (Sobel, 2012).

Place-based education is a great tool for environmental educators in particular because it allows students to study an environmental topic or issue and determine its relevance to their lives (Sobel, 2008; Gruenwald, 2003). Many children love animals, but do not realize that those they find so interesting are connected to many others. For example, many songbirds rely on snails as a source of calcium, a necessary mineral. If those snails are living in areas where acid rain is present, the amount of calcium in their shells will decrease. This may cause the snail

population to decline, which may in turn influence the populations of songbirds. This knowledge brings together many different species and the issues of air and water quality into play. Through PBE, this lesson could be taught through a variety of hands-on methods, including bird watching, snail surveys, and water quality testing. Place-based environmental education (PBEE) may hold the key to enhancing learning and improving skills for students in a variety of subjects.

Childhood is an optimum time to involve students in learning about their environment. Research suggests that the best time to reach students and actually impact how they see and feel about the environment is before age 11 (Stapp, 1978; Tilbury, 1994; Tugurian, 2014; Wilson, 1995). Making the connection between the natural world and science has also been thought to encourage students' interest in science (Tugurian, 2014). Elementary school students typically have a stronger connection to nature which often decreases as they get older (Carrier, Tugurian, & Thomson, 2013). These children also have problems relating what they learn in the classroom to their lives (Carrier et al., 2013).

Gender Differences in Learning

Viewing EE outcomes through the lens of gender can provide valuable insight into helping students learn. Throughout the educational community, the "war on boys" or the "boys' crisis" has become a well-known and debated issue (Rowe, 2000; Sommers, 2000). The premise of this problem is that boys have consistently underperformed academically, had poorer attitudes, and demonstrated bad behaviors at a much higher rate than their female counterparts within school settings (Rowe, 2000). There are many factors that lead to gender differences between young boys and girls, including biological aspects, socioeconomic status (SES), and parent and teacher expectations (Entwisle, Alexander, & Olson, 2007).

Cook (2006) found that differences in brain chemistry and hormones can cause boys and girls to have distinct learning styles. In general, girls develop language skills more quickly and have more patience while boys have better hand-eye coordination without well-developed fine motor skills (Cook, 2006). Boys tend to enjoy competitive tasks, physical movement, and hands-on learning, while girls prefer to work in groups and collaboration-based classrooms, using their social skills (Cook, 2006). Through an investigation of these differences, teaching techniques could potentially be developed in order to effectively reach boys and girls.

When children start out in school as kindergarteners or preschoolers, they demonstrate fairly equal scores in reading. As they reach fifth grade, girls' reading scores tend to be significantly better than boys', in one study by as much as 18% (Entwisle, et al., 2007). Sommers (2000) reported that the average boy is a year and a half behind the average girl in reading and writing. As they get older, boys are less likely to enroll in high-level math and science classes and less likely to take college courses (Sommers, 2000). What causes these differences is at this point unclear.

One reason for this may be teacher bias—favoring one sex over the other, usually based on classroom behavior. In younger grades, teachers' interactions with boys are often negative and disciplinary (Bossert, 1981; Huston, 1983). Boys are three times more likely than girls to be diagnosed with attention-deficit hyperactivity disorder (ADHD; Sommers, 2000). Researchers have suggested that as much as 50% of these differences in lower grades along gender lines may come from teacher bias (Farkas, Crobe, Sheehan, & Shuan, 1990; Lavy, 2004). However, teachers are not alone in their differing expectations for boys and girls.

The expectations of parents also influence the differences in grades for both genders. Parents often believe that girls will behave better and do better in school than boys (Entwisle, et

al., 2007). Mothers tend to ask more questions, give praise and encouragement, and talk about books with their female children. They expect their girls to be comfortable in the classroom and receive good grades (Leaper, Anderson, & Sanders 1998). These expectations can also predict how involved a parent is in their child's academic life (Entwisle, et al., 2007). However, this involvement can also be influenced by the socioeconomic status of the parents.

When the socioeconomic status of students is low, this difference in academic performance demonstrates a larger disparity between genders (Entwisle, et al., 2007). Middle SES parents tend to advocate for their children more than low SES parents, which may develop a sense of entitlement in middle SES children. Middle SES parents are more likely to read to their children, engage in fun conversations with them, avoid negative reinforcement, and use more complex language with them. Teachers are often from the middle SES range, so parents of the same socioeconomic level may model behaviors more relevant to a school environment. Middle SES parents may socialize their children in ways that are more compatible with a student's role in the classroom (Entwisle, et al., 2007).

Gender can play a large role in determining how boys and girls learn different subjects (Entwisle, et al., 2007). Using the knowledge of how boys and girls tend to learn differently, environmental educators can make more informed decisions about their teaching techniques in order to reach students most effectively. This understanding may also help boys bridge the learning gap within our school systems. Environmental education has been proven to increase grades, produce better attitudes, and encourage better behaviors in both male and female students (Bartosh, 2003; Carrier, 2009). Using EE in conjunction with knowledge of learning differences between genders, strides may be made in connecting our young boys to school subjects.

CHAPTER 3.

METHODOLOGY

This study focused on measuring students' knowledge of local wildlife and attitudes towards the environment before and after a week-long PBEE program implemented for fourth and fifth grade classes at Briceville Elementary School. A gender comparison was made of student surveys that measured knowledge and attitudes. Teacher perspectives of student achievement, classroom behavior, and the PBEE program implementation were gathered through teacher surveys.

Program

The curriculum for the week was designed using local resources and Tennessee curriculum guidelines (Tennessee Department of Education, 2014). Development of this curriculum was guided by the North American Association for Environmental Education Guidelines for Learning (2004). The lessons focused primarily on wildlife and on a different taxonomic class each day (mammals, birds, reptiles, amphibians, and fish). These lessons came from well-known environmental education sources such as Project Wild, Flying Wild, and others (see Appendix D). Activities were incorporated that catered to different learning styles in the hopes of appealing to all students. On each day, one grade spent half a day doing PBEE lessons, then the grades switched. This ensured that both classes had equal time with the PBEE lessons during the week of the program.

Participants

Briceville Elementary School is a Title 1 school of 118 students that sits in a small central Appalachian coal mining community. This east Tennessee town has a population of about 1,141 with a poverty rate of about 21.6% of families and an unemployment rate of 7.9%.

Just under 80% of students in Briceville graduate high school and fewer than 1% graduate from college (US Census Bureau, 2014b). Young men demonstrate lower graduation rates than women (US Census Bureau, 2014b). The school itself is 99% white and 87% of students receive free or reduced price lunch (Great Schools, 2014). Fourth graders (n= 19) and fifth graders (n= 17) will participated in the lessons and activities. About 80% of these students are in these classes are male (Great Schools, 2014). Since research has demonstrated that the optimum time to reach students to impact how they feel about the environment is before age 11, these students were chosen based on their age and grade level (Stapp, 1978; Tilbury, 1994; Turgurian, 2014; Wilson, 1995). Scores from the Briceville Elementary School's students on the Tennessee Comprehensive Assessment Program (TCAP) reveal underachievement in many subjects—4th grade students (presently fifth graders) scored an average of 29% in math, 24% in science, and 24% in reading and language arts (Great Schools, 2014). This school, and others like it in rural areas of Appalachia, are in need of educational inspiration to engage students.

Research Design

A convergent parallel mixed methods approach was used to incorporate quantitative and qualitative data into this study, providing a stronger data set to add to our knowledge of PBEE (Creswell, 2014). Quantitative and qualitative data sets were analyzed separately and the results were compared. This was a short-term study, focusing only on students ages 9-11 in fourth and fifth grades shortly before, during, and after the implementation of the PBEE program.

Data Collection

Data were collected from the students and the teachers both before and after the program. Parental consent was collected for all students, and teachers signed consent forms as

well. Teachers proctored the surveys for their students using directions provided by the researcher.

Student Surveys

Parents or guardians of the students that participated in the study signed consent forms to allow their children to be involved. Consent forms were distributed by teachers the week before the PBEE program for students to take home. Some parents or guardians did not sign the consent forms, however students were taught the same during the program. Those students that did not obtain consent were instructed to complete the surveys, but the data obtained from them was not used in the data analysis process.

Pre- and post-surveys were given to students who participated. Students' knowledge of local wildlife was measured by several questions, developed by the researcher, that included pictures, physical descriptions, or habitat descriptions (see Appendix A). Development of the questions was guided by the activities students participated in throughout the week. This assessment about local wildlife included multiple choice, write-in questions, and an "I don't know" option to reduce the probability of guessing answers.

Students' attitudes toward their school as a place to see and study nature were measured by several questions from the Ecological Place Meaning survey (Kudryavtsev, Krasny, & Stedman, 2012) as modified by Renga (2012). This sense of place survey has been tested and proven to be an appropriate way to measure ecological place meaning in school settings (Kudryavtsev et al., 2012; Renga, 2012). Only questions directly related to wildlife and exploring nature were included in this study. A panel of experts including the teachers of these students reviewed these modifications to conclude their relevance for this study.

Student environmental attitudes were measured by several modified questions taken from the Children's Environmental Attitudes and Knowledge Scale, CHEAKS (Leeming, Dwyer, & Bracken, 1995). The CHEAKS survey has proven to be a valid method of measuring both environmental attitudes and knowledge (Leeming et al., 1995; Walsh-Daneshmandi, 2002; Walsh-Daneshmandi & MacLachlan, 2000). For the purposes of this study, only the section of the survey dedicated to environmental attitudes was used and modified to better complement the teaching material. A panel of experts reviewed the modifications to determine their suitability for this study.

An additional learning preference survey was also included, which was developed by the researcher. This survey asked students to choose which ways they enjoyed learning the most by comparing the traditional classroom teaching method to PBEE. These 3 questions helped determine if students were more engaged in learning in or outside the classroom.

Teacher Surveys

The teachers participating in this study will also sign consent forms. Teachers will complete pre- and post-surveys developed by the researcher about perceived gender differences in their classroom and their knowledge of PBEE. A total of 3 quantitative questions will address teachers' perceptions of their students' behavior, knowledge of local wildlife, and interest in the environment. Qualitative data will be gathered from open-ended questions. These questions will investigate teachers' impressions of student learning throughout the program, the effect of place-based education, and academic achievement of boys versus girls in their classroom, and the general behavior of students.

Data Analysis

Data were analyzed by looking at raw data from each individual student and teacher. Since the sample size was so small, no inferences can be made from these data. However, much can be learned about the impacts of this program on this particular set of students and teachers.

Student Surveys

The Knowledge of Local Wildlife Survey developed by the researcher for the purposes of this study was scored on a scale of 0-100. There were twenty questions, with each question rated at 5 points each.

The Ecological Place Meaning survey developed Kudryavtsev, Krasny, & Stedman (2012) as modified by Renga (2012) was used to measure students' perceptions of sense of place. Students were asked to rate their responses to six questions about their schoolyard on a Likert scale of 1 (strongly agree) to 5 (strongly disagree). The most pro-environmental answer was given 5 points. Possible range of scores was 5-30.

The modified questions from the CHEAKS survey (Leeming, Dwyer, & Bracken, 1995) used to measure environmental attitudes were scored similarly to the sense of place questions. A Likert scale of 1 (strongly agree) to 5 (strongly disagree) was included to allow students to respond to the six questions accordingly. Again, the most pro-environmental answer was given a score of 5 points, for a possible total score of 5-30.

The learning preference survey included three questions. The first asked students if they preferred learning indoors or outdoors. The second and third questions asked students to identify the ways they liked learning in the classroom and outdoors from a list. These responses were reported as raw data.

Teacher Surveys

A total of three quantitative questions were included, which examined teachers' perceptions of students' level of attentiveness, knowledge of local wildlife, and interest in the environment. Qualitative data were gathered from open-ended questions. These questions investigated teachers' impressions of student learning throughout the program, the effect of place-based education, and academic achievement of boys versus girls in their classroom, and the general behavior of students.

The responses to these questions were rated on a Likert scale from 1 to 5 in which 1 is low (or distracted) and 5 is high (or attentive) from which teachers selected the appropriate response. Teachers were asked to observe their students both in the classroom and during the PBEE activities for the week. They then completed the post-survey in which they described the differences they saw in student learning and specifically, along gender lines. Names of the teachers were kept confidential to everyone but the primary researcher. Each teacher was assigned a number so their pre- and post-surveys were identifiable to the researcher.

Quantitative data from the three Likert scale questions and qualitative data from the write-in response questions was reported as raw data. Only three teachers participated, making data analysis simple. Teachers' answers fell into several categories: one, a general idea of how teachers perceived their students' felt about the PBEE program; two, how students achieved or failed to achieve in the PBEE program; and three, the differences before and after program implementation.

CHAPTER 4.

RESULTS

Participants

The population in this study consisted of students and teachers from Briceville, TN, a rural coal mining community. According to the US Census Bureau, Briceville has a population of 1,141 people with approximately 21.6% of families below the poverty line and 7.9% unemployment. Less than 80% of Briceville students graduate high school, and less than 1% graduate college. Male students demonstrate lower graduation rates than female students (US Census Bureau, 2014). The student population of Briceville Elementary School is 99% white, and 87% of students receive free or reduced price lunch (Great Schools, 2014). The fourth and fifth graders in this study performed well below average in their Tennessee Comprehensive Assessment Program (TCAP) tests (Great Schools, 2014). Based on this data, it seems that these students and others in rural Appalachia are in need of a teaching method to inspire and engage them.

Student Surveys

Students were surveyed before and after the wildlife week. Their teachers administered the surveys in the classroom and explained the directions. The surveys were then delivered to the primary researcher. A total of 35 students were enrolled in the fourth and fifth grades, but many were absent for the pre-survey or missed days during the study week. A total of 23 students (n=23) completed both the pre- and post-surveys for knowledge of local wildlife (n=13 for fifth grade; n=11 for fourth grade). Of those 23, 19 were male (n=19) and 5 were female (n=5). However, only 21 of those 23 students completed their pre- and post-surveys for attitudes and behaviors (n=17 males and n=5 females).

Students completed three surveys that measured their knowledge of local wildlife, environmental attitudes, and learning preferences. For the knowledge survey, the average scores of fourth and fifth grades were used. Average scores of male students versus females were also compared. The initial scores on the Knowledge of Local Wildlife survey were low, demonstrating a score of 35% (42% for fourth grade and 29% for fifth grade). Scores on the post-test knowledge survey demonstrated increased scores after the PBEE week. Post-test scores for 4th and 5th graders combined scored 54% on their post-surveys, while fifth graders scored an average of 55%. Fourth graders increased 12 points on their post-tests, while fifth graders test scores increased by 26 points, for a total average gain of 19 points. Only three students (two in fourth grade and one in fifth) showed a decrease on their knowledge post-survey score.

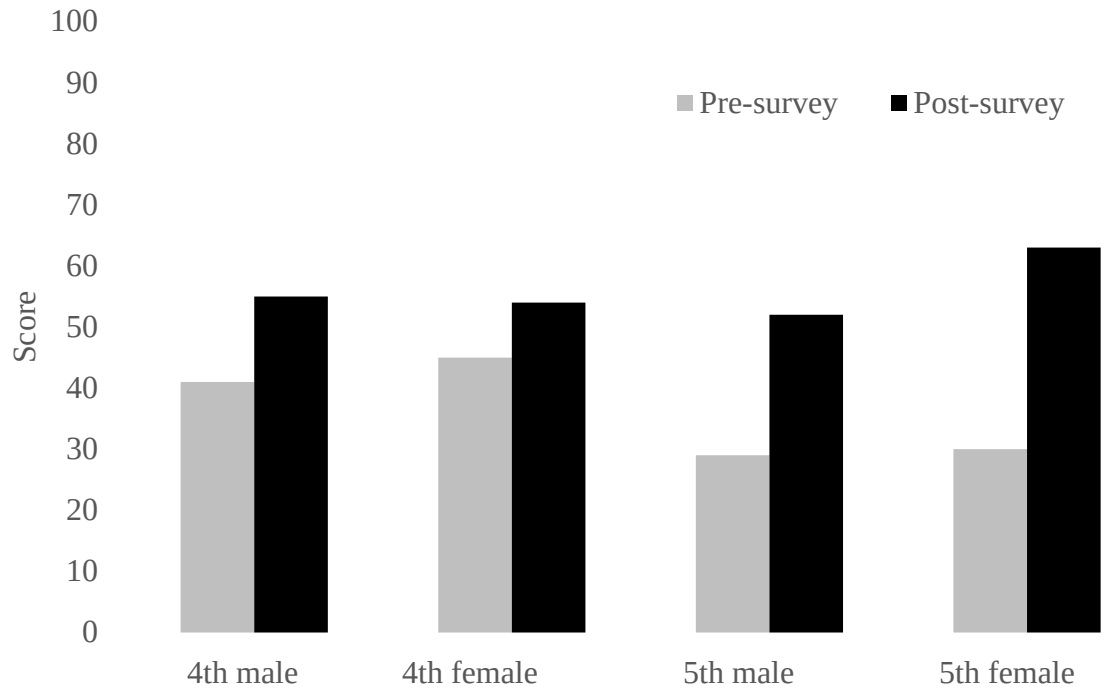

Figure 2. Pre-survey and post-survey comparison of fourth (n=11) and fifth grade (n=13)

Knowledge of Local Wildlife scores on a 0-100 point scale. Students are also compared by gender, males (n=9 for fourth, n=10 for fifth) and females (n=2 for fourth, n=3 for fifth).

When comparing male and female students' pre- and post-surveys, it was found that boys and girls in both classes had a similar scores on their pre-surveys, with 35% for males and 36% with females. However, boys demonstrated a lower post-survey score at 53%, while girls scored an average of 59% (see Figure 1). Boys gained an average of 18 points and girls an average of 23 points. Three students (two boys and one girl) did not show improvement in their knowledge post-survey score.

Students were also administered the Ecological Place Meaning survey (Kudryavtsev, Krasny, & Stedman, 2012) as modified by Renga (2012) to measure sense of place. Students rated their perception of their school as a place to learn about and have fun in nature on a Likert type scale. Though 23 total students completed the knowledge portion of the surveys, only 21 completed the sense of place surveys (n=21). Fourth graders maintained the same completion rates (n=11, with n=9 males and n=2 females), while several fifth graders did not complete the rest of their surveys (n=10, with n=8 males and n=2 females).

Scores on the Ecological Place Meaning Survey did not show much difference from pre- to post-survey. Both grades maintained similar scores on average and show an average increase of 2 points out of a possible 30 (see Figure 3). Students began with an average of 19 points on their pre-surveys and ended with an average of 21 points.

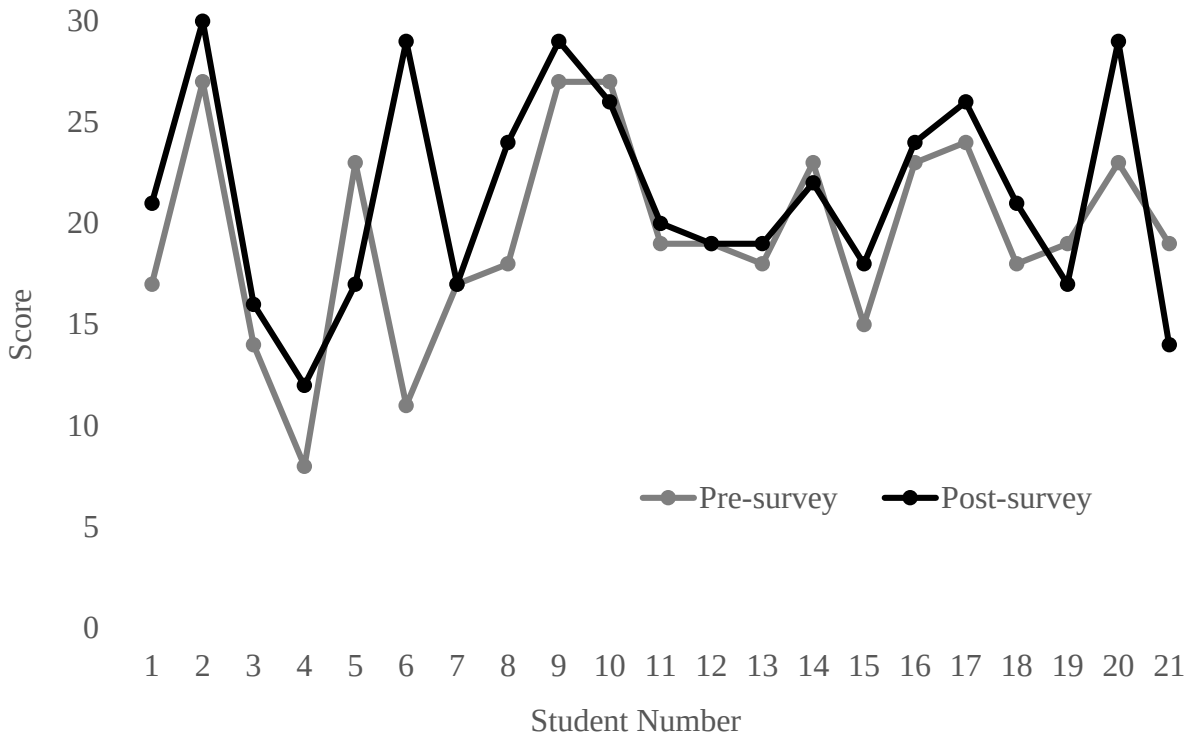

Figure 3. Pre-survey and post-survey comparison of all fourth and fifth grade Sense of Place scores on a scale of 5-30 points (n=21). Fourth graders are numbers 1-11, and fifth graders are 12-21. Female students are numbers 4, 5, 19, 20, and 2.

Students also completed an environmental attitudes survey before and after the experience. The modified CHEAKS survey (Children's Environmental Attitudes and Knowledge Scale; Leeming et al., 1995) was used to measure attitudes and showed a slight difference between pre- and post-scores. Students were asked to rate their feelings on basic questions about other animals and the environment in general. Students rated their response on a Likert-type scale. Pre-scores averaged 26 points out of 30, while post-scores averaged 23 points (see Figure 4). A total of 13 students showed an increase on their post-surveys, while 4 maintained the same score, and 4 students' scores decreased.

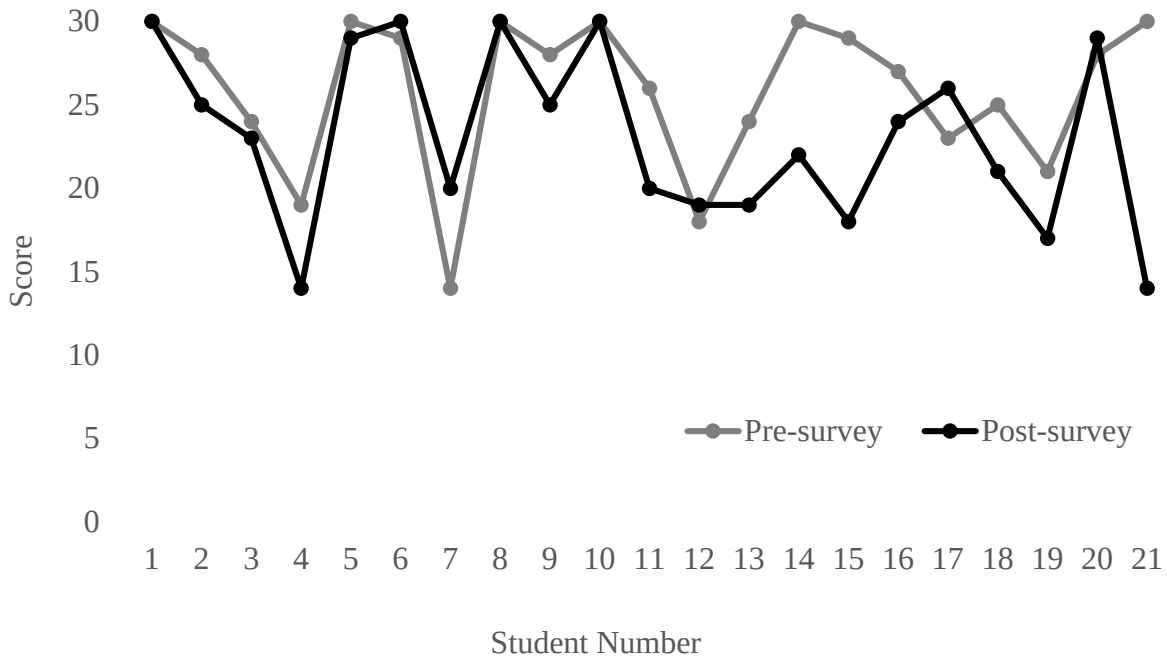

Figure 4. Pre-survey and post-survey comparison of fourth and fifth grade students' (n=21) environmental attitude scores on a scale of 5-30 points.

A learning preference survey was also administered, which included a variety of indoor and outdoor preferences. Students were asked to check which options they liked best for each question. For the questions, further investigating specific ways students liked learning indoors or outdoors, students were given several options and asked to check all the ways they liked learning. A total of 22 students (n=17 males and n=5 females) completed both the pre- and post-survey.

The learning preference survey showed some differences in preferred methods of learning after the experience was over. The first question asked if students preferred learning inside or outside. All students except for two (both fourth grade boys) preferred learning outside according to their learning preference pre-surveys. One of those two, one male student claimed to prefer learning outside on their post-survey, while the other remained the same.

Another male student in fifth grade said in his pre-survey that he preferred learning outdoors, but switched to indoors on his post-survey.

The second question on the learning preference survey investigated the ways students preferred learning in the classroom. There were four options, and students were asked to check all of which they liked (see Table 1). The first option was learning about animals via classroom instruction ("I like it when the teacher tells me about animals"), which was preferred in the pre-survey by 7 students (n=5 males and n=2 females). Post-survey scores for this option showed a gain of two male students (n=7 males and 2 females). The next option was being shown a video about animals. This was a popular choice, with 14 students preferring it in the pre-survey (n=13 males and n=1 female). However, this option lost its appeal for some male students upon post-survey, while it gained acceptance of two additional female students (n=9 males and n=3 females). Being shown a live animal was the next option. This choice garnered the preference of eight students in pre-survey (n=5 males and n=3 females), and gained the support of an additional three male students in post-survey (n=8 males and n=3 females). Touching or feeding live animals was not as popular with students in the pre-survey (n=4 males and n=4 females), but made gains among male students in the post-survey (n=10 males and n=2 females).

Table 1

Students' preferences when learning about wildlife indoors (n=22).

	Total (22)		Male (17)		Female (5)	
Options	Pre	Post	Pre	Post	Pre	Post
Being told about animals	7	9	5	7	2	2
Shown a video about animals	14	12	13	9	1	3
Shown a live animal	8	11	5	8	3	3
Touching/feeding real animals	8	12	4	10	4	2

The last question on the learning preference survey attempted to determine the ways in which students liked learning outdoors. There were several options, including being told about animals, being shown a live animal, touching or feeding live animals, finding animals or signs of animals, and getting dirty or wet looking for animals (see Table 2). A total of eight students preferred being told about animals outdoors in the pre-survey (n=6 males and n=2 females), and an additional two students chose this option in post-survey (n=7 males and n=3 females). Being shown a live animal was an option that 10 students preferred on their pre-surveys (n=7 males and n=3 females). However, a male student changed his mind on the post-survey, and an additional two female students chose this option (n=6 males and n=5 females). Touching or feeding live animals outdoors had 8 supporters in pre-survey (n=5 males and n=3 females) and 10 in post-survey (n=6 males and n=4 females). The next option was finding animals or signs of animals, which nine students chose initially (n=5 males and n=4 females) and 11 students chose in post-survey (n=7 males and n=4 females). Getting dirty or wet looking for animals was another popular option, with the preference of 10 students in pre-survey (n=6 males and

n=4 females), and gained 3 additional male students' choice in post-survey (n=9 males and n=4 females).

Table 2

Students' preferences when learning about wildlife outdoors (n=22).

	Total (22)		Male (17)		Female (5)	
Options	Pre	Post	Pre	Post	Pre	Post
Being told about animals	8	10	6	7	2	3
Shown a live animal	10	11	7	6	3	5
Touching or feeding real animals	8	10	5	6	3	4
Finding animals or signs of animals	9	11	5	7	4	4
Getting dirty/wet looking for animals	10	13	6	9	4	4

The most preferred method of learning for indoors and outdoors on the pre-survey, with 14 out of 22 students' support, was watching a video about animals (see Tables 1 and 2). Other preferred methods were being shown an animal, finding animals or signs of animals, and getting dirty or wet looking for animals. On the post-survey, the most preferred method of learning was getting dirty or wet looking for animals, the choice of 13 students. The other most preferred methods according to the post-surveys were watching a video, touching or feeding animals, being shown an animal, finding animals or signs of animals.

Teacher Surveys

A total of 3 teachers took part in this study (n=3). Teachers completed pre-surveys, then administered the students' pre-surveys. During the PBEE lessons, teachers observed their students to be able to make observations on the post-survey. After the week of lessons was concluded, teachers completed their post-surveys and administered students' surveys.

The teachers that participated in this study described their students on their pre-surveys as having an average amount of knowledge of local wildlife (3 out of 5 on a Likert scale), their behavior as fairly distracted (2 out of 5), and their interest level in the environment as fairly low (2 out of 5). Two out of the three teachers claimed that, in the words of one teacher, "There are more girls than boys that perform well academically." One teacher stated that her students were fairly equal in their academic performance. All teachers stated that both boys and girls would benefit from place-based education. Teachers were interested in learning more about place-based education.

On their post-surveys, teachers described how the program influenced their students' knowledge of local wildlife. Two teachers rated their students as having a fairly high knowledge, and one teacher rated them as having average knowledge. Two teachers rated the general behavior of their students as fairly attentive during the PBEE program, and one teacher rated the students' behavior as average. The interest level of students in their environment was also the same—two teachers rated their students as having a fairly high interest, and one teacher rated their students as average. All teachers stated that they did not observe a difference between the achievement of boys and girls during the PBEE program.

When asked if PBEE methods would help their students learn better than traditional classroom instruction, all teachers agreed that incorporating PBEE would be beneficial. One teacher said, "When they can experience learning first-hand, they get excited to learn… the lessons become 'life learning,' not just academic." Another teacher wrote, "I watched as students who do not regularly participate in a regular classroom setting, participated and enjoyed learning in the place-based environment." The third teacher voiced some concerns,

saying, "… students are easily distracted when out of their regular learning environment. If standards permit, more outdoor learning opportunities would minimize distractions."

Once again, all teachers stated that both genders would benefit from PBEE. One teacher stated, "… boys—who may have more prior knowledge—can build on that knowledge, and girls who may not possess the knowledge can learn from the boys." Another teacher said, "It is important for students to recognize that 'I' am as much a part of this environment/community as are 'You' and 'Them'."

When describing examples of boys' learning behaviors during the PBEE week compared to their classroom, teachers had comments on boys' learning and attention spans. One teacher wrote, "There were some boys that did better in the outdoor learning, but there were also some girls who learned better compared to regular classroom instruction." Another teacher described her students by saying, "… in general the boys appeared to be more engaged and willing to participate." The other teacher said that the boys were sometimes restless and had a hard time focusing, saying that "… their attention spans aren't very long."

All teachers agreed that they would like to incorporate PBEE methods into their teaching, though there were some reservations about education standards. One teacher replied, "Yes, if standards permit doing so," and another said, "Yes, if there were resources, materials, and time to include or incorporate with state standards." The other teacher wrote, "Positively, yes! This type of teaching appeals to all of the five senses, as well as developing the sense of responsibility for self and for others."

Additional comments included, "The program was very educational and fun! We hope you can come back again next year!" Another teacher wrote, "The students really enjoyed the experience… Thank you so much for sharing with us." The third teacher stated, "… this

program is engaging, relevant, and organized…" and noted that "…with a few minor adjustments [this program] could have a profound effect on student behavior and attentiveness."

CHAPTER 5.

DISCUSSION AND RECOMMENDATIONS

This study investigated the outcomes of a week-long PBEE program at Briceville Elementary School in east Tennessee. A total of 23 students from fourth and fifth grade participated in a week-long PBEE program and were given pre- and post-surveys to quantify aspects of their knowledge of local wildlife, attitudes, and behavior. Teachers also completed surveys based on their perceptions of their students' knowledge of local wildlife, attitudes, and behavior. This exploratory study was implemented to explore the differences in these aspects between male and female students.

It was expected that many students would have good scores on their knowledge of local wildlife pre-surveys because they live in a rural area. It was also hypothesized that most students would demonstrate an increase in their knowledge on the post-surveys. Given that boys are generally more kinesthetic learners who enjoy competition and hands-on activities (Cook, 2006), it was expected that male students would demonstrate higher scores than their female counterparts. This study of a small group of rural Appalachian children actually uncovered somewhat different results than were expected.

Student Surveys

The Knowledge of Local Wildlife pre-survey scores were surprisingly low. The average for both classes was 35% (42% for fourth grade and 29% for fifth grade). While these students did not receive high standardized test scores in 2014, it was expected that the students had accumulated a certain amount of wildlife knowledge by growing up in a rural area. Male and

female students had almost identical averages for their pre-surveys (35% for males and 36% for females). Girls outpaced the boys in the post-survey by 6 points, with an average of 59% (boys averaged 53%). These scores demonstrate a 19% average gain for students in both classes, with an increase of 12% for fourth grade and 26% for fifth grade.

While only five female students participated in the surveys, two of them were considered above average students by their teachers. Two other female students were considered average students. The female student who did not demonstrate improvement on her knowledge post-survey was typically a below-average student. The number of boys who the teachers considered below-average was much higher—one teacher considered over half of her class. It is possible that many of the students that participated in this study lacked skills to help them recall the information and perform well on tests. There is also a cultural atmosphere of resistance to schooling, stemming largely from family values and expectations and the relevance of education (Hendrickson, 2012) and the fear of being called out as "acting better" than their peers (Wallace & Deikroger, 2000). To break down these barriers and build new skills would take much longer than this week-long program. However, the majority of students showed improvement in their knowledge surveys. These gains after only a week of PBEE lessons help to demonstrate the value of PBEE as a tool for classroom teachers. To make more significant progress, PBEE lessons should be implemented throughout the year.

The sense of place survey was administered to investigate students' perceptions of their schoolyard as a place for learning about and being in nature. These scores stayed fairly similar from pre- to post-survey. The average combined pre-score of both classes was 19 out of a possible 30 points. This demonstrates that the students felt that some outdoor activities were possible in their schoolyard. Post-survey scores raised to an average score of 23. Although this

is not a large jump, this increase shows that throughout the PBEE week students learned new ways that their schoolyard could be used to learn about nature. A longer PBEE program would be necessary to make a significant increase in these sense of place scores.

The modified CHEAKS survey (Children's Environmental Attitudes and Knowledge Scale; Leeming, Dwyer, & Bracken, 1995) was used to measure environmental attitudes. This survey yielded an average pre-score of 26 out of 30 points (with a score of 30 being the most pro-environmental). These students seem to care very much about animals and the environment. However, the average post-score dropped to 23 points. While this is still a fairly high score, it was surprising that the score went down. It is possible that students' attitudes towards taking the survey may have changed on the post-survey, since this post-test was given the last week of school, was near the end of their survey packet, and was not graded by their teachers. In any case, a week-long program is not long enough to truly measure a change environmental attitudes (Hart & Nolan, 1999; Tung, Huang, & Kawata, 2002).

The learning preference survey was used to measure students' preferences of different ways of learning about animals and nature. Students were instructed to choose all options that they liked. In the pre-survey, students' most preferred options, in order of popularity, were watching a video about animals, being shown an animal, and getting dirty or wet looking for animals. Post-survey results showed some differences, with the most popular choice being getting dirty or wet looking for animals, followed by watching a video, touching or feeding animals, being shown an animal, and finding animals or signs of animals. These post-survey results may demonstrate students' preferences for hands-on activities in the outdoors. It is possible that students had not seen some of these techniques used as tools for learning at school before the PBEE program (getting dirty or wet looking for animals, finding animals or signs of

animals). After these activities were demonstrated, students found that they actually did like these options.

Given these student preferences and their increased knowledge scores, a long-term PBEE program may be beneficial for students. Sobel (2012) helped an Appalachian school integrate PBEE into their curriculum on a year-round basis. After eight years of raising native brook trout, growing gardens, planting American chestnut trees, performing community service projects, and many other activities, this school earned awards for leadership, character education, environmental teaching, and became the school with the highest pass rate in Maryland (Sobel, 2012). This school demonstrates what is possible with PBEE—schools can not only increase their standardized test scores, they can also mold environmentally aware and literate students who care about their community and the environment. A similar program could potentially work wonders with the children of Briceville, Tennessee.

Teacher Surveys

Teachers played a significant role in this study by observing the behavior of their students throughout the PBEE program, proctoring the students' surveys, and taking their own surveys. The teachers' surveys investigated their perceptions of their students' knowledge of local wildlife, behavior, and attentiveness with several Likert-type scale questions. Teachers were also asked about the academic performance of their students and their own knowledge and interest in PBEE in short answer questions.

In the pre-survey all teachers described their students as having and average knowledge of local wildlife (3 out of 5 on a Likert type scale), their behavior as fairly distracted (2 out of 5), and their interest level in the environment as fairly low (2 out of 5). The post-survey yielded somewhat different results. Two teachers claimed that their students' knowledge of local

wildlife increased to a 4 out of 5 on the Likert type scale, or fairly high knowledge. The other teacher rated their students as having average knowledge. When describing the behavior of students in the PBEE program versus in the classroom, once again, 2 teachers rated their students as having an increased score of 4 out of 5 on the Likert scale, or fairly attentive. The remaining teacher claimed that their students' behavior was average. The teachers' ratings of their students' interest level in the environment increased from fairly low (2 out of 5) to fairly high (4 out of 5) for 2 teachers, while the other teacher rated their students as average (3 out of 5). Most teachers perceived and increase in their students' interest level in the environment, but one did not. However, in the short-answer portion of the post-survey, this teacher claimed to have seen an increase in knowledge and interest level. It is unclear why this teacher rated her students differently in the Likert scale portion of the survey.

In the short answer portion of the pre-survey, teachers were asked about their students' academic performance, their own knowledge of PBEE, if PBEE lessons would benefit boys or girls more, and if they would like to learn more about PBEE. Two teachers said that in their class, girls performed better than boys academically. The other teacher said their class was about equal in terms of academic performance. They all said that PBEE would benefit both boys and girls. Teachers were interested in learning about PBEE and incorporating it into their lessons.

The post-survey answers after the PBEE week were similar. Teachers remarked that the lessons benefitted both genders. This was supported by the results of the Knowledge of Local Wildlife survey taken by the students. Carrier (2009) found similar results in her study focusing on gender and EE—there were no significant differences between girls and boys in the outdoor treatment group. However, boys made significant gains in the treatment group compared to the

indoor control group (Carrier, 2009). There were several remarks about the male students having issues with concentration and having short attention spans, but also claimed that some boys were more engaged in the PBEE lessons than in the classroom. This also seems to be supported by Carrier's (2009) study.

Teachers were interested in learning more about PBEE and incorporating it into their lessons, but voiced concerns about state standards and testing. Ernst (2007) found similar results when surveying teachers about using EE in their lessons. Teachers perceived that an emphasis on state standards and testing, lack of funding, lack of planning time, and lack of transportation as barriers to their use of EE. It seems that though almost 10 years have passed since Ernst wrote her article, teachers are still facing the same barriers.

Overall, teachers recognized improvements in several areas with their students after the PBEE week. However, two teachers observed more than the other. Some teachers used this as an opportunity for planning time, while others stayed for most of the lessons. This could explain the discrepancies in answers regarding their students.

Teachers said that while they would like to use PBEE lessons, they are concerned that what the students learn won't help them on a standardized test. A series of teacher workshops in this area would greatly help teachers in understanding the many benefits of environmental education. Paul and Volk (2002) found that teachers who attended extended training in EE (compared to a single workshop) were more likely to use what they learned in their classroom. Teachers were also more likely to continue to use this new approach over time (Paul & Volk, 2002). Learning more about environmental education and how to use it may help teachers overcome many of the perceived barriers that keep them from using EE (Ernst, 2007; Paul & Volk, 2002).

Conclusion

This small exploratory study investigated the impact of a week-long PBEE program on fourth and fifth grade students in a rural Appalachian community. Briceville, Tennessee is representative of central Appalachia in many ways—it is a coal mining community with a higher poverty level and lower high school graduation and college enrollment rates than national averages (US Department of Education Regional Advisory Committee, 2011). It is a place where students begin school already at an academic disadvantage. It is a rural area, and many residents engage in outdoor pursuits such as hunting, fishing, mushroom foraging, searching for ginseng, riding ATVs, and other activities. Because of this, it was expected that these students would have a rather high amount of knowledge about their surroundings. However, this results of this study showed that with this small group of students, this was not the case. Their knowledge of local wildlife scores started out low, but increased by almost 20% after a week doing lessons in the outdoors. Their sense of place scores measuring their perceptions of their schoolyard as a place for learning about nature remained fairly similar, as did their environmental attitude scores. These students' attitudes towards the environment were largely pro-environmental. They care about wildlife and the environment very much. Prelle and Solomon (1996) found similar results among children in England—rural students showed more concern about environmental issues than other students. The Briceville students' learning preference surveys demonstrated some differences, with more students choosing hands-on outdoor options in the post-survey.

Teachers also noted changes after the PBEE week. They believed students' knowledge increased, they were more attentive, and were better behaved in the PBEE lessons compared to the classroom. Teachers believed that both genders benefitted from the program, but some boys

were more engaged outdoors than in the classroom. Teachers were interested in learning more about PBEE, but were concerned about state standards and standardized testing.

This study was small in scope and short on time. To demonstrate significant differences, a lengthier study is required with a larger study group. Sobel (2012) performed a study in which a coal mining community, similar in many ways to Briceville, incorporated PBEE into their curriculum at a local elementary school. After eight years of increasing test scores, this school had the highest pass rate of any school in the state of Maryland (Sobel, 2012). It has been proven time and time again that environmental education can increase test scores (Coyle, 2005; Sobel, 2012). A longer time frame with this population could yield outstanding results for students, families, and their home.

Limitations

The sample size for this study was very small, with only 23 students participating in the pre- and post-surveys. The gender ratio was also skewed, with a total of 5 females in both classes. Because only fourth and fifth grade were included, just 3 teachers were part of the study.

The teachers acknowledged that several of their students received below average test scores and some had been diagnosed with ADHD.

The lessons during the week were all done outdoors. This may have affected students' ability to focus in this novel situation.

The PBEE week occurred two weeks before the end of the spring semester, which may have also affected students' ability to concentrate on the lessons.

Post-surveys were administered the last week of school. This may have influenced students' attitudes toward completing the surveys, which may have seemed like tests.

The researcher attended this elementary school and grew up in this community. It is possible that the teachers and students responded to the surveys in a way to please the researcher. To avoid personal bias in interpreting the data, and because the sample size was so small, the researcher reported the raw data.

Recommendations for Future Research

There are several directions further research could progress. Much more work could be done to investigate gender differences in EE. Rural populations are also an area of study that should be examined. Long-term studies with larger sample sizes are needed.

1. Researchers could perform similar studies with larger sample sizes to incorporate descriptive statistics.
2. Researchers interested in gender differences in EE could also perform studies with larger sample sizes and similar numbers of male and female students.
3. Different age groups could be studied over the long-term, to compare the way boys and girls learn as they grow in relation to EE.

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APPENDIX A

STUDENT CONSENT FORM

Dear Parents/Guardians and Students,

My name is April Byrge and I am a former Briceville student and resident. I am now a Park Ranger at Great Smoky Mountains National Park and I am studying for my Master's degree in Environmental Education. I am using my thesis work as an opportunity to get the students of Briceville Elementary School involved in learning about and having fun with wildlife.

During this week, BES fourth and fifth grade students will be exploring many of the different types of animals that live in east Tennessee. We will investigate mammals, birds, reptiles, amphibians, and fish by getting outside.

I hope that the students' learning experiences this week will encourage them to get outdoors more and explore local fields and forests. Teachers will give the students printed surveys to complete before starting the program and after the week is over. These surveys will help me to evaluate if the week increased the students' knowledge of local wildlife and influenced their environmental behaviors. The students' responses will not be given to the teachers, and therefore, they will have no bearing on their school grades.

I have two special requests of each parent or guardian:

1) I request your consent to use your child's survey answers for my research project. The results of my thesis may lead to a model of a place-based environmental education program that other rural Appalachian schools can use to enhance classroom learning.

2. Please make sure that your child dresses for variable weather conditions (rain jacket and proper shoes, etc.), and wears clothing and shoes that are okay to get dirty.

Please return this section to your child's teacher by Friday, May 8th.

Please check the box below that indicates your decision regarding my use of your child's responses for the purpose of this study. It is important that you sign and date for either decision.

☐ I **do** give consent for the responses collected from my child to be used.

☐ I **do not** give consent for the responses collected from my child to be used.

_____ _____

Parent/Guardian Signature Date

If you have any questions at all about this special outdoor program, please email me at abyrge14@montreat.edu. If you would like to receive a summary of the results of the project, please provide your email or postal address here.

APPENDIX B

TEACHER CONSENT FORM

Teacher Consent Form

I. Purpose

April Byrge has received permission from the Internal Review Board of Montreat College to conduct the research study entitled, PLACE-BASED ENVIRONMENTAL EDUCATION IN RURAL APPALACHIAN SCHOOLS: GENDER AND LEARNING DIFFERENCES. The purpose of this research is to:

1. Determine the outcomes of a week-long PBEE program on 4th and 5th graders in Briceville Elementary School

2. Investigate student knowledge of local wildlife and environmental attitudes before and after the program

3. Investigate teachers' perceptions of student behavior and achievement before, during, and after the program

II. Participation in the Study

You have been asked to participate in this research study between the dates of May 4-15, 2015. The manner of your participation will include the following:

1. Passing out consent forms for students and holding them for the researcher until the program begins.

2. Completing a survey before the program begins and after the program ends.

3. Facilitating the completion of student pre- and post-surveys and sending them to the researcher.

4. Observing your class' behavior and achievement during the PBEE lessons each day, paying particular attention to any gender differences you may see.

Participation in this study is voluntary and will not affect your performance evaluation. If you decide to withdraw permission after the study begins, please notify the researcher of your decision by emailing abyrge14@montreat.edu.

III. Risks and Discomfort

Minimal risks are anticipated as a result of your participation. Names of the teachers will be kept confidential to everyone but the primary researcher. Each teacher will be assigned a number so they are identifiable to others during data analysis.

IV. Benefits

As a participant in this research study, the researcher believes that the information produced will improve the quality of instruction and types of services it provides for all children in Briceville Elementary School.

V. Confidentiality

All information is confidential and will only be used for research purposes. Anonymity is assured as *neither you or your students' names will appear in any written reports* that stem from data collected from the researcher. Information collected will be stored at Montreat College until May 15, 2016. At that time, all information associated with the present study will be destroyed.

VI. More Information

If you have questions or concerns about this study, please contact _ Dr. Dottie Shuman and April Byrge_ at _828-699-8012 ext. 3405 (Dr. Shuman) or 865-816-2301 (April) __. If you have any questions about your rights as a research participant, contact _Dr. Jon Dewitt, Director of the _Montreat College_ IRB by email at jdewitt@montreat.edu.

VII. Informed Consent

If you have read and understood the information above and agree to participate in this research, print and sign your name below.

_____	_____
Name of Teacher (Please print)	Name of School

Thank you so much for your involvement in this study by completing surveys, helping with students, and providing your time and energy to make this study possible.

APPENDIX C

STUDENT SURVEYS

Student Knowledge of Local Wildlife Pre- and Post-Survey

Directions: Please answer these questions by circling what you think is the best answer or writing in your answer. If you do not know the answer, please choose **"I don't know"** or write it in the blank space.

1. Which of these local animals spends part of their life on land and part in water?

    a. Fence lizard
    b. Brook trout
    c. Southern two-lined salamander
    d. I don't know

2. List one to five things that a black bear would eat in the wild.

    a) _____

    b) _____

    c) _____

    d) _____

    e) _____

3. What is the species of the snake in the picture below?

_____

4. If you wanted to learn about a bird that lives around your school that eats small mammals, what bird would you research?

_____

5. Which species of fish is native to the Appalachians?

    a. Brook trout
    b. Rainbow trout
    c. Tuna
    d. I don't know

6. What type of habitat does an eastern box turtle live in?

    a. Pond
    b. Forest
    c. Desert
    d. I don't know

7. Do treefrogs live in the Appalachian Mountains?

    a. Yes
    b. No
    c. I don't know

8. There are two species of foxes in Tennessee. Which species is the native fox?

    a. Red fox
    b. Flying fox
    c. Gray fox
    d. I don't know

9. List one to three things that a brook trout would eat in its cool stream habitat.

    a) _____

    b) _____

    c) _____

10. What species of bird is in the picture below?

_____

11. There are two species of venomous snakes in east Tennessee. What are they?

    a) _____

    b)_____

12. List one to five things that a box turtle would eat in the wild.

a) _____

b) _____

c) _____

d) _____

e) _____

13. What is the species of salamander is in the picture below?

_____

14. If you wanted to learn about a type of fish that lives in cool mountain streams, what species would you research?

_____

15. Which species of frog is ***not*** native to the Appalachians?

a. Spring peeper
b. Mountain chorus frog

c. Red-eyed tree frog
d. Wood frog
e. I don't know

16. What type of habitat does a largemouth bass prefer?

a. Shallow streams
b. Lakes or ponds
c. Ocean
d. I don't know

17. The eastern newt has a life cycle of 4 stages. Which of the following has the cycle in correct order?

a. Egg, larvae, terrestrial juvenile, aquatic adult
b. Egg, larvae, aquatic juvenile, terrestrial adult
c. I don't know

18. Which of the following owls is native to the Appalachians?

a. Great horned owl
b. Spotted owl
c. Burrowing owl
d. I don't know

19. What type of food do northern cardinals eat? Hint: what type of beak do they have?

a. Insects
b. Seeds
c. Small mammals
d. I don't know

20. What species of mammal is in the picture below?

Student Attitude Pre- and Post-Survey

Directions: Please circle the number below the response that you feel describes your school or yourself the best.

Section 1. Sense of Place

1. My schoolyard is a place for exploring nature.

    1. Strongly agree
    2. Agree
    3. Unsure
    4. Disagree
    5. Strongly disagree

2. My schoolyard is a place to watch birds and other animals.

    1. Strongly agree
    2. Agree
    3. Unsure
    4. Disagree

5. Strongly disagree

3. My schoolyard is a place to find signs of life.

    a. Strongly agree
    b. Agree
    c. Unsure
    d. Disagree
    e. Strongly disagree

4. My schoolyard is a place to have fun in nature.

    1. Strongly agree
    2. Agree
    3. Unsure
    4. Disagree
    5. Strongly disagree

5. My schoolyard is a place to learn about nature.

    a. Strongly agree
    b. Agree
    c. Unsure
    d. Disagree
    e. Strongly disagree

6. My schoolyard is a place to enjoy nature's beauty.

    a. Strongly agree
    b. Agree
    c. Unsure
    d. Disagree
    e. Strongly disagree

Section 2. Attitudes

7. I get upset about the damage pollution does to animals and their homes.

a. Strongly agree
b. Agree
c. Unsure
d. Disagree
e. Strongly disagree

8. It makes me happy to see people trying to help animals.

a. Strongly agree
b. Agree
c. Unsure
d. Disagree
e. Strongly disagree

9. It makes me sad to learn that buildings are being built where animals used to live.

a. Strongly agree
b. Agree
c. Unsure
d. Disagree
e. Strongly disagree

10. I am not concerned about environmental problems that affect animals.

a. Strongly agree
b. Agree
c. Unsure
d. Disagree
e. Strongly disagree

11. I would get upset if I saw someone abusing or hurting a wild animal.

a. Strongly agree
b. Agree
c. Unsure
d. Disagree
e. Strongly disagree

12. I am not concerned about declining animal populations and losing some species.

a. Strongly agree
b. Agree
c. Unsure
d. Disagree
e. Strongly disagree

Learning Preference Pre- and Post-Survey

1. Check one below.

___ I like learning inside the classroom the most.

____ I like learning outdoors the most.

2. Check the ways you most like to learn INSIDE the classroom. I like it when . . .

___ The teacher tells me about animals.

___ The teacher shows me a video on animals.

___ The teacher lets me see a real animal.

___ The teacher lets me touch or feed real animals.

3. Check the ways you most like to learn OUTDOORS. I like it when . . .

___ The teacher tells me about animals.

___ The teacher shows me a real animal.

___ The teacher lets me touch or feed real animals.

___ The teacher lets me find animals or signs of animals.

___ The teacher lets me get dirty or wet looking for animals.

APPENDIX D

TEACHER SURVEYS

Teacher Pre-Survey

Please circle the appropriate answer.

How would you rate the following before the implementation of the place-based environmental education program:

1. Your students' knowledge of native wildlife?

Low				High
1	2	3	4	5

2. General behavior of students?

Distracted				Attentive
1	2	3	4	5

3. The interest level of the students in their environment?

Low				High
1	2	3	4	5

4. In general, do you see a difference between the academic achievement of boys and girls in your classroom? If so, please explain. Use additional space on the back of this page if needed.

5. Place-based education is an interdisciplinary teaching technique that incorporates local places, people, issues, and species. Do you believe that using these local places, people, issues, and species would help your students learn better than traditional classroom methods, such as lecture and completing worksheets? Why or why not?

6. Who do you think would benefit most academically from place-based-education, boys or girls, or both boys and girls? Why?

7. Would you like to incorporate place-based environmental education methods into your teaching? Why or why not?

8. Is there anything else you would like to say about the class? If you have more comments, please list them below.

Teacher Post-Survey

Please circle the appropriate answer.

How would you rate the following during and after the implementation of the place-based environmental education program:

1. Your students' knowledge of native wildlife?

   Low High

   1 2 3 4 5

2. General behavior of students?

   Distracted Attentive

   1 2 3 4 5

3. The interest level of the students in their environment?

   Low High

   1 2 3 4 5

4. In general, did you see a difference between the academic achievement of boys and girls during the place-based program? If so, please explain. Use additional space on the back of this page if needed.

5. Place-based education is an interdisciplinary teaching technique that incorporates local places, people, issues, and species. Do you feel that using local places, people, issues, and species would help your students learn better than traditional classroom methods? Why or why not?

6. Who do you think would benefit most academically from place-based-education, boys or girls, or both? Why?

7. What changes did you observe in the boys' learning behaviors this week in comparison to the classroom? Please provide one or two specific examples, if possible.

8. Would you like to incorporate place-based environmental education methods into your teaching? Why or why not?

9. Is there anything else you would like to say about the program? If you have more comments, please list them below.

APPENDIX E

SAMPLE SCHEDULE OF ONE DAY DURING WILDLIFE WEEK

Sample Schedule

Mammal Monday

8:30AM-9:15AM—Mammal introduction

- What makes a mammal a mammal?
- Have students look at pelts of native mammals, including opossum, striped skunk, rabbit, raccoon, beaver, otter, bobcat, gray fox, red fox, coyote, black bear, and elk. Talk about each animal.

9:15AM-10:30AM—Tracking activity based on a lesson from Smithsonian National Zoological Park (2015).

- Observe tracks (intentionally prepared by instructor) by the side of the stream.
- Identify animal based on the tracks by using identification sheet and ruler.
- Complete worksheet about tracks.
- Draw a map of the streamside, including all tracks with labels.
- Write a short story about one of the animals whose tracks you saw. Share with the class.

10:30AM-11:15AM—Play “How Many Bears Can Live in this Forest?” from Project WILD (Council for Environmental Education, 2011).

11:15AM-11:30AM—Review activities.

- Assign each student a mammal species to investigate, including its description, its range, its habitat, and place in the foodchain.